Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
		2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)
Australian Capital Territory								
The Australian National University								
DP250100007	**The moral circle: Understanding the forces that determine moral inclusion**	15,627.50	98,698.00	162,451.50	79,381.00	0.00	0.00	356,158.00
Crimston, Dr Charlie R	The proposed project aims to transform our understanding of the competing individual and collective forces that determine moral inclusion in society, and ultimately the motivations behind collective social change (e.g., action on climate change, the rights of marginalized communities). It is anticipated that project outcomes will include novel insights into how more inclusive moral norms can be fostered in society and to identify the key psychological barriers to moral inclusion. This would provide significant benefits, including vital policy recommendations and communication strategies to ensure sufficient community support to tackle pressing social challenges, as well as fostering a more compassionate and equitable society.							
	National Interest Test Statement							
	Moral exclusion is associated with widespread social issues such as racism, prejudice, marginalisation, and the negative treatment of non-human animals and the environment. We propose a novel conceptual model that addresses critical gaps in our understanding of the social and psychological forces that drive and restrict the moral concern we feel for other groups and entities (human and non-human). This project aims to identify these forces for the first time. This research will benefit Australians by providing novel insights to tackle pressing societal and environmental challenges, such as violence against women, the well-being of marginalised Australians, and attitudes towards the environment and climate, which cost billions of dollars annually. Socially and culturally, it will identify strategies to reduce intergroup tensions, improve social cohesion, and strengthen our national identity by promoting values of compassion and inclusivity. To maximise the impact of our findings, we will engage with policymakers, community groups, and utilise targeted communication strategies to develop actionable guidelines, policy recommendations, and training materials. Our efforts will ensure that the research outcomes are widely understood and adopted, leading to evidence-based policies and practices. By making our research accessible and actionable, we aim to deliver tangible benefits to all Australians, ultimately fostering a more compassionate and inclusive society.							
DP250100070	**Defining and harnessing the code of messenger RNA modifications**	87,000.00	197,500.00	240,500.00	130,000.00	0.00	0.00	655,000.00
Eyras, Prof Eduardo	This project aims to define and harness a hidden layer of genetic control that guides protein production. Using interdisciplinary approaches combining cell biology, synthetic biology and artificial intelligence, the project expects to generate new knowledge and tools that will enhance our understanding of how biological systems enact their genetic program through messenger RNA to produce the proteins that sustain life. Anticipated outcomes include an improved ability to elucidate key cellular mechanisms and new molecular tools with broad applications in biotechnology. This should realise global benefits across industry and agriculture, fostering economic growth and advancing interdisciplinary training and research in Australia.							
	National Interest Test Statement							
	The ability to synthesise ribonucleic acid (RNA) holds great promise for developing tailored treatments for diseases, as was seen with the vaccines that controlled the COVID-19 pandemic. To make this a reality, therapeutic RNA must be precisely engineered to ensure its effectiveness, stability for transport and storage, and safety for ecosystems and Australia's diverse population. This project will generate new molecular tools that allow RNA to be modified and adapted in a precise and controlled manner through a pioneering combination of computational, synthetic, and experimental techniques. These tools will enable the manipulation of natural and synthetic RNA, allowing the study of fundamental biological processes and the creation of RNA for bioengineering and medical purposes, such as enhancing insulin production or generating safer vaccines tailored to the individual's genetic makeup. Additionally, these tools may aid in the development of effective and environmentally safe animal vaccines and treatments against pathogens for animals and plants of natural and economic importance in Australia. These tools could be commercialised or licensed to biotech and pharma companies globally, integrated into therapy production pipelines, and used by researchers to further explore these biological processes and discover new therapies, ensuring significant economic and societal impacts and contributing to a growing biotechnology market in Australia and worldwide.							
DP250100103	**Investigating the plant growth/defence trade-off**	113,984.00	232,468.00	219,425.00	100,941.00	0.00	0.00	666,818.00
Rathjen, Prof John P	This project aims to understand how plants balance their growth with defence against pathogens. It expects to generate new knowledge in the area of how natural plant							

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	defence mechanisms impact on plant productivity by investigating the underlying biochemical mechanisms. The expected outcomes of this project include the ability to easily identify new long-lasting disease resistance genes, and a more complete understanding of how the plant immune system works.This should provide significant benefits including improving crop productivity by identification of new resistance genes, and strategies to optimise the balance between plant growth and resistance to pathogens. **National Interest Test Statement** Plant diseases cause major crop losses in Australia and worldwide, significantly impeding the Ag2030 vision of delivering a $100 billion agricultural sector by 2030. This project is about understanding the relationship between plant productivity and the ability of crops such as wheat to resist damaging diseases. It's not known why plants cannot grow and defend against pathogens simultaneously, and here, we hope to expose some of the mechanisms by adjusting growth conditions and analysing their effects on plant performance. If successful, the research will help breed better crops by identifying new stable sources of disease resistance and understanding how plant growth and disease resistance interact. The outcomes of this research will allow better, more environmentally friendly methods for controlling crop disease, helping farmers, consumers and exporters to enjoy the benefits of higher crop productivity, ultimately strengthening Australia's economy and supporting local agricultural communities. The research results will be shared with breeding companies, agricultural researchers, and other stakeholders through planned meetings. The results will be published in scientific journals and industry news sources.							
DP250100112 Mahony, Prof Robert E	**Seeing through Space and Time: Spatio-Temporal Event Processing for Robots** This project will develop a theoretically well founded and computationally feasible spatio-temporal modelling and signal processing framework to exploit the coming revolution in event-based sensors exemplified by the recent arrival of commercial event cameras. Event sensors measure relative signal changes, generating asynchronous event streams with low latency and high dynamic range, offering hope that robots and other autonomous systems can perceive the world in real time as events occur rather than via freeze frames provided by classical cameras and digital sensors. Project outcomes will enable safer autonomous driving, visual communication systems for smart cities, and a range of applications in consumer electronics and virtual reality. **National Interest Test Statement** Advanced automation is poised to transform the everyday lives of Australians by revolutionising key industries such as mining, agriculture, transport and logistics, and defence and aerospace. This project will establish design principles and develop algorithms required by autonomous systems and robots to perceive the world in real time using arrays of spatio-temporal event sensors such as event cameras and tactile sensors, enabling them to act quickly, safely, and efficiently in complex dynamic environments that render existing systems sluggish and unsafe. It will enable new capability in products ranging from consumer devices, cameras and virtual-reality headsets, through robotic vacuum cleaners and autonomous vehicles, to large multimillion-dollar aerospace and defence systems. It will help unlock the full economic benefits of autonomous systems that are predicted to create $AU1 trillion in value for Australia's economy by 2030. Improved situational awareness of autonomous systems leads to advances in collision avoidance systems that improve the safety of land, sea, and air vehicles in the home, in the city, and on the highway, with direct societal benefit in reducing accident and mishap rates. Australia's large and growing community of robotics and automation start-ups and established firms will benefit both directly from the alumni that will be trained within the project, but also from the open-source code and industry outreach that the project will undertake.	108,817.50	222,635.00	227,635.00	113,817.50	0.00	0.00	672,905.00
DP250100324 Fforde, Prof Cressida	**Police Collecting of Ancestral Remains and Cultural Property, 1825-1930.** The project aims to investigate the history, legality and modern implications of police collecting of Indigenous Ancestral Remains and cultural property and the role of museums and governments in directing this activity (1825-1930). By examining relevant law and jurisprudence during this period, and assumptions about applicability to Indigenous ownership and enjoyment of their possessions, we expect to generate new knowledge of the legal bases on which resulting museum collections rely. Expected outcomes include new histories about police-collecting and their legal, social and political implications, benefitting repatriation, truth-telling and reconciliation, and decolonised heritage legislation and museum policies here and overseas. **National Interest Test Statement**	119,379.50	228,869.50	203,954.50	190,422.00	95,957.50	0.00	838,583.00

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	It is increasingly well known that police perpetrated violence against First Nations throughout the colonial period. But their role in supplying human remains and cultural objects to domestic and overseas museums is little understood, nor whether they exceeded or abused their powers in doing so. Combining fine-grained historical research with detailed legal analysis, this project investigates police collecting (1825-1930) and its contemporary implications. Revealing this history is of profound importance to First Nations seeking to know what happened to their Ancestors and cultural property, self-determine their future, and make repatriation claims. It is also of deep importance to museums and police, as understanding and acknowledging their past colonial actions will improve service to First Nations and is critical for their reconciliation aspirations. Findings in diverse formats will maximise reach and uptake: a book and journal articles; education materials; conference papers and a symposium; submissions to museums and their peak bodies, to police organisations, government, treaty and truth telling processes, and to social justice commissions and enquiries. Findings will also be made available to First Nations via the Return Reconcile Renew Digital Archive and peak organisations whose experts are on the project reference group. The use of project insights will contribute to repatriation, reconciliation and associated improved social outcomes for First Nation Australians.							
DP250100400 Stuchbery, Prof Andrew E	**Nuclear moments as a unique probe of the nuclear quantum many-body problem** This project explores the self-organisation of protons and neutrons within the atomic nucleus. The goal is to map how deformed shapes and collective rotations emerge from the intricate motion of individual particles. Novel measurements of nuclear magnetism and the charge distribution of the nucleus, and examination of how they vary with the number of nucleons and excitation energy, aim to give new insights. Expected outcomes include the revision of long-held views and a deeper understanding of the general quantum many-body problem, which spans science and technology. Anticipated benefits include international research engagement, and providing essential hands-on training to address Australia’s pressing demand for skilled nuclear personnel.	138,873.50	270,247.00	248,578.00	117,204.50	0.00	0.00	774,903.00
	National Interest Test Statement This project aims to advance the fundamental understanding of atomic nuclei by developing new methods to measure the electric and magnetic fields created by their internal particles. One main goal is to understand how these particles move together to shape and rotate the nucleus, much like the end-over-end spin of an Australian rules football in flight. The electric field helps us see the shape, while the magnetic field reveals which particles are causing the rotation. On a broader scale, this research tackles important questions in quantum mechanics, which is fundamental to chemistry, biology, and various technologies. The project also seeks to enhance international scientific collaboration by developing new techniques at Australia's Heavy Ion Accelerator Facility and using them at top laboratories worldwide. Moreover, the project will benefit society by offering hands-on training in advanced nuclear methods. This training will produce skilled professionals capable of addressing issues related to nuclear technologies, safety, and regulation. Nuclear technologies have diverse applications in medicine, environmental monitoring, and industry. Training experts in this field is crucial, especially as Australia prepares to acquire nuclear-powered submarines, emphasising the need for public assurance and safety.							
DP250100418 Chan, Dr Kai Xun	**Dissecting sensory chloroplasts in specialised cells for climate resilience** This project aims to fill a critical knowledge gap in how unique chloroplasts function beyond photosynthesis across four major cell types of a plant leaf, enabling plants to sense and respond to environmental changes. It aims to dissect how different chloroplasts utilise hydrogen peroxide, a key messenger molecule, in these specialised cells to modulate acclimation to stressful conditions such as excess sunlight. Expected outcomes include an unprecedented, cellular-resolution blueprint of a leaf showing how chloroplast- and cell type-specialisation are coordinated for plant growth and survival. This should provide significant benefits to the engineering of improved climate resilience into key Australian crops including canola and sorghum.	127,126.50	232,303.00	211,703.00	106,526.50	0.00	0.00	677,659.00
	National Interest Test Statement The increasing frequency and intensity of climate extremes are threatening Australian agriculture production. Climate extremes negatively impact crop yields, specifically grains and oilseed, which are down by 87% and are estimated to diminish our GDP by $5.5 billion annually. Traditional strategies to enhance crop resilience often target the entire plant, however, this often results in trade-offs with undesirable impacts on plant growth and seed yield. Greater precision in our strategies is needed to avoid the trade-offs and inform future crop breeding that enhances both crop and economic resilience. This project seeks to discover and understand the specialised roles of diverse plant leaf cells in sensing changes to their environment, such as extended drought and intense sunlight. By deepening our understanding of the cellular and molecular specialisation within the plant leaf, we can leverage the discoveries and insights to guide Australian crop breeders and global agri-technology companies to produce next-generation climate-resilient crops with fewer trade-offs. Collectively, this research contributes to strategies that aim to safeguard the rural Australian agriculture industry and food security against environmental threats from climate change.							
DP250100527	**Geometry of Character Varieties** The aim of this project is to develop a comprehensive theory for the geometry of the	81,300.00	171,100.00	173,705.50	83,905.50	0.00	0.00	510,011.00

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Onn, Prof Uri	spaces of symmetries called character varieties. The significance of these spaces stems from their central role in deep areas of mathematics and physics, such as the geometric Langlands program, mirror symmetry, and Yang--Mills theory. Expected outcomes include resolution of long-standing conjectures regarding invariants of character varieties. The benefits include applications in number theory and knot theory, and more broadly in cybersecurity, quantum computing, and economics. We will also strengthen the Australian mathematical research community by creating a hub in the southern hemisphere for the study of character varieties.							
	National Interest Test Statement							
	The proposed research addresses fundamental problems in representation theory and arithmetic geometry, with significant and diverse implications for the mathematical sciences and broader applications. This project aims to develop innovative methodologies to study rich geometric structures that encode symmetries of surfaces. It aligns well with Australia's STEM priorities and provides excellent training opportunities for young Australian researchers. Expected applications include novel optimisation algorithms with potential uses across various industries. These include new tools in discrete convexity theory and statistics. A striking feature of these results is that they provide linear and quantum versions of well-known results. This leads to more efficient and flexible algorithms in optimisation, applicable in problems like scheduling and resource allocation. By combining knowledge of leading expertise in Canberra, Adelaide, Brisbane, and Auckland, the project will strengthen Australia's educational and research landscape. To maximise the impact of the findings, the project team will engage with both academic and non-academic audiences. They plan to publish results in high-impact journals and present them at international conferences, ensuring visibility within the scientific community. Outreach activities, including public lectures, will disseminate knowledge to a broader audience, fostering public understanding and appreciation of the importance of mathematical research.							
DP250100690	**Understanding Reionization with the Murchison Widefield Array**	87,954.00	176,204.00	176,500.00	88,250.00	0.00	0.00	528,908.00
Wyithe, Prof Stuart	Epoch of Reionization is the time during the first 10% of the Universes age when the first stars formed, and illuminated cosmic space with UV radiation that heated and re-ionized intergalactic atomic gas remnant from the time of the cosmic-microwave background. The Murchison Widefield Array (MWA) Epoch of Reionization key project has collected observations for the past 10 years, aiming to detecting re-ionization in low-frequency radio emission from the 21cm line of hydrogen. This project aims to complete the processing of MWA data to produce a final observational constraint or detection, and integrate these findings with detailed physical models to determine key properties of the first galaxies.							
	National Interest Test Statement							
	This project exploits the Australian Muchison Widefield Array (MWA) telescope and Australian supercomputing expertise to measure the influence the first galaxies on hydrogen in the Universe. This will enable analysis methods 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 and how this will manifest in Square Kilometre Array data, 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 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.							
DP250100728	**Grandparenting in Australia: a history (1945-2025)**	103,495.50	189,717.00	120,964.00	34,742.50	0.00	0.00	448,919.00
Ricatti, A/Prof Francesco	The project aims to develop the first history of grandparenting in Australia. Longer lives, and major demographic, social and cultural changes, have increased the importance of grandparenting for the wellbeing of individuals, families and communities. The research expects to address a major gap in the study of grandparenting - its evolution over time, in relation to profound changes in society, including life expectancy, gender rights, and multiculturalism. Expected outcomes include a new historical understanding of grandparenting, and guidelines for the collection of family histories. The project should provide significant benefits by helping scholars and policy makers shape grandparents' key contribution to Australia's future.							

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	National Interest Test Statement Australia is an aging society. In families with working parents, elderly grandparents increasingly provide the largest, most frequent, consistent, long-lasting and intimate form of childcare and family support. They have a crucial role to play in the social, economic and psychological wellbeing of families. However, grandparents and the role of grandparenting has a limited focus in current public discourse, and within existing government policy frameworks. Drawing on the historical and current experiences of families and communities, this project will deliver the untold story of how grandparenting in Australia has changed over time, and its impact on our society. Through community dialogues and public events; a digital guide to family history; a podcast on grandparenting; and media and social media outputs; the Australian community and key policy makers will gain critical insights into the role and influence of grandparenting. Access to these resources will help to guide and inform the development of future social and economic policies on ageing and aged care, childcare, family welfare, and employment. This will contribute to social equity and economic productivity of the broader Australian society, and a strengthening of the overall wellbeing of Australian families.							
DP250100735 Colless, Prof Matthew	**Testing the cosmological principle with galaxy motions** This project aims to measure both distances and velocities for 100,000 galaxies and so map the visible and dark matter within a billion light-years. It exploits data from the first year of a transformational survey using the European Southern Observatory's newest facility, which will surpass existing maps by a factor of 10 in volume and 50 in galaxies. The goals are to find the origin of the Milky Way's motion through space, test predictions for the motions of galaxies on large scales, confirm the Universe becomes smooth on the largest scales, and pave the way for the full 5-year survey. Expected benefits are a deeper understanding of fundamental physics, advanced training for Australian researchers, and stronger European collaborations.	90,211.50	200,305.50	217,385.50	107,291.50	0.00	0.00	615,194.00
	National Interest Test Statement Maps of the Universe show us where we are and how we got here. This project aims to answer fundamental questions about the Universe by creating a vast new map of galaxies' positions and motions over the whole southern sky. This map will be far larger than any previous survey. It will reveal the origin of the Milky Way's motion through the Universe and test a fundamental assumption of modern cosmology: that on the largest scales the Universe is the same everywhere. The project exploits the Australian government's $120M investment in a 10-year strategic partnership with the European Southern Observatory to access a transformational new survey telescope. To collect light from thousands of galaxies simultaneously, this facility uses advanced micro-robots for positioning optical fibres that were designed and built in Australia. The primary benefit of this project will be a deeper understanding of humanity's place in the Universe. Other benefits include a high-profile demonstration of an Australian technology for precision engineering applications, training for young researchers in sophisticated computing and data analysis, and stronger European scientific and technical collaborations. This map of the Universe will generate spectacular images with broad public appeal. These will be shared through conventional and social media to increase interest in science, inspire young people to take up STEM careers, and publicise Australia's technological capabilities in robotics and optics.							
DP250100759 Morrison, Dr Adele K	**Improving projections of the risk of ocean-driven Antarctic ice melt** The risk of continued ocean-driven ice loss from Antarctica is profound, with marine terminating ice sheets locking up tens of meters of potential global sea level rise. Yet sea level projections are highly uncertain, in part as the numerical models used for making these projections are missing key ocean processes. This project aims to better constrain future rates of sea level rise from Antarctic ice melt by developing new fundamental understanding of the complex ocean processes that drive melting and by transforming the representation of ocean–ice shelf interactions in Australia's next-generation global ocean model. This will benefit future adaptation of Australia's coastal infrastructure, tourism and natural resource sectors.	15,000.00	97,139.50	166,854.00	172,860.50	88,146.00	0.00	540,000.00
	National Interest Test Statement The risk of continued ocean-driven ice loss from Antarctica is profound, with the potential to raise global sea level by many metres over the coming centuries. Over 85% of the Australian population currently live within the coastal zone susceptible to sea level rise and $226 billion in Australian infrastructure assets are at risk of inundation and erosion hazards by 2100. Yet projections of Antarctic ice loss are highly uncertain and more accurate projections of sea level rise are needed for future coastal adaptation. This project will improve projections of future rates of sea level rise stemming from Antarctic ice melt by developing new fundamental understanding of the complex ocean processes that drive melting. New ocean modelling capability will be developed that represents the fine-scale ocean processes that bring warm ocean waters into contact with the Antarctic ice sheet and drive melt. This new modelling capability will have broad use by researchers in the national and international climate science community. The research will support Australia to be better prepared for future sea level rise and help to guide future climate adaptation and mitigation efforts, thus enhancing the resilience of our economy, society, and natural environment. The increased accuracy of sea level projections enabled by this project will also inform insurance and financial risk projections and guide coastal planning policy across all levels of government.							

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DP250100893	**More than the background: the role of lipids in ion channel function**	125,000.00	255,000.00	262,500.00	257,500.00	125,000.00	0.00	1,025,000.00
Corry, Prof Ben A	The movement of solutes in and out of cells underlies nerve impulses and our ability to sense the environment. It is controlled by ion channels, proteins located in cell membranes that open and close in response to different stimuli. But, we have only just begun to appreciate that the membrane and its lipid components actively contribute to regulating these proteins. We aim to explain how lipids regulate two important families of ion channel responsible for sensing touch and sending nerve signals, using a combination of cutting edge experimental and computational methods. These findings will address uncertainties in molecular biology and neuroscience, and provide a basis for predicting lipid regulation in a wide range of proteins.							
	National Interest Test Statement							
	The generation of nerve impulses in responses to the senses, and how they are spread through the bodies is not fully understood. Such impulses are tightly controlled so that sensations don't feel too weak (absent) or too strong (painful), and so that they don't generate chaotic firing that can lead to seizures. This project aims to harness the collaborative expertise of multiple research teams to understand one way the individual cells in your body control such impulses through the properties of the cell membrane. The project is fundamental in nature, and will enrich our understanding of a range of biological processes that can be controlled by cell membranes. This research will have diverse implications, as we will study a range of organisms from humans to plants. For example, we will provide insight into our least understood sense, the ability to feel mechanical forces, as well as having benefit in agriculture and biotechnology providing directions for improving drought and salt tolerance of crops. The software developed in this project can be applied to understanding a wide range of other cellular components and we expect it to be utilised by researchers studying diverse biological processes.							
DP250101119	**Volcanoes on Ice: Mantle Influence on Antarctic Ice Sheet Evolution**	123,544.00	234,699.50	221,427.00	110,271.50	0.00	0.00	689,942.00
Davies, Prof Rhodri	This project will constrain Antarctic mantle dynamics over the past 40 million years using a data-driven computational approach that integrates its volcanic record with complementary geoscientific observations. A major outcome will be the first Antarctic-wide reconstructions of topography and heat flow – surface manifestations of mantle convection that control ice-sheet behaviour. These will be used to explore why the Antarctic Ice Sheet (AIS) formed and how it has since evolved. Benefits include a transformational understanding of connections between the Antarctic surface and its deep interior, reducing uncertainties in forecasting the AIS' response to climate change, and cementing Australia's leadership in cutting-edge Antarctic science.							
	National Interest Test Statement							
	The Antarctic Ice Sheet (AIS) contains nearly two-thirds of global freshwater and is a major source of uncertainty in future sea-level rise. Despite this significance there is a substantial gap in understanding why it initially formed ~34 million years ago, and what has since caused it to advance and retreat. This project aims to fill this gap by exploring the impact of mantle convection – the internal 'engine' driving our dynamic planet – on AIS inception and evolution. Observational constraints on mantle structure and dynamics will be merged with state-of-the-art computational models, to improve understanding of the processes that have operated beneath Antarctica's surface and their influence on the AIS. The project will advance Australia's leadership in Antarctic Science, over which Australia has 42% sovereignty, and train future geoscientists crucial for Australia's economy. Expected outcomes include: 1) enhanced environmental knowledge of Antarctica, specifically the likely response of the AIS to global warming; and 2) better calibrated models of ice-sheet behaviour, for improved future sea-level forecasts. These will contribute to Australia's economic and commercial prosperity (e.g. assessing future sea port viability) and social and cultural well-being (e.g. predicting regional coastal migration patterns). Results will be widely disseminated, including through existing partnerships with Geoscience Australia and the Australian Centre of Excellence for Antarctic Science.							
DP250101265	**Uncovering Hidden Histories of Women and Colloquial Language in Australia**	33,969.00	69,444.50	66,850.00	31,374.50	0.00	0.00	201,638.00
Laugesen, A/Prof Amanda	This project aims to examine the role of women in shaping the history of colloquial language in Australia. It will use a range of historical sources to generate new knowledge about how women collected, recorded, engaged with, and wrote about colloquial language. The project will place this history into a broader discussion of gendered discourses surrounding English, language, and speech in Australia. Expected outcomes include a better understanding of the gendering of Australian national identity and new knowledge about women's role in the story of colloquial language. It will benefit Australia through communicating and providing new perspectives on national							

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	myths around language. **National Interest Test Statement** A love of slang and colloquial language has played a significant role in Australian society, identity, and culture across time. Language has been closely connected to Australian national myths and iconic masculine figures such as the digger, the bushman, and the larrikin. In order to understand the full picture of Australians' relationships with slang, we need greater knowledge of the roles that women have played in shaping the history of colloquial language in this country. This project will investigate the ways that women have contributed to the story of slang in the past in Australia, through collecting, recording, engaging with, or writing about colloquial language. In doing so, the project will reveal previously unknown stories about how women have used slang, and ideas about slang, to both shape and express their identities, and to assert themselves within the nation's culture and story. Through public lectures, podcasts, short newspaper and online articles, and a book, the project will provide the Australian community with important knowledge and insights into the story of women and slang that will shed light on the parts women have played in this aspect of national identity and culture, which, in turn, will help foster a more inclusive sense of national identity.							
DP250101526 Federrath, Prof Christoph	**Radiation-Driven Turbulence and Star Formation** This project aims to determine how radiation-driven turbulence controls the formation of stars. The expected outcomes are the most accurate radiation-hydrodynamical method to date, and the most detailed simulations of radiation-driven turbulence conducted at the NIF laser. This project will transform our understanding of these fundamental processes, providing crucial input for Australian and international facilities and surveys, and for models of galaxy, star and planet formation. Further key benefits of this project are the training of Australia's future generation of Big Data analysts, and the development of interdisciplinary tools involving Plasma and High-Energy Physics, Chemical Modelling, Statistics, and High Performance Computing.	71,114.00	142,228.00	142,228.00	71,114.00	0.00	0.00	426,684.00
	National Interest Test Statement Advancing our understanding of stars and the radiation they produce is a central research goal. This is because stars produce the light and chemical elements necessary for planets to form and for life to exist. However, we also know that ionising, ultra-violet (UV) radiation is harmful to humans and can cause skin cancer. It is therefore critical to develop simulation techniques that can accurately model the propagation of UV radiation in gaseous media, such as the Earth's atmosphere. The development of such a code is a key goal of this project. Furthermore, the Australian Academy of Science's Decadal Plan for Astronomy stresses the need for infrastructure and research workforce investment to power Australia's leadership in international space research. The Plan identifies areas where Australia can make its greatest 'world-leading contributions', such as the origin of stars. Here we will make the most detailed predictions of star formation, advancing Australian-led research into gas/fluid dynamics, radiation, and chemistry. Through application of this fundamental research to chemical modelling, high-performance computing and plasma physics, the project will support industry to adopt new methods in areas of radiation transport in defence to pollution tracking in our air and oceans. These applications will benefit Australians in areas of national security, health, and environmental conservation, and Australia through global leadership in international astronomical discovery.							
DP250101763 Shames, Prof Iman	**Control at What Cost? One-Shot Real-Time Dual Inverse Optimal Control** This project will develop dual inverse optimal control to enable engineered systems to actively impute (learn or infer) and optimise costs associated with control actions in uncertain dynamic environments. Dual inverse optimal control will be developed by introducing novel measures of cost imputability in optimal control, and by introducing real-time schemes that actively select control actions with the dual objectives of simultaneously improving imputability whilst optimising uncertain costs. The outcomes of this project will enable vehicles to actively infer drag and friction costs; robots to actively learn from humans by requesting demonstrations; and appliances that optimise their electricity consumption via imputing market-based costs.	55,818.00	111,636.00	114,136.00	58,318.00	0.00	0.00	339,908.00
	National Interest Test Statement Australia is on the cusp of multiple technology transitions, including the renewable energy transition and the widespread adoption of automation across agriculture, manufacturing, mining, transport and logistics, and aerospace. This project will develop the techniques and algorithms required to enable engineered systems to make optimal decisions in uncertain dynamic economic and physical environments by actively imputing (learning or inferring) and optimising uncertain costs and constraints associated with their decisions and actions. The techniques and algorithms developed in this project will benefit Australia and Australians by unlocking more efficient generation and utilisation of electricity in the national energy market through ensuring that generation is more closely matched to consumption; they will improve levels of efficiency and productivity in agriculture, mining, transport and logistics, and manufacturing through the availability of robots and autonomous systems that learn, improve, and operationalise human expertise at scale; and they will enable robots to actively collaborate with humans and other machines to scale and streamline advanced manufacturing, and health and aged care. The outcomes of this project will be translated into industry by demonstrating the competitive advantages they build for Australian businesses in the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	national electricity market, large-scale irrigation, and manufacturing, as well as by training the workforce required to implement them.							
DP250101791 Dasgupta, Prof Mahananda	**Dissipative Pathways to Nuclear Fusion** This project aims to pin down the emergence, evolution and sensitivities of energy dissipation in nuclear collisions, from the earliest stages through to fusion - a foundational problem limiting progress in the field. Leveraging latest Australian insights, utilizing newly developed detectors and national infrastructure, this project is expected to clearly characterise the routes to nuclear fusion. Expected outcomes include a profound change in the core understanding of the quantum processes governing fusion. At the frontiers of experiment and theory, this project will train personnel in nuclear science needed by Government and industry in Australia, and the improved predictions will benefit key applications nationally and internationally.	129,885.50	295,915.00	288,400.50	122,371.00	0.00	0.00	836,572.00
	National Interest Test Statement This project tackles a crucial question in quantum mechanics and nuclear science: how and why does nuclear fusion become irreversible? Utilising Australia's world-leading accelerator for nuclear physics at the Heavy Ion Accelerator Facility, locally designed radiation detectors and advanced computational methods, this project aims to explore nuclear fusion in unprecedented detail and develop innovative models for nuclear reactions. Nuclear reactions are key to many applications, from medical treatments to ensuring safe operations of nuclear technologies. There is a growing demand for nuclear expertise in Australia across fields such as mining, medicine, space, and defence. Major national initiatives include a new facility for nuclear medicine production, particle accelerators for cancer treatment, and nuclear-powered submarines. This creates an urgent need for skilled professionals in nuclear physics, radiation measurement and nuclear technology modelling. This project will provide world-class training in experimental, theoretical and computational nuclear science, inspiring a new generation to gain nuclear expertise, and enhance Australia’s international reputation for high quality nuclear physics. The research team’s active engagement with industry across various sectors will help ensure that this foundational research informs future applications of nuclear science.							
DP250101834 Hirst, Prof Giles	**Building worker & technology partnerships that maximise human-AI creativity** This project aims to offer new knowledge about how workers can best partner with artificial intelligence (AI) to solve problems creatively. To date, we do not fully understand how to combine these diverse forms of capability. Through both laboratory studies and field research, we investigate how human psychological conditions of trust and motivation build collaborative capabilities underpinning creativity, and, in turn, how work design promotes dynamic collaboration. We then develop scientifically-based interventions that promote collaboration by building trust, motivation, and work design. This project offers a roadmap for how organizations can boost creativity by leveraging the strengths of both workers and AI in partnership.	31,684.50	98,934.00	164,935.00	147,352.50	49,667.00	0.00	492,573.00
	National Interest Test Statement Using artificial intelligence (AI) to automate creative work poses employment, quality and performance concerns and misses the benefits of workers and AI working together. When workers effectively collaborate with AI, this partnership, has potential to boost creativity while addressing the risks of automation. By examining how to design work systems and develop workers' abilities to support human-AI collaboration, we will generate scientifically informed knowledge about how to leverage the strengths of both to augment creativity. We will offer research-led guidance to support workers as their needs and technology change. Working with industry partners, this knowledge will be tested in work settings to inform policy and practice in the public service and industry. Project findings will guide and inform future approaches to maximise the creative potential of Generative AI at work, leading to a more skilled workforce, which in turn promises to enhance their work experience and accelerate economic and social growth in Australia, and the broader community.							
DP250101876 Roberts, Prof Celia M	**Experimenting with Estrogen: Towards inclusive science, medicine and policy** This project aims to investigate how biological scientists, medical clinicians and lay people are experimenting with the sex hormone estrogen. Using ethnography, qualitative interviews and textual analysis, it will identify, analyse and evaluate these experimental understandings and practices, focusing on how they challenge discriminatory and out-dated models of sex and gender. Expected outcomes include more holistic and inclusive understandings of estrogen and its effects that are better aligned with contemporary lived experiences of sex and gender. Benefits include	79,429.50	158,487.50	159,956.50	80,898.50	0.00	0.00	478,772.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	increased capacity of health professionals to provide effective and respectful services, and of Australians to make informed decisions about their bodies and health. **National Interest Test Statement** Estrogen is a hormone that plays a vital role in the reproductive, brain and bone health of all Australians. However, outdated ideas about sex and gender hinder scientific, medical and lay understandings of estrogen. This has led to divisive medical and public debate about the safety and effectiveness of estrogen therapies particularly for menopausal and trans and gender diverse people. This is a problem: without clear medical guidance, consumers turn to social media for health advice and take estrogens without medical supervision. To address this problem, this project examines how biases and cultural beliefs about sex and gender shape estrogen related scientific research, medical practices, public debate and lay practices. This first ever study of this issue analyses cutting-edge scientific research, medical practice and diverse people's lived experiences to provide a comprehensive and nuanced understanding of estrogen use. The project will contribute new knowledge with and for diverse stakeholders through a collaboratively curated series of public events and publications for policy makers, community organisations and professional bodies. Together, these will broaden and rebalance the debate about estrogen use in Australia and internationally. The use of our findings in practice will improve doctor/patient communication and inform decision-making thereby enhancing the health and wellbeing of menopausal and trans and gender diverse people in Australia.							
DP250102214 Bedford, A/Prof Stuart H	**Transformed landscapes: 3000 years of adaptation and resilience in Vanuatu.** This project aims to explore the history of dramatic human modification of a Pacific Island landscape over the past 3000 years and draws out the implications of these transformations for future generations in a changing global climate. Since initial settlement, the island of Efate in Vanuatu has been spectacularly altered by a series of socio-agrosystems, recently revealed by LiDAR aerial imagery. This transdisciplinary project will combine field and archival research by archaeologists, historians and linguists to map social and agricultural development across Efate, generating a deep-time perspective that will inform responses to contemporary challenges around population growth and food security in the Pacific. **National Interest Test Statement** Climate change poses a significant threat to Australia and its region. Food security and pressure on resources are going to be critical challenges for many of Australia's Pacific Island neighbours, with anticipated changes in social, agricultural and economic development. This project focuses on the history of past strategies of adaptation on Efate Island, Vanuatu, where there is an exceptional record of high-density population and innovative changes in land use in response to changing environmental conditions. To better understand the way Efate Islanders have adapted to changing environments over thousands of years, this project introduces cutting edge remote-sensing technologies alongside new archival discoveries and traditional knowledge of land use practices. A team of archaeologists, historians and linguists will work together to show how different strategies for adaptation on Efate might point to an expanded range of possible futures for land use across the region. Understanding these past strategies will add to the toolkit of disaster risk reduction measures and plans for climate change adaptation. This toolkit will also inform policy makers developing strategies to address climate change and its social, agricultural and economic effects in Australia and the region.	75,726.50	152,781.00	155,138.00	78,083.50	0.00	0.00	461,729.00
DP250102681 Farine, A/Prof Damien R	**Pollinator pathways: GPS insights into honeyeater migration and habitat use** This project aims to address key gaps in knowledge about where and how birds move across the landscape. The project will conduct the largest simultaneous GPS tracking study in Australia to date, focusing on large, tree-pollinating honeyeaters to shed light on their seasonal and migratory movements. Expected outcomes include the first detailed maps of the routes that migrating honeyeaters take and actionable data on how habitat features influence the ecosystem services that these keystone pollinators provide. This represents the first major step in closing a 20-year gap in studies of Australian migration and should benefit land managers and partner organisations by enhancing return on investment for conservation and revegetation efforts. **National Interest Test Statement** An estimated 20% of all bird species are migratory, with potentially half of all migratory species in decline. In Australia, many migrants play a critical role in ensuring the health and resilience of agricultural and natural ecosystems as pollinators for flowering plants. However, current understanding of the movements of migratory birds in Australia is decades behind the global standard. This project combines cost-effective and cutting-edge technologies to close this gap and establish a new standard for wildlife monitoring in Australia. Tracking migratory pollinators as they move in and between different habitats will reveal—for the first time—the complete migratory paths of any honeyeater species and the features shaping where they go and when. The project will generate novel insights into avian biology and deliver specific outputs to key stakeholders (Greening Australia and conservation efforts for Australia's most endangered bird—the regent honeyeater). Further, the project will integrate with, and expand, Australia's Internet of Things capacity that is underpinning multibillion dollar developments in the agricultural sector.	141,825.50	275,671.00	223,658.50	89,813.00	0.00	0.00	730,968.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	In doing so, the project will develop tools that can incorporate biodiversity monitoring with ‘smart agriculture’ systems, benefiting both primary production and conservation goals.							
DP250103623	**Unleashing the potential of Restorer-of-fertility proteins for hybrid crops**	185,895.00	300,895.00	228,500.00	113,500.00	0.00	0.00	828,790.00
Melonek, Dr Joanna A	Hybrid crops offer higher and more stable yields than conventional lines. However, cost-effective systems for hybrid seed production are missing for key crops like wheat or barley. One of the main challenges is identifying and tracking Restorer-of-fertility genes that control self-pollination in breeding material. This project will make this process easier, cheaper, and faster by improving our understanding of how Restorer-of-fertility proteins interact with RNA. This knowledge will also extend the application of these genes as biotechnological tools in agriculture, synthetic biology, and medicine.							
	National Interest Test Statement							
	Crops make an important contribution to the Australian economy both regionally and nationally, but yields are declining. Hybrid varieties have shown the potential to produce up to 40% higher and more stable yields, as seen in maize and canola. However, developing hybrid breeding systems requires identifying specific genes, a process that is currently very labor-intensive and therefore costly. This project aims to accelerate the identification and tracking of these genes by better understanding how the proteins they encode bind to their RNA targets. The economic benefits of hybrid varieties tailored to the challenges of the Australian climate, particularly for key crops like wheat, barley, and sorghum—major staples contributing to Australian agricultural exports—are expected to be significant. Societal benefits will come from more sustainable yields, ensuring better food and market security in the future. High-yielding hybrid cultivars will reduce the need for deforestation or converting natural habitats into farmland, helping to protect the environment. Additionally, the new knowledge will extend the use of these genes as biotechnological tools in synthetic biology and medicine. The project's aims and expected outcomes will be shared with the wider community through public engagement programs, industry showcases, and media outreach.							
DP250103744	**Harmonic analysis for elliptic partial differential equations**	91,606.00	185,712.00	193,212.00	99,106.00	0.00	0.00	569,636.00
Yung, A/Prof Po-Lam	This project aims to establish fundamental estimates for elliptic partial differential equations, a crucial step in unravelling the behaviour of solutions in real-world applications. The overall goal is to study the changes in these estimates as the equation coefficients, indicative of factors like the roughness of the medium, become increasingly singular, through investigating a longstanding conjecture of Pucci from 1966. Anticipated outcomes encompass the invention of a new class of fully nonlinear elliptic equations, along with new harmonic analysis techniques for studying them. The results will be a significant milestone for partial differential equations and solidify Australia's leadership in this cornerstone of modern mathematics.							
	National Interest Test Statement							
	Partial differential equations (PDEs) provide a mathematical way of modelling nature. Our previous work has found applications in differential geometry, computational mathematics, optimal transport and more recently in geometric optics. They provided new models for optical systems, which direct given light sources onto desired targets. The current project seeks to establish a good quantitative understanding of solutions to some of the most fundamental types of PDEs. It innovates by constructing a new mathematical object that captures symmetrically the contributions to curvature from different directions, a framework commonly used for expressing image processing operators in computer vision. The project further addresses a longstanding open problem about PDEs, whose study is pioneered by Australian mathematicians. By putting together novel ideas from different areas of mathematics, the project seeks to deliver deep results, and ensure that Australia remains at the cutting edge of the mathematical developments that will underpin the next generation of technological advances, such as communication technologies, medical imaging and mineral exploration. It will also foster international collaboration, via in-depth discussions with experts across the world, and build up Australia's capacity in quantitative skills by training postdoctoral researchers and HDR students. Lectures aimed at general audiences will be given to promote understanding and maximize use of our discoveries.							
DP250103951	**Demystifying employee disclosure of retirement plans at work**	39,615.50	86,035.50	84,182.50	37,762.50	0.00	0.00	247,596.00
Bordia, Prof Prashant	This project aims to improve and streamline the retirement transition process by investigating employees’ disclosure of retirement plans (DRP) at work. DRP is an important step in retirement transition with considerable benefit for both employees (obtain much needed support and accommodation on pathway to retirement) and employers (enables succession planning); but DRP is a fraught issue for employees who are wary of discrimination and lost opportunities. The project will generate vital knowledge aimed at improving retirement transition practices in the workplace. This knowledge will provide significant benefits to employees as well as employers on how to							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	achieve wellbeing and productivity outcomes for Australia’s ageing workforce. **National Interest Test Statement** Projection shows 670,000 Australians are expected to retire in the next five years and in current practice, employers and employees are reactive to the gaps arising from retirement. In order to transition to a proactive approach, critical new knowledge is required to determine best practice approaches that involve robust and productive late-career employee-organisation relationships. This project will provide strategies and tools to enhance this transition. The research will determine a stronger grasp of how to effectively prepare and support both employees and employers by identifying major factors that disrupt the retirement process. Creating an online training program that focuses on preparing for retirement will contribute to new knowledge and resources that offer a more detailed initiative, based on the needs of Australian employees and employers. Additionally, the findings will be presented to the Australian Human Rights Commission, Council on the Ageing, public and private sector human resource professionals, and other relevant stakeholders. This project’s findings and recommendations will impact industry and government organisations and deliver immediate social, economic, and commercial benefits.							
DP250103952 Langford, Dr Mat	**Fully nonlinear geometric flows** Geometric flows describe geometries changing through heat flow and diffusion. They arise naturally in many fields, from phase change and tumbling stones to string theory, and provide new tools for understanding questions in geometry and physics. This project aims to develop techniques for the design and analysis of highly nonlinear geometric flows, and apply them to understand long term behaviour of these processes. The new methods will contribute to the theory of nonlinear partial differential equations, enable the application of geometric flows to resolve important geometric and topological questions, and produce new theoretical tools applicable to similar systems arising in areas such as image processing, finance and material science.	87,500.00	180,000.00	187,500.00	95,000.00	0.00	0.00	550,000.00
	National Interest Test Statement In many physical systems, an interface changes over time in a way dependent on its curvature. Examples include erosion processes like stones tumbling on the beach and the propagation of bushfire fronts. Often these evolutionary processes are highly nonlinear. This project addresses the research gap in the mathematical understanding of fully nonlinear evolution by curvature. Better mathematical understanding of these processes developed in this project could lead to improvements in applications such as bushfire modelling, of critical significance in Australia. Research outcomes could be promoted beyond academia to organisations that rely on these or related models, so they can make adjustments to their operations with potential economic, environmental and health benefits. Graduates and early career researchers from the research training element of this program could be directly placed into jobs with such organisations to realise this research translation. The Administering Institution has a well-established team ready to assist with research translation by connecting these researchers with users in bushfire modelling and in other practical applications.							
DP250104143 Sherburn, Prof Michael S	**Next Generation Synthesis** This project aims to unite state-of-the-art domino reaction strategies with sustainably resourced organic feedstocks to improve efficiency and sustainability in organic chemical synthesis. Organic compounds are ubiquitous: we use them as medicines, agrochemicals and countless other materials. The problem is that their manufacture is costly, labour-intensive, time-consuming and generally unsustainable. Efficiency gains in chemical synthesis will lead to less waste, thereby reducing negative environmental impact. Other benefits include enhanced capacity in the next generation of chemical synthesis, which will advance fundamental science and train the next generation of Australian scientists in world leading, next generation approaches.	90,514.00	181,028.00	181,028.00	90,514.00	0.00	0.00	543,084.00
	National Interest Test Statement Chemical synthesis describes the controlled assembly of otherwise inaccessible and important molecules. It underpins the chemical industry, one Australia’s largest manufacturing sectors, contributing around $40 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 a little about how to bring atoms together to form molecules. The problem is that we don’t know how to do this well. Chemical synthesis of virtually any stable molecule is feasible but is neither practical nor sustainable. This project aims to invent innovative new approaches to make chemical synthesis both practical and sustainable. It aims to develop groundbreaking new fundamental science to make molecules faster and cleaner. It also aims to use plant-derived and sustainably sourced building blocks in place of non-renewable precursors. The academic outputs of this work will lead to new industrial collaborations with potential 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 and other important materials. This project will also benefit Australia by training people in the experimental skills needed by future high technology industries.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250104172	**The chemical diet of plants and its ramifications on carbon loss in leaves**	150,000.00	280,000.00	214,612.50	84,612.50	0.00	0.00	729,225.00
Scafaro, Dr Andrew P	This project will developing a novel framework to significantly improve our understanding of plant nocturnal leaf respiration and its contribution to atmospheric carbon concentrations. It is widely assumed that respiration consumes sugars to make the energy needed to power cells and grow. However, recent work has shown that plants use other substances to fuel respiration, saving sugars for export from leaves to growing tissue. Not using sugars significantly alters carbon dioxide released during respiration, with important consequences for climate models that predict plant-atmosphere carbon exchange. Expected outcomes include a better representation of how carbon release from vegetation is accounted for in global carbon cycles.							
	National Interest Test Statement Australia relies on plant growth for the food we eat to the functioning of our natural ecosystems. Plant growth plays a central role in the carbon cycle, yet our ability to measure and model plant respiration, the release of carbon, at scale and across landscapes are limited. This research project will leverage state-of-the-art technologies and advanced frameworks to better understand carbon release by plant respiration in both current and future climate scenarios. In doing so, the research will inform future crop development and agriculture best practices. Carbon and its accounting are central to our efforts in the coming decades to adapt to the changing climate. The resulting improved plant carbon use and climate modelling will help to better meet our international climate change obligations and develop more effective strategies to manage Australian natural resources and mitigate climate change risks to the environment, society and economy. The state-of-the-art technologies developed as part of the project will be shared widely with collaborators and the broader scientific community, with the potential for commercial development of specialised scientific instruments.							
DP250104228	**Mapping the bio-cultural impact of Papuan migrations into Wallacea**	164,561.50	351,800.50	334,815.50	147,576.50	0.00	0.00	998,754.00
Tobler, A/Prof Raymond E	This project aims to explore the movement of Papuan genes, culture, and languages into Wallacea in the past 15,000 years. Multidisciplinary evidence suggests that New Guinea has been a key bio-cultural progenitor for contemporary Wallacean societies, though the underlying historical movements and exchange mechanisms remain poorly understood. By generating and integrating complementary genetic, linguistic, and archaeological records from East Nusa Tenggara and West Papua, this project will illuminate the historical processes and peoples that have shaped modern Wallacean society. Expected outcomes include a comprehensive re-evaluation of New Guinea's role as a bio-cultural hub in one of the most diverse but understudied regions on the planet.							
	National Interest Test Statement The Wallacean archipelago is a renowned hotspot for human linguistic and genetic diversity, testimony to a deep history spanning more than 50,000 years. Like their neighbours in Australia and New Guinea, the Indigenous peoples of Wallacea are thought to have remained isolated from outside groups, and each other, for more than 45,000 years until the introduction of new genes and languages by Austronesian seafarers some 3,500 years ago. However, this static view of Wallacean history has been challenged by converging interdisciplinary evidence that documents the transformation of Wallacean societies by the infusion of Papuan genes and culture from around 15,000 years ago, and emphasises the potential of interdisciplinary approaches in reconstructing this poorly understood historical period. In this project, our international team will explore the origins, timings, and impacts of the historical migration of Papuan peoples across Wallacea, by undertaking a coordinated research program to gather new genetic, archaeological, and linguistic records for key regions in eastern Wallacea and West Papua. By disseminating our results through high impact journals and multiple media outlets, our research will raise global awareness of the rich bio-cultural diversity in this under-appreciated part of the world and reaffirm Australia's leadership in transformative and ethical interdisciplinary research into human history.							
DP250104537	**Speed-of-Light Earthquake and Tsunami Detection**	86,295.50	244,775.00	249,207.50	90,728.00	0.00	0.00	671,006.00
Slagmolen, A/Prof Bram J	This project strives to revolutionise earthquake and tsunami early warning systems by leveraging sensor technology originally developed for gravitational wave detections. Anticipating seismic events, the project ultimate aim is to yield precious additional seconds for earthquakes and valuable minutes for tsunamis, outperforming current early warning systems. The project outcome will underscore the viability of integrating cutting-edge technology into operational earthquake early warning systems. This can provide substantial advantage, more time to safeguard lives, halt high-speed trains, and protect							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	critical infrastructure such as power stations and gas mains from the devastating impact of seismic waves and surging water volumes. **National Interest Test Statement** Earthquakes and tsunamis can devastate communities and infrastructure in Australia's Asia-Pacific neighbors, resulting in billions of dollars in economic losses, response, and recovery costs. Australia bears a significant portion of these costs through increased foreign aid and losses to overseas investments by Australian companies. While effective early warning systems can reduce fatalities and economic losses, current systems rely on outdated models. This project's innovative sensors have the potential to significantly improve these early warning systems. These sensors measure changes in gravity, which can be detected earlier than the seismic waves currently used, significantly increasing warning lead times. Even a modest increase in lead time is crucial for protecting critical facilities, halting hazardous activities, and facilitating evacuation. This will lead to more effective impact mitigation, allowing our Asia-Pacific neighbors to recover quickly, maintain economic stability, and further strengthen Australia's diplomatic and historical relationships with Indo-Pacific countries. This project will enable Australian scientists to contribute to and potentially deliver Australian-designed hardware and software for improved emergency early warning systems. It will also foster greater collaboration and dissemination of results within Australia's advanced research sector and the international seismic research community.							
DP250104538 Barnes, Prof Nicholas M	**Vicinal learning for model calibration and distribution modelling** This project aims to address the overconfidence of current highly accurate large deep neural networks, ie., incorrect predictions frequently have high confidence. This project expects to develop new theoretical models of vicinal model calibration, that can be implemented as efficient fine-tuning, ensuring that confidence reduces away from ground truth data, to a uniform distribution for far away images. Expected outcomes are new model-calibration theory and techniques, for classification and dense prediction, improving out-of-distribution detection while ensuring adversarial robustness. This should provide significant benefits in reducing risk in vision systems, including safety-critical applications, e.g. bushfire detection. **National Interest Test Statement** Computer vision based event detection will revolutionize safety-critical problems. For example, detecting potentially catastrophic bushfires in their early stages, and alerting emergency services. If fire services are deployed while a fire is small it can be extinguished. Automated computer vision detection systems can be deployed more pervasively than manual approaches. However, current suitable detection approaches do not accurately estimate their confidence in their decisions. In this project, we will undertake key research to create computer vision approaches that accurately estimate prediction uncertainty. These will be applied to key problems including bushfire detection. Detection errors can cause critical delays to deployment of fire services, either by failing to detect fires early, or giving frequent false alarms. Our research will enable accurate confidence estimation, allowing overall dispatch systems to mitigate false alarms. For example, by closely monitoring early fires that are uncertain, rather than ignoring them, or immediately alerting fire services. We will publicly release our code for detection, and evaluate our approaches through the ANU-Optus Bushfire Centre of Excellence on our network of Australian fire detection cameras. Additionally, we will work directly with our partners in fire services to directly improve fire detection in Australia.	75,000.00	150,000.00	150,000.00	75,000.00	0.00	0.00	450,000.00
DP250104551 Iskhakov, Prof Fedor	**Innovation in durable goods: expansion of electric cars in Australia** Highly desirable transition to environmentally friendly technologies such as electric automobiles requires well-designed governmental support. Short-sighted policies may lead to unintended consequences and do more harm than good. The importance of a secondary market for durable goods makes the policy design a complex dynamic problem. This project will produce mathematical and computational tools to explore potential regulation standards and stimulus programs in a simulated environment to find an optimal approach for expanding electric cars in Australia. Built on the team's groundbreaking research in modelling equilibria in markets for automobiles, this project will enable the search for optimal policy that will benefit Australian society. **National Interest Test Statement** The expansion of electric vehicles (EVs) is crucial for decarbonizing the Australian economy, requiring effective policies to support EV adoption. This focus has intensified with the "New Vehicle Efficiency Standard" and the ongoing parliamentary Inquiry into the transition to electric vehicles. This project develops a comprehensive toolkit, incorporating a mathematical framework and computer models for realistic, data-driven, and theoretically sound analysis of durable markets, such as the car market. This toolkit will simulate EV adoption under various policy regimes, aiming to accelerate the transition and minimize costs to individuals, firms, and the economy. It will provide valuable insights into optimal policy design, helping to avoid unintended adverse consequences like rebound effects, market distortions, and social or cultural inequalities during the electrification of Australian automobiles.	94,533.00	196,018.50	209,712.50	108,227.00	0.00	0.00	608,491.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
DP250104755	**Mid-infrared spatial filtering to enable the search for extrasolar life**	126,161.00	211,448.50	163,525.00	78,237.50	0.00	0.00	579,372.00
Ireland, Prof Michael J	This project aims to create the key missing technology of mid-infrared high-efficiency spatial filtering for detecting life on planets like Earth, the European Space Agency's priority theme. This proposal plans to accelerate the search for life by suppressing starlight as a noise source at infrared wavelengths, to unveil distinctive characteristics of Earth-like exoplanets. The expected outcome is the fabrication of a spatial filtering technology capable of covering the 3 - 18.5 micron region in no more than two devices. The expected benefits are the involvement of Australia in the most important space missions of the next decades and the enhancement of applied photonics technology in our society.							
	National Interest Test Statement							
	How habitable are other worlds and is there life on other planets outside our solar system? More than 5000 planets have now been discovered to date. Detecting and characterising earth like planets are the most significant goal to answer these questions. Based on micron-scale processing of transparent material, this project will develop and enhanced the ability for future space missions to detect emission such as thermal radiation from Earth-like exoplanets. In obtaining critical informations on atmospheres, sign of oxygen and water, and habitability, this method will allow the understanding on how secondary atmospheres like that of Earth's form and when. The project will reinforce Australia's position in space exploration and generate broad society impacts with the introduction of new advanced detection devices, paving the way towards commercializing of photonic devices operating at thermal infrared wavelengths with improved opportunities for sensing. The developed technology will provide essential insights about one of humanity's grandest goals, crossing several fields of science and philosophy – determining our place in the Universe through both finding how common planets with potentially life-supporting atmospheres are, and even if there is life on other planets.							
	The Australian National University	3,148,447.50	6,479,696.00	6,365,181.00	3,392,703.00	358,770.50	0.00	19,744,798.00
University of Canberra								
DP250100663	**Conserving heritage in stone: culture and lasers in partnership**	200,462.00	358,349.50	302,020.00	144,132.50	0.00	0.00	1,004,964.00
Wain, Dr Leonie A	There is an urgent worldwide need to find an effective method to conserve heritage, such as Indigenous sandstone rock art sites which are at risk of permanent loss. This project aims to develop an innovative approach to rock art conservation by integrating Indigenous knowledge into decision-making processes, while pioneering the use of new femtosecond (fs) lasers for cleaning stone without causing surface damage, and robotic control of the fs laser system. Expected outcomes include a novel governance framework, and a sustainable method for preserving culture. This should yield significant benefits across environmental, cultural and economic sectors, protecting the environment, and enhancing cultural tourism and Indigenous job opportunities.							
	National Interest Test Statement							
	Ancient Aboriginal rock art in World Heritage Kakadu Park is threatened by damaging and disfiguring dirt and biological growths. Working under the cultural guidance of Traditional Owners this project will explore new, eco-friendly laser techniques for cleaning the art. Complex rock surfaces mean that the laser will need a “Human-in-the-loop” robotic control system to integrate the strengths of humans (cultural knowledge, perception, decision-making) with the strengths of robots (accuracy, speed, power, and consistency) so we will explore how to embed cultural decision-making processes into AI control of the laser. Dirt, biological growth and weathering crusts affect outdoor surfaces everywhere, so this work will advance precision cleaning options across Australia and beyond. Laser cleaning offers environmental benefits (no chemicals, electrical power), commercial opportunities (conservation cleaning) and economic benefits (tourism income from upgraded heritage sites). Embedding cultural knowledge into laser control systems ensures culturally appropriate decision-making and promotes jobs for community participation in conservation. To connect with a range of potential markets for this research (eg rock art and building conservation; precision surface cleaning; graffiti removal; surface decontamination) we will publish short articles in relevant industry newsletters/magazines. We will also publish detailed articles in open access academic journals.							
DP250103027	**Just transmission: advancing coherence in Australia’s electricity policy**	247,133.00	494,549.00	496,261.00	248,845.00	0.00	0.00	1,486,788.00
Pickering, A/Prof Jonathan R	This project aims to develop strategies for a just and coherent approach to constructing new electricity transmission infrastructure in Australia. Through fieldwork and comparative legal and political analysis of synergies and tensions between policy							

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	objectives, the project expects to generate new knowledge on best practice for how transmission projects can engage and benefit regional communities. Expected outcomes include improved understanding of how existing practices align with principles of energy justice, and a stronger evidence base for transmission reform. The project should yield economic benefits by identifying pathways to strengthen public support for accelerated investment in Australia's renewable energy future.							
	National Interest Test Statement To reach its net zero climate change target by 2050, Australia is estimated to need over 10,000 km of new transmission lines to deliver electricity from new solar, wind, and battery infrastructure in rural and regional areas to major cities and industrial centres. Concerns about fairness are a key element of community attitudes towards new transmission projects. Accordingly, there is an urgent need to ensure that public engagement, policies and laws on transmission adopt fair processes and deliver just outcomes for communities. To respond to this need, this project aims to develop new strategies for a just and coherent approach to constructing electricity transmission infrastructure in Australia. Through socio-legal analysis of Federal and State legislation and policy, and case studies of two proposed transmission projects in New South Wales and Victoria, the project will yield economic and environmental benefits by identifying practical and authentic steps to strengthen public support for accelerated investment in renewable energy. This will enhance the prospects of success for major initiatives such as the $20 billion Rewiring the Nation plan. The project will also yield social benefits by identifying ways to bridge rural-urban divides over energy policy. We will partner with local communities throughout the project, and project outcomes will be shared through policy briefs, videos, submissions to government inquiries and a practical guide for community members.							
	University of Canberra	447,595.00	852,898.50	798,281.00	392,977.50	0.00	0.00	2,491,752.00
	Australian Capital Territory	3,596,042.50	7,332,594.50	7,163,462.00	3,785,680.50	358,770.50	0.00	22,236,550.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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New South Wales								
Australian Catholic University								
DP250100105	**Critical Pedagogies for AI and Extended Reality (XR) Technology**	93,749.50	186,249.00	180,563.50	88,064.00	0.00	0.00	548,626.00
Mills, Prof Kathy A	This project aims to advance critical pedagogies to address gaps in uses of artificial intelligence and extended reality technologies – virtual, mixed, and augmented reality – for students' multimodal literacies – key outcomes of the Australian curriculum. Existing critical and multimodal theories need expansion to account for artificial intelligence and extended reality technologies, requiring new teaching and learning capabilities and algorithmic knowledge for digital reading and authoring. It develops new critical pedagogies with teachers to advance primary and secondary students' multimodal literacies. Benefits include advanced teacher and student capabilities, and critical pedagogies needed for Australia's social and economic future.							
	National Interest Test Statement							
	Recent technological advances in artificial intelligence (AI) and extended reality (XR) technologies—virtual, mixed and augmented reality—require urgent investigation and expanded capabilities for Australian education systems to address the escalating concerns for school teachers to support students' critical and multimodal literacies. AI tools, such as Open AI's ChatGPT, are now widely accessible to upper elementary and secondary students for learning, along with AI image or art generators that use text prompts to produce digital imagery. This unique project will generate distinctive critical pedagogic models to strengthen advanced teaching skillsets to support next-generation digital reading and writing competencies that are fast becoming essential for students' post-secondary and workplace success. The project involves collaboration with teachers from primary and secondary schools (state and private), and with technology industry partners across urban, regional and rural Australian contexts to equip students to use AI-XR texts as active agents to critically reflect on underlying biases, values and interests. Outcomes include evidence-based models and exemplars for teaching students to be confident users of AI and extended reality technologies for multimodal reading and authoring, and state-of-the-art skillsets that are now needed by all young Australians to sustain digital and workforce participation for Australian education—the engine room of Australia's future economy.							
DP250100134	**Artificial Intelligence for the Early Years**	202,517.50	423,217.50	262,255.50	41,555.50	0.00	0.00	929,546.00
Edwards, Prof Susan E	This project aims to generate new knowledge about Artificial Intelligence (AI) for the early years. Education and care for young children (birth-to-8-years) is important for children's long-term developmental outcomes. AI is already being used by educators to assess children's development and provide suggested learning experiences in practice. It is also being applied in children's digital games and content. However, little is known about how AI interfaces with children's play, learning and developmental outcomes and how to ensure children are provided with AI that is safe, equitable and trustworthy. The research will inform a new AI for the Early Years Statement to inform adult-decision making about AI design and use with young children.							
	National Interest Test Statement							
	This project is about making sure that young children, their families, educators and service providers get to use AI that is safe, equitable and trustworthy. AI is common in many of the applications that children and their adults use. AI can provide creative and interesting play and learning opportunities for young children. Using AI is important for young children growing up with digital technologies. However using AI can expose children to harm and risks, such as data harvesting, online childhood sexual exploitation, privacy invasion and mistaken judgements about children. This project will create useable and useful advice for adults who design and use AI with children. This advice is important because AI is a technology in Australia's List of Critical Technologies in the National Interest. It matters that adults know how to use AI that helps children play and learn and keeps them safe. We will create free online resources for children, families, educators, service providers and digital designers to learn about using and staying safe with AI.							
DP250100603	**Night Vision in the Late Ancient Mediterranean**	50,848.50	126,397.50	138,490.50	62,941.50	0.00	0.00	378,678.00
Crabbe, A/Prof Kylie L	Night Vision aims to create a new history of wakeful nighttime activities in the late ancient world by combining study of material remains (e.g. lighting and							

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	timekeeping technologies) with literary descriptions of what humans do at night. Grounded in our night studies network, the project will generate new knowledge of late ancient culture, illuminating overlooked people and experiences with the new analytical category of “night vision”. Expected outcomes include scholarly publications and a robust agenda of co-designed outreach with museums and observatories. This should provide significant benefit by consolidating historical night studies in the Australian academy and enriching the cultural knowledge of night for the Australian community.							
	National Interest Test Statement							
	This project aims to counter the notion that night was a period of idleness prior to the advent of electricity in the modern period by seeking to elucidate the many and varied night activities of the late ancient Mediterranean world (c.2C BCE–7C CE). Using this rich case study of a period and region of great technological, social, and religious upheaval, we will provide a better understanding of the sociality of nighttime activities and a new cultural history of the period that gives agency to marginalised groups. The project will thus not only enhance our knowledge of the complexities of ancient societies and provide lessons for the present in better understanding patterns of violence, religious observance, storytelling, and the mechanisms of social cohesion. Collaborations with key industry partners, including Stromlo Observatory (ACT) and the Immigration Museum (VIC), will provide benefits in heritage access, cultural education, and community inclusion and wellbeing. Benefits for the field include new knowledge, innovative methods, and capacity development for PhDs, including modelling of best practice interdisciplinary work with cultural and scientific organisations.							
DP250101982	**Improving disciplinary literacy in Senior High School Industrial Technology**	41,500.00	123,500.00	167,000.00	105,250.00	20,250.00	0.00	457,500.00
Doran, Dr Yaegan J	This project addresses major literacy issues in Senior High School Industrial Technology. It describes the distinctive literacies needed for designing and constructing projects in timber, metal, graphics etc., and generates with teachers pedagogies to develop these specialized literacies, providing new knowledge of literacy and pedagogy in an area long neglected in literacy research but with some of the highest literacy needs in senior high school. Outcomes include co-designed exemplar pedagogy for discipline-specific multimodal literacy in Industrial Technology, significantly benefitting advanced manufacturing through a new generation of workers with advanced literacy to operate digital platforms for designing and managing complex systems.							
	National Interest Test Statement							
	Australia’s economy increasingly requires advanced manufacturing industries to develop bespoke solutions to specialised problems. The future success of these enterprises depends on a new generation of workers with advanced literacy skills to operate digital platforms that manage complex systems and the vision to coordinate the demands of product design, quality assurance, servicing and marketing. This project addresses this by targeting the major literacy demands of Industrial Technology – a Senior High School subject involving construction using timber, metals, graphics etc. Industrial Technology enrols 10% of students in NSW, who have the second lowest mean socio-economic status of all non-VET subjects, and who have consistently struggled with literacy throughout their schooling. These students are precisely those who will by and large move into the advanced manufacturing of the near future, and so we require new methods of literacy teaching to rectify the significant inequities they currently face. To address this, this project will develop new understandings of the literacy demands of Industrial Technology and new pedagogies for teaching literacy in conjunction with practical construction. These practices will be jointly designed with teachers to ensure teaching practices developed are relevant and targeted, and can be distributed amongst the Industrial Technology teaching community in ways that support this vital subject area and its students.							
DP250102285	**Translation and Transformation in Late Antiquity**	15,000.00	62,500.00	92,000.00	44,500.00	0.00	0.00	214,000.00
Hanaghan, Dr Michael H	This project offers the first holistic assessment of translation in Late Antiquity, a critically important cultural transformation on par with the introduction of the printing press. It will explore who translated texts, when and why, when the norms for modern European literary analysis were set. It aims to uncover how new translations communicated and shaped knowledge while developing distinct social, political, and cultural groups. It will expand our understanding of the rich variety of Late Antique translation techniques and apply this understanding to how translation methods in modern Australia are changing, including the use of AI technologies, the presence of multi-language communities, and the experience of bilingual speakers.							

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	National Interest Test Statement							
	The study of language translation and transformation will offer social and cultural benefits to Australians dealing with new language norms affected by the introduction of Artificial Intelligence (AI) with machine learning capabilities. The new technology makes anonymous translations available to all. These will be characterised by singular iterations of texts in translation that are often not repeatable or verifiable by their users for accuracy. This evolution in technology seems like a boon to a multi-cultural society like Australia, but it will need to be grounded in multi-lingual expertise and user capacity to verify the translations' sources. This project will help language teachers and translators avoid the mistakes of Late Antiquity, when translations misrepresented, reinterpreted, and deliberately altered their source texts in pursuit of specific agenda. As in Late Antiquity, Australia finds itself in a fluid situation thanks to AI, namely that of functional multilingualism which is not based on deep knowledge of the source language. This study will show how lack of literary bilingualism meant that many were reliant on translations whose accuracy could not be measured, providing a template for our own age and culture. The project also builds translation capacity in ancient languages for two doctoral students and will contribute to international efforts to modernise the teaching of ancient languages to accommodate the new translation technologies available to students.							
	Australian Catholic University	403,615.50	921,864.00	840,309.50	342,311.00	20,250.00	0.00	2,528,350.00
Charles Sturt University								
DP250100677	**The Role of Public Library Services for a Changing Rural Australia**	31,696.50	126,530.00	145,085.50	50,252.00	0.00	0.00	353,564.00
Hider, Prof Philip M	Very little research has been conducted on the value and impact of Australian rural public libraries, and yet the paucity of social and economic infrastructure available to their communities strongly suggests their potential as critical service centres, offering an important place for social connection as well as a wide range of resources, including those supporting digital literacy and access. This project investigates the role these libraries play in narrowing the socioeconomic gap between rural and urban Australia through seven ethnographic case studies, with outcomes including a research monograph, the first national conference on rural and remote librarianship since 1987, and a set of recommendations for future policy and practice.							
	National Interest Test Statement							
	Local, state and federal governments invest large amounts of money in Australia’s public libraries. While only a fraction of this investment targets rural Australia, it is here where community libraries potentially play their most critical role. Alternative spaces for social connection and community support in remote parts of Australia can be limited, and libraries can therefore provide much needed assistance for many relatively disadvantaged families and individuals by offering access to physical and online collections, running regular events, and facilitating digital inclusion. No research focused on the impact of public libraries on Australian rural communities has been published this century, and evaluation of the extent to which library services and rural community needs align is long overdue. This project investigates if, and how, rural libraries are meeting the needs of the populations they serve, and how they might better support their communities in a changing environment, by examining the role of the library from the perspectives of community members, including both users and non-users. Research outcomes will be shared at a national roundtable with industry stakeholders and at the national conference of the Australian Library and Information Association, with key implications and recommendations published in a white paper.							
DP250101156	**Capturing elusive bionanoparticles via oscillating field induced convection**	106,309.00	211,292.00	213,866.00	108,883.00	0.00	0.00	640,350.00
Shiddiky, Prof Muhammad J. A.	Capturing tiny bioparticles at low concentrations within biofluids poses a major challenge for broad bioanalysis applications. The project aims to develop a novel sample preparation method that enhances bioparticle capture and isolation processes. This method will prevent unwanted biomolecules from adhering to surfaces and enable selective target capture, thus improving detection specificity and sensitivity. This will be achieved using convective fluid motion, a recently discovered phenomenon triggered by an oscillating magnetic field. The outcomes will enable efficient isolation and detection of a wide range of biomolecules in biomedical, agricultural and environmental applications, resulting in significant economic benefits for Australia.							
	National Interest Test Statement							

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	Current portable biosensing devices, such as the COVID-19 RAT, face two longstanding challenges: i) false positive responses due to non-specific biomolecule detection; and ii) low signal response resulting from insufficient detection sensitivity. These biosensing issues are usually compounded by more complex biofluids, such as blood, which contain numerous non-target molecules. Currently, there are no comprehensive solutions for sample handling in these devices. This project aims to establish a novel biofluid handling method that enables biosensing devices to eliminate false positive responses and boost detection sensitivity of biomolecules. The project utilizes the tunability of alternating current (AC) electric field-induced fluid flow to enable the transport, manipulation, and analysis of biomolecules at the microscale. The outcomes will enable the practical implementation of portable biosensing devices to detect various disease-specific biomolecules early, with greater sensitivity, specificity, and speed. Accurate, early, and rapid detection of various chronic diseases will significantly reduce Australia's healthcare costs. This innovative interdisciplinary approach will push the boundaries of existing devices and provide a single platform for rapid point-of-care (POC) biosensing and translation via small-scale manufacturing. The outcome will solidify Australia's position as a world leader in the design, manufacture, and commercialization of portable biosensing devices.							
DP250103150 Du, Prof Jia Tina	**Australian public libraries and social capital: an exploratory study** This project aims to investigate the role of Australia's public libraries as creators of social capital. With over 146 million visits annually, public libraries are ideally positioned to support stronger trust and social connectedness. The project expects to identify how public libraries can build more resilient communities by increasing social cohesion and reducing isolation. Expected outcomes include identifying the underlying mechanisms associated with creating social capital, and a maturity model to inform the nation's 1706 public libraries. This should provide significant benefits, such as developing healthy and cohesive communities to help society and government function effectively.	43,819.00	134,827.00	132,298.00	41,290.00	0.00	0.00	352,234.00
	National Interest Test Statement Flourishing economies rely not just on financial but also environmental, human and social capital. Social capital refers to the networks of human relationships and activities that foster the development of healthy and cohesive communities, helping society and government function effectively. However, growing evidence suggests that social capital in Australia is declining. Australian public libraries – in which the nation invests over $1.24 million annually – have 1706 service points and over 146 million annual visits. This positions them ideally to foster social cohesion and trust in community and thus help lead the way in enabling stronger social capital. Yet very little is currently known about how public libraries develop social capital. This project will address this by establishing an empirically derived maturity model that can inform the design and delivery of library services to more effectively contribute to building socially cohesive, information-rich, economically strong and culturally vibrant Australian communities. Engagement with library associations throughout the project and via the online symposium launching the framework will ensure the project is relevant to key stakeholders.							
	Charles Sturt University	181,824.50	472,649.00	491,249.50	200,425.00	0.00	0.00	1,346,148.00
Macquarie University								
DP250100184 Matulionyte, A/Prof Rita	**'No' to Black Box: Towards Transparent and Safe AI in Healthcare** While Artificial Intelligence (AI) offers immense potential for various sectors, there is little information about how AI applications are developed and tested. This lack of transparency contributes to AI safety issues and undermines trust. In healthcare, these challenges have led to limited adoption of AI in practice, with lost opportunities for patients and healthcare systems. Based on new empirical and international comparative data, this project will develop an AI Transparency Map that identifies stakeholder transparency needs and current gaps. Outcomes will include a Framework of policy measures to improve AI transparency. Australia will benefit from safer and more effective adoption of AI in healthcare and other high-stake sectors.	85,895.00	179,367.50	180,286.50	86,814.00	0.00	0.00	532,363.00
	National Interest Test Statement The global healthcare AI market was valued at USD 16.3 billion in 2022 and is expected to grow at 40.2% to reach USD 173.55 billion by 2029. While healthcare AI is expected to improve diagnosis and treatment of patients, decrease healthcare costs, and make healthcare more accessible, the adoption of AI tools in practice has been slow. This is due to a lack of trust in AI and safety issues, which are in turn caused by a lack of transparency around AI functioning and limitations. Based on new empirical data, this project will develop a first of its kind AI Transparency Map that identifies stakeholders' transparency needs for AI healthcare technologies and current transparency gaps. The project will then collect best industry practices and international policy approaches to improve AI transparency, and develop a Model Framework proposing legal, policy and governance measures that							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	will foster AI transparency around healthcare AI. These project outputs will enable governments and stakeholders improve transparency around healthcare AI, which will lead to increased trust and safer use of AI, and eventually speed up the adoption of these promising technologies in practice. The interdisciplinary and international project team will leverage their extensive industry contacts and engage with healthcare, AI and policy stakeholders throughout the project, which will ensure that the project benefits the targeted stakeholders and the society at large.							
DP250100431 Raban, A/Prof Magdalena Z	**Consumer experiences and preferences for aged care through citizen science** This project aims to generate large scale data on consumer experiences and preferences for care delivered in residential aged care using an innovative approach. The new knowledge generated by this project will be rich data on consumer experiences and preferences for infection management in residential aged care. The expected outcomes will include a replicable model for elucidating consumer experiences and preferences for key care types and will enable the development of resources to support a high-quality care experience aligned with consumer preferences. Significant benefits to one of Australia's most vulnerable populations are expected, and reductions in economic losses from antimicrobial resistance due to antibiotic overuse may follow.	83,485.00	136,905.00	102,022.00	130,358.50	81,756.50	0.00	534,527.00
	National Interest Test Statement A core value of aged care is that it should be person centred; however the poor quality of aged care services in Australia has been a concern for over two decades. Recent regulatory changes provide little insight into how aged care services can provide person centred care that meets consumer needs. Furthermore, past and current efforts to understand consumer needs rely on summary measures of care experiences and treat residential aged care as a single service rather than a collection of services. This project will overcome these limitations and generate large scale data on consumer experiences and preferences for residential aged care using an innovative approach. We will use participatory citizen science and co-design, with consumers, a crowdsourcing platform to capture consumer experiences and preferences in near real-time, using infection management as an exemplar. A key outcome will be a replicable model for elucidating consumer experiences and preferences for a range of care types. Social benefits will flow from improved aged care services, a right of all Australians. Reductions in economic losses from antimicrobial resistance due to antibiotic overuse may follow in the future. We will leverage our connections with industry (e.g. aged care providers, IT vendors), government (e.g. Aged Care Quality and Safety Commission) and nongovernment organisations (e.g. Consumers Health Forum of Australia) to disseminate the research findings and promote adoption of the research.							
DP250101090 Carlson, Prof Bronwyn L	**What does ‘doing diversity’ do, and how can it be done differently?** This project aims to take stock of the state of news media’s ‘diversity problem’—developing the first detailed, Australia-wide study of how news media organisations respond to criticism of the makeup of their workforce. We will examine what initiatives are being taken to diversify news media workplaces and their workforce, and the frameworks and approaches to understanding and addressing the problems of racism, discrimination, and harm inside the workplace. We will build new knowledge on strategies and practices of survival employed by diverse media workers who navigate careers in often hostile environments, using this to inform a set of strategies for industry to improve their practices, and make news media organisations safer workplaces.	79,301.50	221,191.00	262,360.50	120,471.00	0.00	0.00	683,324.00
	National Interest Test Statement This project constitutes the first major study of how diversity is ‘done’ in Australia’s media sector, and the opportunities and barriers it presents for media employment, workers’ safety and wellbeing, and social and cultural representation. Producing evidence of how diversity is defined and pursued within news organisations, and learning from the practices and experience of media workers, it will inform robust and sustainable solutions to problems of exclusion, discrimination and harm. This supports social inclusion in the media industry, a key contributor to national culture, and generates knowledge and debate of significance for other industry sectors. Through sharing and discussing its findings in public fora, including in and through media itself, the project will provoke public engagement and reflection on the adequacy of existing diversity policies and practices. Enabling informed reflection works to promote the benefits of enhanced inclusion, supporting all Australians to fully and safely participate in the social, cultural and economic life of the nation. The project also, importantly, contributes to and facilitates international research, extending and enhancing Australia’s reputation as a nation that supports all citizens to contribute to national life without discrimination, and regardless of cultural, ethnic or gender identity, sexuality or disability.							
DP250101771	**Consumer Data Privacy Risk Analysis and Management in the Open Banking Era**	70,336.50	116,722.50	93,898.00	47,512.00	0.00	0.00	328,469.00

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Smith, Prof Tom	This project aims to address privacy issues in current Open Banking adoption using Bayesian learning techniques that quantitatively analyse privacy risks and propose scenario-based risk mitigation strategies. The expected outcomes include advancing the theoretical knowledge base in privacy risk assessment and mitigation for open finance, and new guidelines for establishing explicit and well-informed consumer consent in digital financial service platforms. The project findings are expected to significantly enhance ethical and responsible digital financial service offerings, strengthen consumers' privacy awareness and well-grained data controls, and foster the development of privacy regulation in digital finance and the open data economy. **National Interest Test Statement** Open banking - an innovative and legislated financial services practice that gives consumers the option of sharing their bank data with accredited third parties, has the potential to revolutionise the financial sector by fostering innovation and prioritising customer-centric solutions. However, open banking has not been widely adopted in Australia and abroad due to privacy and security risks. While informed consumer consent holds promise in addressing this issue by empowering consumers with data control, clear guidance for consumers on how to effectively implement consent mechanisms is commonly lacking. This project aims to bridge these gaps by leveraging cutting-edge AI-driven data analytic techniques to explicitly quantify potential privacy risks associated with personal bank data sharing, alongside the formulation of risk mitigation strategies that empower consumers to provide privacy-preserving bank data sharing consent. The outcomes will promote ethical digital transformation in the Australian financial industry, enhance consumer privacy awareness and education when using digital financial services and products, and inform regulatory and legal framework design regarding privacy risk disclosure and consumer information provision standards in the development of digital and open finance. The project findings will be widely communicated among financial industry and regulators to facilitate its practical use.							
DP250102392 Formosa, Prof Paul C	**Generative AI and Creative Industries: Ethical, Legal and Work Implications** Generative AI is creating significant new challenges in the creative industries as it consumes the copyrighted outputs of creative workers to generate content that can compete with the outputs of those same workers. Using an innovative interdisciplinary approach and industry collaborations, this project will generate solutions to the ethical, philosophical, legal, and workplace problems created by Generative AI in the creative industries, a sector contributing $90 billion and over 700,000 jobs to the economy. The national benefit of this project will be the design of an innovative framework for responding to this economy-altering technology in a fair and ethical manner, while drawing on the perspectives of impacted creative workers. **National Interest Test Statement** This project will develop solutions to the problems raised by Generative AI for the nation's creative industries, which contribute $90 billion annually to the economy and employ over 700,000 people. As Generative AI rapidly transforms creative work, it is essential that Australia develops responsible strategies to harness these technologies for productivity gains while mitigating risks. By examining the ethical, philosophical, legal, and work-related implications of Generative AI in diverse creative industries such as literature, screen writing, software development, and graphic design, this project will deliver actionable recommendations to support Australia's creative professionals. The project will generate real-world benefits by translating research insights into practical outcomes through a multi-stakeholder workshop and an evidence-based Industry Report. Scholarly publications and popular media pieces will further disseminate findings. The project will enhance Australia's research capacity in this field while fostering valuable domestic and international collaborations. This research will help position Australia as a global leader in responsible AI innovation, safeguarding the nation's creative ecosystem. This project directly advances Australia's national interest across multiple domains: promoting responsible technology development, supporting workforce adaptability, protecting creative professionals' rights, stimulating economic growth, and enriching cultural life.	70,544.00	167,569.50	169,733.00	72,707.50	0.00	0.00	480,554.00
DP250103698 Lawrence, Prof Jonathan S	**Bending Spines for Next Generation Spectroscopic Survey Telescopes** The Universe is big; with many billions of stars in each of many billions of galaxies. Open questions in astronomy: what is dark energy? what is dark matter? how do galaxies evolve? can only be answered by obtaining data from huge samples of stars and galaxies. With this grant we aim to develop technologies critical to enable future telescopes to build spectroscopic surveys of over 100 million objects. We propose an innovative concept for a “bending-spine”	134,219.00	262,432.50	248,699.50	120,486.00	0.00	0.00	765,837.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	optical-fibre-positioner using technologies from medical and photography sectors. This will benefit: Australian scientists through access to future facilities; Australian industry, through reverse knowledge transfer; and Australian society, through enhanced understanding of the Universe. **National Interest Test Statement** This project will develop a new type of optical fibre positioning robot for astronomy. This critical technology will enable future generations of large-scale international astronomy facilities to collect huge datasets required to answer questions on the origin and evolution of the Universe. This research will raise the profile of Australia in the global astronomy community and will cement our position as a partner of choice in astronomy technology. This research will have a long term societal and cultural benefit to Australia through astronomy science outcomes, both from the perspective of improving our understanding of the universe and our place in it, and from the perspective of communicating such results to the wider community and thus improving their knowledge and interest in science and engineering fields generally. This research has great potential for commercialisation. By further advancing the level of technological maturity of our technology, we improve our chances of identifying and capitalising on new applications outside of astronomy within the broader industry sector, particularly in areas such as advanced manufacturing and medical endoscopy.							
DP250103808 Bryan, Dr Paul	**Multi-point maximum principles, integrability profiles, and smoothing** Regularity theory forms the foundation of differential equations governing the behaviour of systems such as gravitation, climate modelling, biological systems, economics models, geometric structures such as minimal surfaces and many others. Tremendous developments occurred during the 20th century, yet many unresolved questions remain (such as the Millennial prize problem on the regularity of Navier-Stokes). We propose new methods to tackle such questions via a geometric approach to obtain optimal inequalities. The project will greatly simplify the very technical aspects of the field and open up new avenues to solve the major outstanding problems in this area. **National Interest Test Statement** The project aims to develop a fundamental theory of regularity for partial differential equations. Regularity pertains to the underlying structure of solutions of problems modelled by differential equations from which everything else follows. This project has very broad implications for a range of problems including in physics, economics, climate modelling, engineering, biological systems, and many areas of mathematics itself. The project will develop new tools to study problems of great interest to the international mathematics community and will attract both domestic and international researchers and students to Australian universities. In this way it will lead to significant national benefits, both economically and intellectually.	94,065.00	190,604.50	203,049.00	106,509.50	0.00	0.00	594,228.00
DP250103889 Huang, Prof Shujuan	**Innovative microwave processing for sustainable semiconductor fabrication** This project pioneers the use of rapid microwave annealing in transforming solutions into semiconductors, a process pivotal for industries such as solar cell manufacturing. Solution-processed semiconductors offer ultra-cheap solar cells with a very low carbon footprint, but their potential is hindered by challenges in material stability and fast manufacturability. This project focuses on uncovering the dynamics of microwave processing to grow high-quality, stable semiconductor crystals. By combining innovative microwave processing and characterisation techniques, we aim to gain insights that will propel this technology forward, potentially transforming the production of semiconductors and significantly impacting sustainable electronics. **National Interest Test Statement** This project will develop a low-cost, energy-efficient microwave technology for rapidly fabricating high-quality, solution-processed semiconductor devices, with a particular emphasis on solar cells. This innovation tackles the high energy consumption issue of traditional semiconductor manufacturing. By enabling faster and greener production of solar cells, this project directly supports Australia's ambitious target of achieving Net Zero greenhouse gas emissions by 2050. The research goes beyond immediate applications in solar cells. It delves into the fundamental understanding of how microwave radiation influences semiconductor crystal formation from solutions. This knowledge will pave the way for a broader "microwave processing" industry in Australia, encompassing not only solar cells but the entire electronics sector. This shift has the potential to fuel economic growth through innovation	99,364.50	197,804.00	197,699.00	99,259.50	0.00	0.00	594,127.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	and a vibrant startup ecosystem. Ultimately, by enabling the production of cheaper and more sustainable electronics, this research will improve the quality of life for Australians. This research is particularly timely as Australia joins Southeast Asia as a future leader in the global semiconductor industry.							
DP250104339 Narendra, A/Prof Ajay	**Neural basis of spatial navigation in three-dimensional environments** Ensuring optimal capability to navigate within a complex three-dimensional environment is a challenge for technical systems, which has been elegantly solved by biological systems. This project aims to understand how animals enhance their brains to travel towards their goal in complex environments. It will leverage previous ARC funded research on navigation along horizontal planes and apply sophisticated analytical tools to quantify neural connectivity to navigate in 3D environments. Expected outcomes include understanding how the brain regions required for efficient navigation in 3dimensional environments for developing miniature and autonomous agents, enhancing research capacity and institutional collaborations.	147,276.50	333,783.50	404,407.00	307,268.50	89,368.50	0.00	1,282,104.00
	National Interest Test Statement We live in a three-dimensional world with complex horizontal, vertical and oblique structures. Travelling within cluttered landscapes to detect and find a specific goal that is often occluded is a challenge for both animals and machines. While we rely on the 86 billion neurons in our brain to carry out spatial tasks, a jumping spider, with a brain smaller than a pinhead and just a few million neurons has determined ways to accomplish this task. This project will determine how animals with mini-brains navigate to specific goals in complex 3D environments and identify the required brain circuitry to solve such spatial tasks. This project will (i) highlight the strength of evolutionary biology and neuroscience in Australia, (ii) build research capacity by training young scientists in advanced microscopy and engineering methods, and (iii) discover how animals with miniature brains solve spatial computation. The project clearly aligns with the National Research Priority – Advanced Manufacturing. This project has enormous potential to generate IP and patents bringing economic and commercial benefits to Australia's technology industry. The project builds on substantial prior investments from the Australian Research Council that has led to the development of technologies and insights. This enables us to advance our knowledge of the common but overlooked phenomenon of spatial navigation in complex landscapes.							
DP250104770 Kemp, A/Prof Darrell J	**Detecting visual stimuli from mobile versus static perspectives** This project aims to understand how a viewer's perspective (mobile/stationary) determines signal saliency and defines the features of the nervous system used to detect stimuli and mediate behavioural responses. We will use mate-seeking butterflies as an empirical system to elucidate the optimal way to transmit visual information in noisy environments, a universal yet little understood problem in nature. The research will generate new knowledge and models in visual ecology and neuroscience that can inform human applications in image analysis, signal detection and telecommunication. It also promises future impact for Australian agriculture and public health by identifying what is visually salient to insect pests and vectors of disease.	89,385.00	246,148.00	234,523.00	77,760.00	0.00	0.00	647,816.00
	National Interest Test Statement This project will identify the solution generated by thousands of years of evolutionary trial-and-error for how to most effectively detect target objects against complex, distracting visual backgrounds. A truly realistic accounting of visual noise for the first time in any real-world biological system has significant application potential and could be game-changing because it is fundamental to communication, object characterization, spatial orientation, and navigation. The knowledge advance from this project will directly inform challenges faced by industry partners (e.g., Horticulture Australia) and government (e.g., CSIRO, DPI). Revealing how visual signals are optimally detected has the potential to improve the design of visual guides such as traffic signage across land, air and sea, pedestrian management and hazard alerting. It will also generate new and important insights for emerging technologies across robotics, autonomous sensors and self-navigating vehicles. An enhanced understanding of how insects view and orient around their world will also inspire the design of technologies such as lures and traps to manage agricultural pests and carriers of human disease such as Malaria and Dengue fever.							
DP250104928 Jiang, Prof Yijiao	**Stand-alone zero-gap photoelectrochemical eletrolyser for ammonia synthesis** Due to the energy crisis and surging demand for ammonia, the imperative of ambient ammonia synthesis has never been greater. This project aims to develop	100,064.50	195,129.00	190,129.00	95,064.50	0.00	0.00	580,387.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	a stand-alone zero-gap photoelectrochemical electrolyser for ammonia generation from aqueous nitrate solution, driving by a tandem perovskite/silicon photocathode with cocatalysts. Anticipated outcomes encompass innovative engineering strategies to enhance sunlight absorption, minimize resistance, and achieve highly selective ammonia production, ultimately leading to a scaling-up electrolyser prototype. The success of this project will advance the manufacturing of sustainable ammonia, promote balance in the nitrogen cycle, and position Australia as a global leader in a sustainable economy. **National Interest Test Statement** Ammonia forms the cornerstone of modern agriculture as a fertilizer, and it has recently emerged as a promising solution for hydrogen storage and distribution—a key component of a net-zero emissions future. However, the current methods of industrial ammonia production operate under harsh conditions and are far from sustainable, accounting for 1-2% of global energy consumption and nearly 2% of carbon dioxide emissions. This project aims to tackle this challenge by developing a cost-effective approach to ammonia production, powered entirely by abundant solar energy in Australia. The rational design approach will be employed to address the insufficient charge conversion efficiency of the photoelectrodes and long-term stability challenge of the perovskite-based photoelectrode. With the new materials in hand, a novel stand-alone zero-gap photoelectrochemical electrolyser system using inexpensive aqueous electrode will be developed to enable sustainable ammonia manufacturing and mitigate the carbon footprint associated with ammonia production. The impact of this technology will be profound as it moves the Australian economy closer to zero-emission goals, provides a boost to the local advanced manufacturing, hydrogen export, and creates new skilled jobs.							
	Macquarie University	1,053,936.50	2,247,657.00	2,286,806.50	1,264,211.00	171,125.00	0.00	7,023,736.00
Southern Cross University								
DP250100304 Burton, Prof Edward D	**A new paradigm for aluminium geochemistry in acid sulfate environments** Toxic levels of dissolved aluminium are a significant problem in environments that are impacted by acid sulfate soils and acid mine drainage. This project aims to provide a new and potentially paradigm-shifting understanding of the mineral-water interactions that control aluminium geochemistry in such environments. This will be achieved by combining advanced synchrotron-based techniques with novel field studies and innovative laboratory experiments. Outcomes will include transformative new insights on unresolved mineral-water interactions for more accurate modelling of aluminium geochemistry in acid sulfate environments. This should provide a much improved capacity to predict and control aluminium fate to protect valuable water resources. **National Interest Test Statement** Mining of coal and metal ores, drying of wetlands during droughts, and drainage of coastal floodplains often triggers geochemical processes that produce highly acidic water that is rich in dissolved aluminium. This is a problem because elevated levels of dissolved aluminium cause severe damage to aquatic ecosystems and degradation of valuable surface- and ground-water resources. Managing these adverse impacts is a major challenge for the mining industry, for development of coastal land, and for protection of inland water quality. The proposed project will be of significant national benefit because it will provide strategic new knowledge on aluminium geochemistry for better management of water quality in these economically- and ecologically-important contexts. The project will also create a legacy of benefit by building national and international collaboration, growing research capacity and training the next generation of scientists in research priority areas that are crucial for Australia's future prosperity.	98,881.50	197,229.50	199,716.50	101,368.50	0.00	0.00	597,196.00
	Southern Cross University	98,881.50	197,229.50	199,716.50	101,368.50	0.00	0.00	597,196.00
The University of New South Wales								
DP250100004 Jeyakumar, Prof Vaithilingam	**Quantifying Uncertainty of Risk-Aware Optimization for Safe Decision-Making** Robust optimization (RO) is a powerful technology used for decision-making in	73,850.00	156,600.00	161,800.00	79,050.00	0.00	0.00	471,300.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	the presence of data uncertainty. Developing mathematical theories and methods for quantifying uncertainty and obtaining solutions with safety guarantees remains a major mathematical challenge for risk-aware RO containing also random events yet is vital to the practical use of the technology. This project aims to develop novel theories and methods, addressing the challenge by bringing together investigators' latest breakthroughs and prize-winning advances. Expected outcomes will provide superior RO foundations and technologies for improving decision-making in a broad range of disciplines and enhancing emerging applications of RO, like newer radiation therapies.							
	National Interest Test Statement							
	The proposed development of optimization technology offers advanced mathematical methods and computer algorithms to help people make safe decisions when faced with uncertain conditions. This technology is designed to address critical needs, including safety and risk prevention guarantees, that current techniques for practical decision-making often fail to meet. Consequently, it is expected to bring significant benefits to many different fields where optimization is used for complex decision-making. This project introduces an improved optimization technology that integrates safety and risk prevention assurances, thereby enhancing not only cost-effectiveness and performance but also the quality and reliability of decisions made. If successfully implemented, this technology could have a big impact across various areas like managing investment portfolios, distributing energy, and planning radiation treatments. This impact will be achieved through improved asset allocations, reduced distribution costs and enhanced treatment plans. The project will also create knowledge and advanced computer models to develop decision-support tools with economic benefits for Australia, especially in industries like banking, finance and healthcare where making safe decisions is crucial. The biggest national benefits will likely be seen in cutting-edge technologies such as advanced radiotherapies and artificial intelligence where existing systems may have limitations without safety guarantees.							
DP250100041	**Lights, DNA, action! Photo-controlled machinery for nanorobotics**	128,908.50	260,247.50	187,954.00	56,615.00	0.00	0.00	633,725.00
Rizzuto, Dr Felix J	Nanomachines can translate chemical energy into motion, but programming when, how long, and over what distances they operate requires control over reaction timescales. This project aims to build synthetic DNA machinery that responds to light and modulates its operation using molecular recognition. These machine parts will fold, coil, and lever under visible light irradiation, organising a biochemical engine that propels DNA nanobots with precision in time and space. Expected outcomes are the translation of light into time-dependent motion through spatial reorganisation and kinetic control, providing photo-actuated, bio-orthogonal nanomachinery for benefits in molecular delivery, sensing, and robotics applications.							
	National Interest Test Statement							
	Time is the lens through which all action occurs, but at very small scales it gets challenging to control how machines change shape and move over time. This project will use light to operate nanomachines that are activated and transformed over programmable lifetimes. This technology will control the rate and operational window of nanobots for downstream navigational, cargo delivery, and assembly tasks that are performed over definitive timeframes. Aligned with Australia’s Draft Research Priorities (2023) in robotics, biotechnology, and harnessing future industries, this project will position Australia as a world leader in light- and time-controlled nanorobotics. Improving our national capacity for nanomachinery is expected to create new environmental sensors, microscopic delivery/transport technologies, and biocompatible devices that have commercial impact across Australia’s nanomanufacturing, engineering, and biochemical industries. With the global market of nanorobotics projected at $8.9 billion in 2025 , increasing demand for automated nanotechnology will ensure diverse job opportunities for researchers in the biotechnology, chemical, and sustainability sectors. Socially, the ‘scifi’ nature of our nanobots will inspire the public’s curiosity in fundamental research, supporting Australia’s growing nanotechnology landscape. Media releases and public talks will ensure widespread dissemination, popular understanding, and commercial interest.							
DP250100078	**Insurance as a Management Tool for Uncertainties in the Changing World**	35,487.00	153,644.50	233,811.00	115,653.50	0.00	0.00	538,596.00
Tang, Prof Qihe	The world we live in is fraught with multi-layered uncertainties, posing profound challenges to economic activities. This project reconceptualises insurance as a management tool to cope with novel uncertainties, beyond its traditional risk management function. Aim 1 enhances integrated assessment modelling with uncertainties and an insurance component, Aim 2 conducts quantitative analysis of uncertainties arising from technological advancements, Aim 3 develops a dynamic pricing framework under uncertainty, and Aim 4 prices green bonds focused on uncertainties. Expected outcomes are a system of robust and							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	adaptive insurance solutions to uncertainties. The project offers policy insights for ongoing regulatory reforms amidst a changing world.							
	National Interest Test Statement							
	Australia is highly vulnerable to climate change, natural disasters, and financial instability, which are sources of multi-layered uncertainties, posing profound challenges for its economy. This project reconceptualises insurance as a management tool to cope with uncertainties in a changing world. It focuses on novel risks and uncertainties induced by climate change and technological advancements and develops actuarial solutions from an insurance perspective. By developing a robust and adaptive decision-making framework, the project contributes to the financial safety of institutions and the stability of the financial system, the key objectives of the Australian Prudential Regulation Authority. The project aligns with the Australian Government's Science and Research Priorities: (i) Environmental Change, addressing the key challenge "Improved accuracy and precision in predicting and measuring the impact of environmental change caused by climate and local factors." (ii) Cybersecurity, addressing the key challenge "Understanding the scale of the cyber security challenge for Australia, including the social factors informing individual, organisational, and national attitudes towards cyber security." Along with Australia's net zero plan, domestic green financial markets have recently seen rapid growth. Our project will provide scientific support for market development. A planned workshop will disseminate the research findings to practitioners, regulators, and government advisors.							
DP250100081	**Modular nanopores as conduits for nanoreactors**	37,500.00	145,500.00	220,500.00	112,500.00	0.00	0.00	516,000.00
Rizzuto, Dr Felix J	Nanoparticles that can store, transmit, and process chemical signals are required for nanoscale reaction and computation networks. The aim of this project is to develop artificial cells that can programmably communicate. This strategy uses modular, responsive DNA nanostructures to form nanopores and channels in synthetic compartments. Controlling the mixing and transfer of cargo within these networked systems will harness knowledge in nanotechnology and self-assembly to generate nanoreactors for chemical transformations. Engineering the migration of molecules across membrane boundaries will offer benefits in biotechnology and nanochemistry – for the triggered release of cargo, data transmission, and chemical fractionation and computation.							
	National Interest Test Statement							
	Cells are miniature factories where different compartments handle specific tasks. Directed communication between molecules and reaction pathways in each zone ensures that tasks are undertaken efficiency, but current technologies cannot replicate this level of programmable information transfer. To develop sensing, catalysis, and tissue engineering technologies inspired by cellular systems, we need to engineer information highways between artificial compartments. This project uses DNA structures to create reversible gateways between synthetic compartments. The development of artificial cells that dynamically connect and communicate will lead to downstream economic and commercial benefits ranging from targeted delivery systems to highly sensitive environmental sensors, new chemical separations methods, and ways to improve catalysis. Benefits to the Australian biotechnology market will be pipelined through partnerships with Swann Genetics, Moderna, and the CSIRO. Australia's synthetic biology industry is expected to generate $27 billion in revenue and 44,000 jobs by 2040. This project's focus on Australia's Research Priorities (2023) of 'developing impactful emerging technologies' will ensure highly trained personal for the bionanotechnology industry, enabling an innovative economy. This project will bring social benefits for Australia by demonstrating the importance of strategic fundamental science to broad audiences, through public talks, online videos, and social medias.							
DP250100104	**Building a super-ribosome with nature's tool kit of protein modifications**	96,243.00	193,611.00	189,449.00	188,922.50	96,841.50	0.00	765,067.00
Wilkins, Prof Marc R	This project aims to improve the cell's capacity to grow, in normal and in stressed conditions, by optimising its protein-making machine (the ribosome). This is significant as efficient organism growth underpins all bio-industries - from fermentation through to aquaculture and broad acre crops. Expected outcomes of the project include novel ways to use small tweaks to proteins - known as post-translational modifications - to optimise ribosomes, a knowledge of the diversity of such ribosome modifications in the tree of life, and a new self-tuning ribosome. The project should provide benefits through pioneering a new paradigm for ribosome optimisation, which is of strong future potential for a range of biological and biotechnology industries.							
	National Interest Test Statement							
	Protein synthesis is a critical process for life. It is a determinant of how rapidly things can grow, generally, including all the microbes, animals and plants used to sustain the human population. This project will seek to enhance the growth rate and stress tolerance of the yeast species used in baking, brewing and many industrial processes. This will be done by making changes to the structure of the protein-making machine in the cell, called the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	ribosome, using entirely novel engineering methods. In doing so, this project will pioneer a new field of ribosome design and improvement, where intellectual property has potential for out-licensing or commercialisation. Our project outcomes will be of high immediate potential in the $900b market of yeast-driven products and of future relevance to broad-acre crops and even livestock and aquaculture. Staff and students participating in this project will be trained in and gain unique experience in the field, contributing to a highly trained national workforce.							
DP250100141 Ukkola, Dr Anna M	**Constraining future drought projections for Australia** This project aims to explain why future projections of drought in Australia remain highly uncertain and to implement strategies to reduce uncertainty. Existing projections vary in the sign of the change in drought, hindering our ability to guide adaptation investment. The project will combine extensive climate model simulations with the best available observations and latest scientific understanding of Australian droughts to identify the most plausible future drought trajectories. Results are expected to provide the most robust assessment of future drought in Australia to date, underpinned by the latest science, to support decision-making in agriculture, water resource management and other sectors.	19,217.00	114,167.00	203,865.50	108,915.50	0.00	0.00	446,165.00
	National Interest Test Statement Drought threatens Australia's agricultural viability, social cohesion, biodiversity and the viability of nature-based solutions designed to help achieve net zero emissions. The 2017-19 drought alone has been estimated as costing Australia $53 billion. Climate change has the potential to worsen droughts but how Australian droughts will change into the future has remained an open question. This has made it challenging for policymakers and practitioners to target drought adaptation and mitigation measures. This project will use the latest science, observations, and climate model projections to help clarify how droughts will change in the future. The project will provide the most comprehensive assessment of future drought to date, using newly-developed climate model projections. Our project seeks to identify which regions of Australia will experience changes in the frequency and intensity of droughts as our climate warms and quantify how large these changes will be. These findings will be shared with government and industry practitioners to benefit decision-making in sectors including water management, conservation, agriculture. Our project will enhance the national understanding of future drought risk to build resilience across Australia's society, economy and environment.							
DP250100309 Sarker, Prof Ruhul A	**Evolutionary Framework for Electric Vehicles and Drones Logistics Systems** This project aims to develop an adaptive evolutionary approach for solving electric vehicle and drone-supported, last-mile logistics and distribution planning problems. The project addresses the escalating challenges in current logistics systems by focusing on enhancing efficiency, reducing costs, and minimizing the environmental impact of logistics systems. This novel approach will challenge existing methodologies, offering enhanced decision-making approaches, significant economic and environmental benefits, a robust decision-making tool and strong research training, with a vision for long-term impact on logistics efficiency.	90,799.00	180,934.00	182,757.50	92,622.50	0.00	0.00	547,113.00
	National Interest Test Statement Autonomous electric vehicles and drones will likely become increasingly used to enhance parcel deliveries throughout Australia. This system is expected to be the future transport technology, which is flexible, low cost, and environmentally friendly compared to existing traditional transport vehicles. However, the issues related to this new technology and distribution planning must be investigated, and appropriate solutions must be sorted for their successful implementation. Our project proposes new methodologies to generate environmentally sustainable solutions at lower costs. This project will benefit the transport industry by achieving significant cost savings through more effective decision-making and an opportunity to adapt to other practical problems beyond this project. Australians will also benefit from implementing such an efficient system for their parcel deliveries. This research project will also enhance research training and international collaboration and allow Australia to achieve leadership in this research field. It is worth noting that transport and low-emission technologies are among the Australian national research priorities. Finally, the scientific outcome of this project can be adapted to address distribution challenges in various parts of the world, making it globally relevant.							
DP250100345 McNally, Prof Gavan P	**Multimodal mapping of punishment learning** This Discovery Project aims to provide the first integrated, multimodal mapping of how punishment learning is assembled in the brain. Combining an animal model directly relevant to humans, with innovative, cutting-edge methods it expects to identify the brain cell activity, connectivity, and spatiomolecular mechanisms of	115,751.00	238,830.50	248,646.50	251,134.00	125,567.00	0.00	979,929.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	punishment learning. This outcome has the potential to transform contemporary understanding of associative learning and decision making, showing how the brain helps us make better choices, benefiting academic and downstream industry users. It also has potential to generate new capacity and identify new ways to mitigate the social and economic impacts of poor decisions, benefiting the wider Australian community. **National Interest Test Statement** We all make poor decisions some of the time. However, some people make poor decisions a lot of the time. Across a variety of domains, from health to the environment, the impacts of poor decisions by individuals are staggering. For example, excessive alcohol use costs the economy $67bn/year. Tobacco use, lack of physical activity and poor dietary choices cost $27bn/year. Australians lead the world for gambling-related losses ($21bn/year). There is a pressing need to understand how we learn from our mistakes to mitigate these impacts on individuals and the community. Yet we know very little about the psychological and brain mechanisms that help us learn from our mistakes. This Discovery project addresses this need by generating a transformative, new understanding of the cognitive processes and brain mechanisms supporting learning from our mistakes and driving better versus worse decisions at the level of the individual. It uses innovative behavioural, cellular, and molecular genetic tools to map how we learn from our mistakes to make better decisions in the future. With a clear established pathway from innovation to impact on real world settings, this Discovery expects to deliver new technology, new knowledge, and new capacity to address the mechanisms of better decisions and mitigate the individual, social and economic impacts of worse decisions.							
DP250100574 Boyer, Prof Cyrille A	**3D-Printing Nanostructured Solid Polymer Electrolytes** This project aims to pioneer the design and development of solid polymer electrolytes (SPEs) to enable Li-metal batteries, utilising the high-capacity lithium metal anode. By merging the digital assembly capabilities of 3D printing with in-situ self-assembly of block copolymers and establishing precise control over bicontinuous SPE nanostructures, we anticipate yielding SPEs with tuneable ionic conductivity and mechanical strength. The envisioned outcomes include enhanced battery safety and heightened energy density, surpassing traditional Li-ion batteries. Additionally, integrating 3D printing will bolster manufacturing efficiency and scalability, facilitating battery customisation to meet specific requirements and applications. **National Interest Test Statement** To achieve Australia's net zero future and support the widespread adoption of electric vehicles and renewable energy resources, better high-energy battery storage is urgently needed. While lithium-ion batteries (LIBs) have been instrumental, they rely on unsafe flammable liquid electrolytes and only store limited amounts of energy. A promising alternative are lithium metal batteries, which could double the storage capacity of conventional LIBs. To deliver on this promise, new solid electrolytes, especially those made of polymer, must be developed to address both safety and efficiency concerns in lithium metal batteries. Current solid polymer electrolytes are difficult to produce and do not possess the ionic conductivity and mechanical properties needed for widespread adoption. This project aims to overcome these challenges by developing rapid, one-step 3D-printing techniques to create safe and efficient solid polymer electrolytes specifically designed for high-energy lithium metal batteries. The project aligns with the Australian Government's focus on energy and advanced manufacturing. By leveraging Australia's abundant lithium reserves, the project not only promises substantial economic benefits but also advances local lithium battery production technology. Project outcomes will be commercialised, contributing to the growth of Australia's battery and manufacturing sectors and advancing the country's clean energy future.	98,413.50	200,586.00	204,682.50	102,510.00	0.00	0.00	606,192.00
DP250100708 Pla, A/Prof Jarryd J	**Near-quantum-limited microwave measurements at elevated temperatures** This project aims to enable ultra-low noise measurements of microwave quantum technologies (such as computers and sensors) at temperatures above 1.5 Kelvin. Currently, these technologies must be cooled close to absolute zero in expensive refrigerators to eliminate noise. This project expects to create new knowledge in the form of techniques and devices that actively remove noise from microwave quantum technologies at elevated temperatures, pushing the precision of measurements to the quantum limit. A key outcome is the demonstration of cheaper and more accessible systems for operating microwave quantum technologies, with significant scientific and economic benefits in areas as diverse as quantum computing, dark matter research and defence.	128,574.50	257,389.50	230,937.50	102,122.50	0.00	0.00	719,024.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement To clearly detect their signals, quantum technologies that operate at microwave frequencies, such as quantum computers, sensors, and spectrometers, must be cooled near absolute zero (-273°C) using refrigerators that are complex and very expensive. This project will develop new devices and techniques that make it easier to detect signals from microwave quantum technologies at higher temperatures, allowing their use in radically cheaper refrigerators. By making the refrigeration required to run microwave quantum technologies more affordable and accessible, this project will increase the global competitiveness of quantum computers and sensors being developed in Australia. Advanced quantum technologies are predicted to create an $86 billion global industry by 2040, and asserting Australia's innovation and leadership in this space will fuel economic growth. The technology developed by this project could be commercialised through a spin-out company or by licensing the knowledge created to relevant industries to maximise its impact. The results of the project will be shared with the Australian public through media engagements, popular news articles, and the use of video and other forms of interactive material that present complex science ideas in formats that are easy to understand.							
DP250100714 Peng, Dr Shuhua	**Self-Powered and Interference-Free Wearable Sensors** This project aims to develop self-powered and interference-free wearable sensors without bulky and rigid power sources like batteries, thus addressing the significant issues of portability and miniaturization for wearable electronics. This will be achieved by novel engineering of soft conductive composite materials by gaining a deep understanding of how their microstructures impact energy harvesting and sensing capabilities. Outcomes will include new knowledge of self-powered and interference-free sensing mechanisms and new development of integrated wearable sensor. This project holds significant potential to advance renewable energy for cutting-edge wearable electronics, while simultaneously promoting sustainability in Australia.	95,644.50	195,279.50	163,499.50	63,864.50	0.00	0.00	518,288.00
	National Interest Test Statement Portable and wearable electronic devices have been receiving increasing attention because personalized electronic devices such as smart watches and smart glasses have sprung up, bringing much convenience to our life. For portable and wearable electronic devices, the energy supply is a major obstacle to its flexible and integrated application. This project aims to develop a new soft self-powered wearable sensor system with high mechanical flexibility and minimized environmental inference to precisely measure a range of physical stimuli. This new sensing system will overcome the major limitation of existing self-powered sensors with significantly improved accuracy and reliability, which is expected to be the major form of wearable technology in the future. The technology will transform the wearable electronics industry in Australia, creating commercial opportunities in renewable energy supply and sensing system as well as reducing battery replacement and our environmental pollution.							
DP250100715 Bilston, Prof Lynne E	**A neuro-biomechanical model of the pharynx during breathing and swallowing** The pharynx enables breathing, eating, & speech, but its biomechanics and neuromuscular control are poorly understood. This project will solve this via an integrated series of experimental and modelling studies. Experimental work will elucidate the neural circuitry and molecular basis for pharyngeal sensation and neural control and pharyngeal function. These data will then be integrated into a 3D neuro-biomechanical model of the pharynx to simulate breathing and swallowing. This will provide the first full understanding of pharyngeal mechanosensory machinery and how neural drive, anatomy & sensation interact during breathing and swallowing. The model will provide a platform for future development of oral devices and sensors.	142,106.50	321,990.50	340,504.50	309,904.00	149,283.50	0.00	1,263,789.00
	National Interest Test Statement The pharynx (throat) enables us to breathe, eat and speak as well as switch seamlessly between these activities. However, we do not know how forces from airflow and food are sensed in the pharynx during breathing and eating, nor how this sensory information is fed back into the nerves and muscles in the pharynx so they can work in a coordinated way and rapidly adjust to changes. We will tackle this with an integrated series of experimental and modelling studies that will result in creation of the first 3D computer model of the pharynx that can simulate how the sensory system and muscles work during breathing and swallowing. To achieve this, we will identify the molecular machinery that encodes force and pressure detection in the pharynx and the neural circuits that provide sensory feedback to these muscles, and measure how the muscles respond to sensory inputs in humans. We will also develop new modelling technology to simulate how sensory information alters the contractions of the muscles of the pharynx and compare the model ouput to humans. This will provide the first full understanding of how the pharynx senses forces and pressures and how sensory input is integrated with individual anatomy by the nervous system to enable breathing and swallowing. Our model will also provide a platform for future development of oral devices and sensors. This project will further cement Australia's leadership in this field and create a platform for further research and development.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250100727	**Understanding and overcoming cognitive inertia**	94,036.50	199,926.00	207,643.00	203,631.00	101,877.50	0.00	807,114.00
Hayes, Prof Brett K	This project aims to advance understanding of cognitive inertia, where decision-makers persist in choosing familiar but inferior decision options, and how to best respond to this problem. A new conceptual framework explaining how inertia develops will be tested through an integrated program of experimental research and computational modeling. The expected outcomes are advances in our understanding of the cognitive processes that drive inertia and how these may differ between individuals, and the development of more effective methods for preventing or reversing inertia. This will provide significant benefits by guiding better decision making in domains such as finance, environmental sustainability, and health.							
	National Interest Test Statement							
	Exploring one's options is crucial to making decisions about complex issues relevant to everyday life (e.g., what sort of household energy plan should I purchase?). Problems in decision-making often arise through cognitive inertia - sticking with a familiar option when better alternatives are available (e.g., failing to consider a more sustainable energy plan that will be cheaper in the long run). However, the reasons why people often persist with choosing inferior options are not well understood. This project aims to evaluate a new model of cognitive inertia in order to improve decision quality. We will use the model to develop new ways of helping people to explore their options and hence make better decisions. Project results will be communicated to Australian government agencies and relevant industry stakeholders, and could lead to new ways of presenting information about decision options when communicating with the public. In turn, this will lead to communities that are better equipped to critically appraise the information they receive and subsequently make more informed decisions, including those guiding what we buy and how we live.							
DP250100739	**Tax justice: Closing policy gaps to lessen intimate partner financial abuse**	35,144.00	55,216.50	40,529.00	20,456.50	0.00	0.00	151,346.00
Kayis-Kumar, A/Prof Ann K	This project aims to address the weaponisation of the tax and transfer system in Australia by perpetrators of intimate partner financial abuse. The research team will innovate and drive knowledge advancements at the intersection of tax and financial abuse by applying interdisciplinary approaches including co-design with frontline services, practitioners and policymakers, and international comparative legal analysis with leading scholars in Australia and the United States. The research will generate significant economic and social benefits by enhancing outcomes for victim-survivors and their families; bolstering existing coercive control reforms; modernising Australia's tax law, and administration; and maintaining trust in the tax system.							
	National Interest Test Statement							
	Intimate partner financial abuse is a red flag for domestic violence (DV). It occurs in nearly all DV cases, impacts over 2.4M Australians, and costs the national economy over $10.9B annually. Perpetrators can currently use business structures to create tax debts in the victim-survivor's name. This gives rise to the perverse outcome of victim-survivors being held responsible for perpetrators' debts, with the Australian Taxation Office unwittingly being mobilised against them using payment plans, debt collectors and bankruptcy. In contrast, 'innocent spouse relief' provisions in the United States offer relief on grounds of financial abuse. Leveraging participatory action research methods and collaborating with US researchers, this interdisciplinary project aims to address current legal, regulatory and administrative shortcomings by comprehensively mapping the abuses of the tax system by perpetrators, and designing tax law and policy responses to identify and support victim-survivors while also disrupting perpetrators. To maximise knowledge translation and practical outcomes, results will be shared through government and policymaker meetings, community organisations, industry networks, conferences, articles and media channels. The new knowledge generated by addressing this critical gap has significant policy and practical relevance, strengthening the federal response to DV and modernising tax law and administration by combatting the weaponisation of the tax system in Australia.							
DP250100753	**Electronic delocalization in organometallic molecules**	106,717.00	222,874.50	233,202.50	117,045.00	0.00	0.00	679,839.00
Peeks, Dr Martin D	This project aims to investigate a new class of organometallic molecules capable of long-range delocalization of electrons. This project expects to generate new knowledge in chemistry by studying how the interaction of metal centres and pi-conjugated fragments affects electron delocalization. The expected outcomes of the project include (i) the synthesis of new organometallic building blocks for next-generation semiconductors; (ii) quantitative insight into their electronic and							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	optical properties, individually and in complex assemblies. This project will provide benefits by establishing a platform for the design of future materials with potential applications as molecular conductors and semi-conductors, and as next-generation sensors. **National Interest Test Statement** Recent progress in technology has been driven by the manufacture of ever-smaller electronics. We carry computers in our pockets that are more powerful than those which filled entire rooms just fifty years ago. The next step towards faster and lower-energy computer chips is to shrink the size of electronic circuits even further – to the size of single molecules (50,000 times smaller than the width of a hair). In this project, we will build a toolkit of molecule-scale electronics and create design rules for better materials. Through partnerships with users and IP licensing, this research will contribute to the Australian advanced manufacturing sector and will help to establish an onshore semiconductor industry (current global value: $860bn). For the Australian community, our research will underpin the electronic devices of the future, with uses from energy storage (e.g., improved batteries), to miniature sensors (e.g., wearable devices), and computing (e.g., faster processing).							
DP250100778 Wang, A/Prof Danyang	**Nanostructured dielectric thin films for miniaturized energy storage** This project aims to establish a new framework for solid-state capacitor materials design towards producing unprecedented, reliable energy density in miniaturized energy storage. The project will substantially advance the state-of-the-art in electrostatic thin-film capacitors. Expected outcome is to achieve novel oxide multilayers with both ultrahigh energy density and ultrafast operation under low electric field in virtue of combination of configurational entropy design and negative capacitance stabilization. The project will set a viable paradigm of high-performance dielectric capacitors to meet the demands of miniaturization and integration in emerging electronic systems, such as Internet of Things devices and autonomous AI agents. **National Interest Test Statement** The increased functionality and miniaturization of modern devices demands higher energy density and better efficiency of energy storage than the state-of-the-art. Ceramic thin-film capacitors have emerged as ultrafast charge-discharge miniaturized sources, compared with batteries and fuel cells. However, the energy density enhancement of current thin-film capacitors still relies on the application of intensely strong electric fields, which incur concerns over reduced reliability and shorter lifetime. This project aims to develop novel ‘thin-film materials’ with ultrahigh energy density and ultrafast operation under low electric field, which not only meet the requirements for integration and miniaturization, but also greatly improve the reliability and operational performance of advanced electronic systems. The project will underpin Australia’s leadership and competitive edge in next-generation energy storage technology. The pursuit of such ground-breaking discoveries in thin-film materials aligns with national interest in Advanced Energy Storage, which was set out as a priority by the Australian Government in National Science and Research Priorities. Through partnership and the licensing of IP, these new materials will add a critical technology into the global ceramic thin-film capacitors industry ($2.6b by 2026), and have potential application across numerous Australian industry sectors, from electric vehicles to renewable energy and medical devices to defence and aerospace.	96,106.00	192,112.00	194,512.00	98,506.00	0.00	0.00	581,236.00
DP250100812 Dutta, A/Prof Rukmi D	**Lightweight, Low Rare-earth, Permanent Magnet Motors for Electrified Future** This project seeks to push the envelope of the power to weight ratio of electric motors developed for transport electrification, aiming for over 5kW/kg using a novel Halbach magnet array with low rare-earth content and integrated stator cooling. This high-specific power breakthrough promises lighter, more efficient motors for electric vehicle, aircraft, and drones. The project will attempt to unlock the theoretical secrets of buried Halbach arrays, leading to a groundbreaking motor design and its drive system. The project will expand the knowledge base for future generations of high-specific-power electric machines and train the workforce for a sustainable, green future. **National Interest Test Statement** The Government’s 2021 NEAT Policy (Advanced Air Mobility and National Emerging Aviation Technology) highlights the role of electrified aviation in Australia’s quest to reduce carbon emissions and reach a “net zero” future. However, existing motors are not powerful, compact, or sustainable enough to deliver on the promise of electric aircraft and high-power drones. While permanent magnet motors are the preferred choice for these emerging	112,750.50	254,139.00	271,596.00	130,207.50	0.00	0.00	768,693.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	applications due to their high efficiency and power density, they cannot yet produce the power-to-weight ratio needed for carbon-neutral aviation and next-generation electric vehicles. This project aims to develop the first-ever permanent magnet motor with the required kilowatts-per-kilogram specification using fewer rare-earth materials. The high energy-density rare earth materials used in permanent magnet machines already benefit Australia as the world's second-largest supplier. The developing drone sector could boost Australia's GDP by $14.5 billion over 20 years (NEAT 2021). By sharing project findings with stakeholders in aviation and automotive technology via workshops, publications and commercialisation opportunities for IP licensing, this project should enable the adoption of Australian-designed cutting-edge permanent magnet motors in next-generation electric vehicles, aircraft and drones. Crucially, a highly efficient, lightweight motor designed and manufactured in Australia will also ensure the sector's geopolitical self-reliance.							
DP250100827 Lupton, Prof Deborah A	**Public Understandings of Immunity Systems and Human-Microbial Relations** Human immunity and microorganisms are currently dominant topics in public forums, often in contested ways. This sociological project aims to investigate the societal drivers of the meanings and practices that shape public responses to the interdependencies between human-microbial relations and immunity systems. The project will combine qualitative and creative research methods with social theory. Expected outcomes include the generation of new insights about community and other stakeholders' understandings concerning the complex relationships between immunity systems, society, microorganisms and the microbiome. It is expected that these insights will contribute to better policy and communication strategies to counter misinformation.	78,234.00	165,100.50	189,227.50	102,361.00	0.00	0.00	534,923.00
	National Interest Test Statement Australia and the world are currently confronted with the urgent risks posed by microorganisms, yet their positive contribution to human and planetary wellbeing is also increasingly recognised. This sociological project aims to investigate the societal drivers of the meanings and practices that shape public responses to the interdependencies and interrelationships between humans, microbes, immunity and the ecosystems and microbiomes of which they are a part. Involving the participation of Australians across diverse social groups, ages and locations, the project expects to identify public understandings of these topics. This research also plans to analyse publicly available information and investigate how people find and assess this information and put it into practice. To do so, qualitative and creative research methods will be combined with cutting-edge sociocultural theory. The project aims to use these insights to develop ideas about how best to promote knowledge and combat misinformation for a better informed public. Expected outcomes include the generation of new insights about community and other stakeholder understandings concerning the complex interconnections between people, society, immunity systems, microbiomes and microorganisms. It is expected that these insights will have social, cultural and economic benefits by contributing to better policy and communication strategies to enhance awareness of the importance of microorganisms to human and planetary wellbeing.							
DP250100915 Tilley, Prof Richard	**Unveiling Nanoparticle Homogeneity: One Particle at a Time** Nanoparticle catalysts are an essential part of our lives with applications ranging from fuel cells in cars to the synthesis of drug molecules. These nanoparticle catalysts are always inhomogeneous and contain a range of sizes, shapes and compositions. The aim of this project is to measure the catalytic properties of individual nanoparticles. In doing so we will understand the level of homogeneity needed within a sample for high performance and identify which nanoparticles are the most active. These highly active nanoparticle targets will be synthesised at scale to achieve homogeneity and efficiency across real samples and so benefit industries from next generation cars to more effective pharmaceuticals manufacturing.	126,780.50	249,671.50	243,869.50	120,978.50	0.00	0.00	741,300.00
	National Interest Test Statement This project combines state-of-the-art microscopy techniques to gain a deeper understanding of how nanoparticles function in chemical reactions. These nanoparticles catalyse a range of reactions that play a crucial role in vital applications, from cleaner fuel hydrogen production and biomass processing to open new horizons in green technologies. Our innovative approach involves combining two analytical methods to understand how the structure of individual nanoparticles controls the catalytic properties. This understanding will be linked to computer simulations to set a new standard in nanoparticle analysis and expand our understanding of their unique properties. For Australia, this research bridges a critical gap by offering a more precise and detailed approach for studying these minute particles for advanced green technologies. By harnessing the power of advanced nanotechnology, we aim to enhance our understanding of nanoparticle behaviour, essential for improving technologies crucial to Australia's progress. Commercially, Australian companies will gain a competitive edge by leveraging this advanced research, boosting industries and creating job opportunities. Socially and environmentally, it could contribute to cleaner and sustainable energy solutions, reducing pollution and safeguarding our environment. This research has the potential to drive innovation and benefit Australia across multiple fronts, positioning us at the forefront of nanotechnology advancements.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250100955	**A scaled boundary framework for nonlinear dynamic analysis of structures**	113,880.50	225,121.50	224,969.50	113,728.50	0.00	0.00	677,700.00
Song, Prof Chongmin	This project aims to address the integrity assessment of engineering structures subjected to dynamic actions, which are often the most critical loading cases. An innovative scaled boundary framework will be established leveraging the power of modern computer facilities needed for dynamic nonlinear analysis of large-scale structures. Modern digital technologies for geometric modelling will be seamlessly integrated with computational mechanics. The outcome of this project is an innovative technology and a computer simulation tool that will be robust, fully-automated and highly efficient. This research will benefit Australian economy and society by enabling timely, cost-effective design, planning and management of civil engineering structures.							
	National Interest Test Statement							
	Engineering structures such as buildings, bridges, tunnels and dams are integral parts of national infrastructure assets. Ensuring their resilience and safety under earthquakes, cyclones, blasts and other dynamic actions is a major concern to all the stakeholders. This project aims to establish an advanced numerical framework to utilise modern computing systems and digital technologies (laser scanning, computer tomography, virtual reality, etc.) for computer simulation of large-scale structures in a fully automatic and near real-time manner. Through industry partnerships and licensing of intellectual property, the innovative computer simulation tools developed in this project will benefit infrastructure asset owners, as well as Australia's building, engineering, and mining sectors. These innovations will increase the capability for cost-effective and rational decision making in the management of infrastructure that more comprehensively considers the impact of extreme events and environmental changes. This project will lead to scientific and technological advances in computational structural analysis that help Australian structural engineering firms stay competitive and benefit Australia's digital transformation.							
DP250101007	**Determining the role of corticostriatal circuits in impulsive actions**	117,603.50	196,281.00	160,488.00	180,231.00	98,420.50	0.00	753,024.00
Turner, Dr Karly M	This project aims to determine what happens in the brain during impulsive actions. Using cutting-edge neuroscience tools, this project expects to generate new knowledge by identifying when, where and how the brain supports impulse control in real time. Expected outcomes of this project should improve our fundamental understanding about why impulsive behaviours persist and how they are controlled in the brain, which is significant for our basic understanding of the human brain and behaviour. Benefits include future use of this information to reduce risky behaviour as well as informing policy, educational and public safety messages, while building collaborations and research capacity in Australia.							
	National Interest Test Statement							
	Everyday decisions require us to adapt our current goals, choose the correct response to attain those goals, and then respond at the correct time. But sometimes we make poor decisions such as drinking too much alcohol or checking a mobile phone while driving. We often know the negative consequences, so why do we make poor decisions? We will address this critical gap in our knowledge by examining what happens in the brain during impulsive behaviours. Using cutting-edge tools in neuroscience, this project will identify what happens when we make poor choices and investigate the brain circuits involved. Fundamental knowledge about impulsive actions will build on current theories of how we make decisions and identify factors involved in poor decision-making. Impulsive behaviours have been linked to problem behaviours in society such as excessive drinking, aggressive behaviour and dangerous driving. The findings of this project can inform policy, educational and public health messages to reduce the burden of impulsive behaviours on society.							
DP250101047	**Electrochemical Control of Fluorophore for Single-Molecule Light Microscopy**	102,214.00	208,719.00	233,553.50	238,161.00	223,305.00	112,192.50	1,118,145.00
Gooding, Prof John J	This project aims to show how fluorescence microscopy can be improved by modulating the properties of fluorophores electrochemically. This is significant as electrochemistry has already been shown to improve single molecule microscopy with better imaging and ability to detect individual molecules. This advance will make us towards single molecule counting which then opens the door to developing sensors with detection limits of a single molecule and that do not require calibration. The outcomes will be an understanding on the chemistry that allows electrochemistry to improve fluorescence microscopy, the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	commercialisation of new microscopes and new sensing technologies. These tools should provide new ways of understanding our molecular world.							
	National Interest Test Statement							
	Fluorescence microscopy and fluorophores are a $2 billion industry at the corner stone of biological science. Excitation of fluorophores using light is the basis of fluorescence microscopy but this has limitations with regards to seeing multiple colours and being able to count single molecules. The proposed research will overcome these limitations by using electrochemical manipulation of fluorescent molecules in conjunction with light to give multicolour, single molecule counting light microscopes. Based on our recent discovery, this topic has never previously been explored. It will not only give better performing microscopes but also facilitate the next generation of single molecule sensors for quantitative analysis. The Australian owned intellectual property will give Australia a foothold in this expanding scientific instrument market and strength our enviable position in sensing. The new knowledge will show how electrochemistry can be used to optimise the properties of fluorophores for different microscopy applications as well as guide the synthesis of new fluorophores with advantageous properties for the new microscopy technologies. Drawing on our commercialisation experience, this technology will be targeted towards commercialisation with some interest already shown from the proof-of-concept work. The research questions answered in the proposed research are aimed at expediting the commercialisation opportunities this technology promises.							
DP250101112 Li, Prof Guoyin	**Taming Hard Optimization in Measure Spaces for Modern Applications** Optimization over measures is pervasive in modern technologies spanning commerce, science, and engineering, including image recognition systems and industrial robots. Despite its ubiquity, it presents a significant challenge in mathematical optimization. This project aims to tackle this challenge by developing innovative mathematical principles and efficient numerical schemes, building upon the investigators' recent award-winning breakthrough. This project expects to make fundamental advances and develop novel methodologies, enhancing Australia's global standing in this emerging field. Expected benefits include the development of much improved and reliable solutions to numerous machine learning tasks, key technologies of modern inventions.	76,000.00	158,000.00	165,500.00	83,500.00	0.00	0.00	483,000.00
	National Interest Test Statement							
	The project is designed to address the critical needs of modern optimization, such as rigorous mathematical principles and efficient computational procedures for large-scale optimization in very high dimensions, that are not met by current methods. Hence this project will advance Australia's national interests in multiple ways. Firstly, developing cutting-edge optimization technologies to tackle modern challenges across computer science, engineering, and scientific domains will improve our quantitative expertise in Australia. This will empower us to harness emerging avenues of scientific and engineering advancements, thus amplifying Australia's standing in innovation on the global stage. The successful implementation of our optimization technology will significantly impact various sectors that need extremely high dimensional optimization technologies, such as industrial automation, machine learning, and image processing, by improving automation controls, increasing prediction accuracy or improving image qualities. Beyond these immediate gains, the project carries direct societal benefits for Australia by reinforcing Australia's global reputation as a frontrunner in pioneering optimization technology. The strategic research partnership between leading optimization research centers in the USA, Austria, and Australia built into this project promises to bolster our nation's capacity for international research collaboration, fostering knowledge exchange on a global scale.							
DP250101137 Bao, Prof Jie	**A Probabilistic Approach to Big Data-Based Industrial Process Control** Based on the behavioural systems theory for stochastic systems, this project aims to develop a novel probabilistic behavioural process control approach by utilizing big industrial process operation data. Unlike many existing data-driven control methods for deterministic systems, the proposed approach deals with the uncertain operation conditions encountered in daily industry operations by using the statistical information from big process data and controlling the probability distribution of process variables (e.g., leading to products with more consistent specifications). The research outcomes are expected to help the Australian process industries leverage the power of Industry 4.0 to improve the efficiency and economy of their operations.	93,968.50	190,190.00	194,907.50	98,686.00	0.00	0.00	577,752.00
	National Interest Test Statement							
	Australia has very strong process/manufacturing industries representing over $873bn turnovers and $350bn value added per annum. In these industries, many modern plants are very complex but are often controlled by simple logic controllers that deliver inadequate performance. Furthermore, plant operations are always subject to uncertainties (e.g., variations in raw material specifications, environmental conditions and energy costs). This project							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	aims to develop a novel big data-based process control approach to operate these complex processes and improve their energy and materials efficiencies and the consistency of the product specifications by using the statistical/probability information from big process data. This project is expected to help the Australian process industries improve their competitiveness in the global market while reducing their environmental footprints. A big data-based process control framework that deals with process uncertainties 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".							
DP250101254 Sharma, Prof Ashish	**A Bayesian model for inferred streamflow in absence of in-situ observations** A novel Bayesian framework for specifying hydrological models when no streamflow measurements exist is proposed. The framework uses a new likelihood function that operates with inferred, scaleless measurements of streamflow, enabling use of satellite reflectance and altimetry as surrogates of streamflow, while incorporating hydrologic signatures to introduce scale. A new temporal differencing-based reflectance surrogate overcomes deficiencies in existing alternatives, the framework enabling semi-distributed estimation for high order catchments. Streamflow data from Australian Hydrologic Reference Stations are to be used to assess the viability of the proposed framework, before application to ungauged catchments in remote settings worldwide.	85,135.50	216,216.50	208,882.50	141,410.50	63,609.00	0.00	715,254.00
	National Interest Test Statement The World Bank states that the largest economic risk facing us over a 10-year horizon is a "Global Water Crisis". While some facets of such a crisis may be beyond our control, its potential impact can be mitigated through proper modelling, prediction and communication. This research addresses a key factor impeding hydrologic modelling, prediction and communication, seeking to utilize the power of hydrologic modelling under uncertainty along with derived or indirect streamflows to measure and model river flow worldwide. Success in this research will lead to a many-fold increase in hydrologic measuring capability worldwide, as fewer than 1% of catchments are presently gauged. Additionally, the new modelling paradigm developed for this new data source will create predictability where streamflow measurements are difficult to obtain. With the methodological concepts vetted over the past years through controlled experimental studies, and coarse scale remotely sensed measurements shown to demonstrate improvements across Australian catchments, this research has the potential to impact especially the poor and vulnerable worldwide, especially those in rural and remote settings that are difficult to monitor or protect.							
DP250101324 Konstantinou, A/Prof Georgios	**Making weak power grids work: Models, controls, and interactions** This project aims to improve the understanding and optimise the operation of weak power grids with significant distributed energy resources (DER). Utilizing a mix of detailed and model-free approaches, and extensive data from DER testing, the project will reframe DER representation to better address destabilizing dynamics in active distribution networks and improve overall control and coordination across a rapidly changing power system. Outcomes of the project also include a blueprint for optimizing observability and controllability in weak grids and robust power electronics control contributing to grid stability, greater DER integration while aligning with energy transition targets and enhancing energy security and efficiency.	88,311.00	180,887.50	187,640.50	95,064.00	0.00	0.00	551,903.00
	National Interest Test Statement Our project focuses on enhancing Australia's evolving power distribution networks to effectively integrate distributed energy resources (DERs), addressing the growing need for reliable, sustainable energy. As we shift towards greener energy and increasingly electrify transportation and industrial applications, managing the variability, interactions and stability become major priority for distribution networks. This project aims to fill existing technical and methodological gaps by evaluating system dynamics, developing advanced models for DERs, proposing and validating robust power electronics control methods for networks. This research benefits Australians economically by optimising resource utilisation and minimising costly grid upgrades. Environmentally, it supports our transition to a low-carbon economy. Socially, it enhances energy security and reliability, ensuring stable power supply for communities nationwide, including our remote and rural areas. By advancing distribution side solutions, Australia can provide global leadership in sustainable energy practices. Maximising our research impact, we will disseminate our findings through open-access platforms, public engagement, and media outreach, and will continue our engagements with industry partners, energy providers, and policymakers, ensuring broad understanding and adoption. Our approach ensures solutions are practically implemented, delivering tangible benefits to Australians and advancing our energy future.							
	Ultrasensitive analysis of membrane protein interactions							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250101368 Donald, Prof William A	Proteins densely populate biological membranes and play key roles in signal transduction and molecular transport, underscoring the importance of elucidating their interactions and effects of macromolecular crowding. Conventional analysis methods are hindered by low membrane protein yields, sample heterogeneity, and limited biochemical compatibility. This project aims to overcome these challenges by establishing a single-ion native mass spectrometry platform for the precise analysis of membrane protein interactions and their response to crowding. This is expected to accelerate biochemical discovery and enhance understanding of membrane proteins. The research will drive economic growth by fostering innovation in the biotechnology sector. **National Interest Test Statement** Our project addresses the critical need to understand membrane protein interactions vital for cell function. Membrane proteins, constituting a significant portion of cellular components, pose challenges for analysis outside lipid-rich environments, hindering biotechnological advancements. Developing advanced methods to analyse these proteins aims to unravel crucial interactions, filling a research gap relevant to the Australian biotechnology sector. Our research also offers tangible benefits in industry and innovation. Revealing membrane protein interactions could advance bioactive molecular discovery, aiding in therapeutic drug development and pesticide efficacy. Aligned with national biotechnology priorities, our project enhances Australia's global competitiveness. We're dedicated to sharing our findings beyond academia. Through outreach and partnerships with industry and government, our methods can be applied beyond research, fostering economic benefits. Our focus on fundamental research with practical applications reflects our commitment to Australia's national interests. Overall, our project promises to advance scientific knowledge, drive innovation, and boost Australia's global competitiveness. Leveraging interdisciplinary expertise, we're poised to make significant contributions benefiting Australian society and beyond.	95,713.50	191,192.50	193,445.50	97,966.50	0.00	0.00	578,318.00
DP250101396 Sui, A/Prof Yulei	**Certifying Code Language Models to Fortify Software Engineering Foundations** Code Language Models, specialised branches of Large Language Models (LLMs), are revolutionising software development by automating code generation and enhancing productivity. This project aims to develop precise and scalable certification techniques that solidify code-centric large language models for high-quality code generation. It expects to generate new knowledge about how to use software analysis and verification approaches to ensure such systems are correct, robust and secure. Expect outputs include techniques and open-source tools to fortify LLM-based development and impact sectors reliant on quality software, aligning with the anticipated $20 billion LLM market by 2030, marking a significant leap in Australian-led global research. **National Interest Test Statement** Software systems lie at the heart of almost all Australian industries, but if their underlying code is poor quality, these systems are vulnerable to outages and malicious attacks. To enhance productivity, many software engineers use AI-based code language models, but while these models can write code quickly, they cannot always do it well. This project therefore focuses on increasing code quality and safeguarding the future of Australia's critical digital infrastructure by creating a framework to make AI-generated code more correct and secure, and AI models more robust. Increasing the quality of automatically generated code will better protect Australian businesses against cyberthreats, creating significant short- and long-term social and economic benefits. It will also increase business and consumer confidence in software built using this code, leading to greater adoption of the technology, with associated commercial advantages. Additionally, our project will promote innovation and expertise in code language model technology, advancing software engineering research in Australia. To ensure software engineers understand and adopt our framework, we will make the tools and techniques we develop open-source, sharing them freely with Australian businesses, policymakers and researchers. We will also communicate our results widely by giving keynotes and talks at international conferences and workshops, and showcasing our results online and through industry presentations.	123,565.00	252,502.50	174,649.50	45,712.00	0.00	0.00	596,429.00
DP250101401 Liang, A/Prof Kang	**Single-atom engineering to ignite nanozyme catalysts** This project aims to develop a new class of highly active artificial enzymes with full atomic utilisation, capable of efficient, selective, stable and cost-effective bio- and chem-catalysis. The anticipated goal of this project is to enhance Australia's manufacturing sectors by introducing innovative and disruptive methodologies for producing high-value chemicals in areas such as energy, health, food, the	119,899.50	240,214.50	242,467.50	122,152.50	0.00	0.00	724,734.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	environment, and agriculture. This initiative seeks to solidify Australia's stance in the competitive global arena by offering more economical and effective solutions. **National Interest Test Statement** To fully harness the potential of nanotechnology and advanced manufacturing for chemical production, it is essential to understand how new catalyst technologies can be innovatively developed and implemented in industry. This research project aims to investigate the synthesis and application of groundbreaking catalyst technologies, focusing on their integration and commercial potential to significantly enhance Australia's manufacturing competitiveness. The initiative targets transformative advancements in catalyst technology, which is critical for propelling the long-term growth of Australian manufacturing sectors including energy, food, environmental solutions, and pharmaceuticals. These sectors are recognised as high-value industries with substantial impact on the national economy and are integral to the government's recent multi-billion-dollar investment strategy aimed at reinforcing modern manufacturing capabilities. By fostering collaborations with leading Australian chemical and manufacturing industries, the project will explore long-term commercial opportunities and strategic partnerships. These efforts are designed not only to advance technological innovation but also to ensure sustainable economic growth and maintain Australia's competitive edge in the global market. This alignment with national priorities underscores the project's strategic importance and its potential to contribute significantly to the country's future economic landscape.							
DP250101405 Stewart, Dr Alastair G	**Understanding Biological Energy Synthesis** Biological energy production is a fundamental process occurring in all forms of life. This process relies on molecular interactions that drive an essential cellular protein generator. Despite energy production being critical to life, the molecular mechanisms of this process are not understood. This project aims to decipher the molecular mechanisms underlying biological energy production using a trailblazing method developed in my laboratory. The fundamental knowledge generated will have the potential to be applied to biotechnology innovations, such as the creation of nanomachines. The applications of this knowledge represent long-term economic, commercial and environmental benefits to Australia’s future. **National Interest Test Statement** This project will advance Australia's scientific and technology sector by introducing innovative methods to study biological systems, particularly ion channels and membrane proteins, enhancing diagnostic and treatment capabilities. The project aims to produce fundamental scientific discoveries, but also aligns with national priorities on sustainable energy via the creation of synthetic artificial chloroplasts, which could spur new applications in the nanotechnology sector. Simultaneously, the project will provide the groundwork for others to address global health challenges such as antimicrobial resistance, potentially offering new strategies that could significantly improve public health outcomes. This work will also bolster Australia's international collaborations, enhancing global scientific networks and opportunities.	103,034.00	210,751.00	107,717.00	0.00	0.00	0.00	421,502.00
DP250101468 Selomulya, Prof Cordelia	**Engineering network-forming behaviours of plant proteins** This project seeks to innovate plant-based protein texturization by developing a dual emulsion gel system with pea protein, as an alternative to extrusion. The approach can be tailored to create properties that closely replicate the sensory and mechanical properties of animal-derived foods, and allows encapsulation of micronutrients that are often lacking in plant-based products. Successful outcomes will expand the utilisation of plant proteins beyond those commonly found in extruded products, and contribute to the growth of Australia's plant protein market, projected to reach $13 billion by 2030. **National Interest Test Statement** Up to 10% of the global meat market could be captured by plant-based products to replace animal foods such as meat and fish, with an estimated total market value of US$85 billion by 2030. A major challenge in generating these products is to mimic the sensory qualities (e.g. mouthfeel, springiness, chewiness) of animal foods. The high temperatures and pressures used in current manufacturing processes do not mimic these effects well, and often result in nutrient loss. This project will develop a new gelling technology to create desirable qualities without excessive heat treatment, while also protecting nutrients and allowing use of diverse plant proteins beyond the commonly used soy and wheat proteins. The method could lead to new solutions in plant-based food manufacturing as it can be directly integrated into current processes. The project aligns with Australian Government priorities in food research and production. Rapidly growing demand for plant foods due to health benefits, sustainability and mitigating environmental damage sees Australia investing heavily in plant-food manufacturing. If these innovations are adopted by industry – as evidenced by the team’s current collaboration with large companies and start-ups – they will increase Australia's capabilities in advanced food manufacturing, including in regional areas. Ultimately this increases opportunities for employment and value-added exports, while delivering more nutritious, healthier and sustainable foods.	117,250.00	230,000.00	232,400.00	119,650.00	0.00	0.00	699,300.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250101469 Boecking, Prof Till	**Visualising membrane pore assembly for cytosolic delivery of cargo proteins** This project aims to develop state-of-the-art single-molecule imaging to visualise the assembly of molecular machinery deployed by bacteria to punch giant pores into the membranes of mammalian cells as portals for the translocation of cytotoxic proteins. The project expects to generate new knowledge in the fields of microbiology, synthetic biology, and nanotechnology. Expected outcomes include a full description of a new protein translocation pathway, development of new biophysical techniques for the study of protein machines, and an understanding of the engineering principles at play. This project anticipates contributing advanced capabilities in bionanotechnology, benefiting applications in sequencing, biosensing and protein delivery.	102,500.00	207,000.00	204,500.00	100,000.00	0.00	0.00	614,000.00
	National Interest Test Statement Organisms of all kingdoms of life deploy pore-forming proteins to punch holes into the membrane surrounding a target cell. These pores serve as portals for the delivery of (toxic) proteins into the target cell, leading to cell death. How these pores function to deliver the right protein into the right cell is poorly understood. The aim of our project is to reveal at the molecular level, how pores assemble and select proteins for translocation. We will also investigate the mechanism used to translocate proteins through the pore. Understanding these processes requires cutting-edge imaging technology and gives us a ‘blueprint’ for developing new and efficient systems for delivery of cargo proteins across cell membranes. This advance in knowledge has potential applications for Australia’s nanotechnology industry for engineering pores used in biosensors and sequencing technologies. It will also give us unprecedented insight into molecular machinery deployed by bacteria 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.							
DP250101509 Zhao, Prof Chuan	**Unlocking High-Stability Platinum-Free Catalysts for Hydrogen Fuel Cells** Fuel cell is a cornerstone technology for the success of Australia’s hydrogen economy, but its scalability has been stagnant for decades because of its high cost and reliance on platinum materials. This project aims to unlock the potential of non-precious metal catalysts for hydrogen fuel cells using an interdisciplinary approach. Highly porous, multi-site single atom catalysts will be developed to block the degradation pathways, and integrated into a novel low-water retention membrane electrode assembly. The expected outcomes include new materials development, new cell design and a robust platinum-free hydrogen fuel cell prototype.The project will provide significant benefits to Australia in developing revolutionary hydrogen technologies.	123,750.50	244,001.00	238,001.00	117,750.50	0.00	0.00	723,503.00
	National Interest Test Statement Hydrogen fuel cells are a cornerstone technology of the hydrogen economy. This research focuses on a crucial gap in the hydrogen economy in Australia by addressing hydrogen utilisation through the development of low-cost hydrogen fuel cells. This technology will strongly contribute to Australia's National Hydrogen Strategy to reach net zero emissions by 2050 by decarbonising hard-to-abate sectors such as heavy transport, aviation, and shipping, thus greatly benefiting the environment. The project will explore new chemistry and develop new engineering approaches, generating an exceptional training platform for Australia’s future scientists and engineers to collaborate across disciplines, preparing them for leadership roles in hydrogen technologies and pursuing scientific and commercialisation avenues in Australia and overseas. The research outcomes will be expanded beyond academia through press releases and webinars to reach a broader audience. The intellectual properties generated by this project will be protected to enable the translation of research to industry beyond this project's completion, and the launch of new spin-out companies.							
DP250101514 Li, A/Prof Xiaopeng	**Uncovering Mesostructures in Additively Manufactured Aluminum Alloys** Metal additive manufacturing of aluminium alloys has shown a great promise for various applications in many key industries including aerospace, transportation, defence, etc. However, a huge knowledge gap exists in understanding and controlling the widely observed large variation in mechanical properties in the additively manufactured aluminium alloys. Therefore, this project aims to introduce machine learning and in-situ monitoring to develop a new approach to	95,032.00	187,655.00	184,989.50	92,366.50	0.00	0.00	560,043.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	investigate the process-bonding structure-property relationships in additively manufactured aluminium alloys. The outcomes of this project will fill the critical knowledge gap and open new opportunities for wider applications of additive manufacturing of aluminium alloys. **National Interest Test Statement** Metal additive manufacturing is a technology that can potentially create high-quality, high-strength metal products for important industries like aerospace, healthcare, transport and defence. For example, lightweight but high-strength metal components are vital in building aeroplanes. But so far only a few applications have been successful because the fabricated metal products vary widely in properties such as mechanical strength – a barrier that stops more industries adopting the technology. This research examines structures within the metal alloys called mesostructures, which play a critical role in their mechanical properties but have been overlooked until now. We will couple this new knowledge with machine learning and real-time monitoring during manufacture so robust metal alloys with specific properties can be produced consistently. Our research directly supports the Australian Government's goal of upscaling advanced manufacturing and is a perfect match with their recently released blueprint – the Made in Australia Innovation Fund – by encouraging value-added local manufacturing and investment in key industries. Environmentally and socially, our findings pave the way for more energy-efficient manufacture of lightweight, consistently high-strength metal products, which benefits all Australians. We anticipate patenting our new monitoring approach, which will speed up industry uptake, for example, for online quality control for additive manufacturing of metal components.							
DP250101589 Poole, A/Prof Kathryn	**Redefining the mechanosensory role of Transient Receptor Potential channels** This project will answer the question: how do members of the Transient Receptor Potential (TRP) super family of channels contribute to cellular force sensing? TRP channels do not fit the classic paradigm of force sensing channels as they are not activated by membrane stretch. This project will determine if TRPs can be activated by a different type of force (tensile forces applied at cell adhesion sites) and aims to establish a new paradigm for mechanosensing, where select TRP channels function as mechano-amplifiers to boost the signal from a classical stretch-activated primary mechanosensor, i.e. PIEZO1. This work is anticipated to redefine our understanding of the flexibility of force sensing via ion channels in mammalian cells. **National Interest Test Statement** To adapt to the local environment, cells must sense external cues and translate them into messages that tell the cell how to respond. While we know that cells in our bodies sense and respond to force, the way that information is conveyed is unclear. In this project, we will investigate how a family of force sensing molecules transmits the sensation of force and amplifies these signals within the cell. An improved understanding of basic mechanisms underpinning cellular force sensing will enhance national bioengineering capabilities (both creating implantable devices and designing materials that do not negatively impact cellular function) and provide future avenues for investigating alterations in human performance related to aging and sedentary populations. Improving outcomes for our rapidly aging population will drive social wellbeing and economic growth. Socially, the research also has potential to inspire curiosity about the intersections between biology and physics, thus supporting the growing research field of mechanobiology. Media engagements, public events and social media will ensure widespread dissemination and enhance commercial interest in industries outside basic research.	90,000.00	191,552.50	197,680.00	96,127.50	0.00	0.00	575,360.00
DP250101611 Greenhill, Prof Catherine S	**Probabilistic methods for complex discrete structures** Large discrete structures are ubiquitous in the modern world, and are modelled using random graphs or hypergraphs. However, existing analysis techniques fall short of the generality required to capture real-world applications, due to the size, irregularity and structural constraints of these networks. This project aims to build on recent breakthroughs to develop new theoretical tools to overcome these barriers. Expected outcomes include enumeration formulae and new probabilistic estimates for pattern appearances in complex discrete structures. The explicit formulae and practical algorithms produced by our project will benefit researchers who model real-world discrete systems using graphs or hypergraphs. **National Interest Test Statement** This project serves an increasing demand for a better understanding of large mathematical structures called hypergraphs. Hypergraphs are abstract models of multi-way relationships within any set, and are used in a wide	90,906.00	183,362.00	192,652.00	100,196.00	0.00	0.00	567,116.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	variety of applications from ecology to epidemiology. Designs are hypergraphs that give a way to group objects into blocks that satisfy strict balance and regularity conditions. This is key in statistical studies, controlling the effects of the variables being tested and reducing the impact of other random factors. Designs are also widely used in fields as diverse as software testing, tournament scheduling and communications technology. Many questions about large hypergraphs remain unanswered, including their typical properties. Our results will lead to significant benefits including: (i) the discovery of new hypergraphs and designs that may be used in the above applications, (ii) a greater understanding of the structure of complex systems such as networks, (iii) faster algorithms for constructing hypergraphs with desired properties, and for processing them once they have been built, (iv) enhanced links between researchers in three leading Australian universities, and their international collaborators, (v) training for a number of young researchers in an area which underpins many modern information and communication technologies. Results will be communicated in journals and conferences, and via outreach activities to the broader community.							
DP250101688 Pettit, Prof Christopher J	**AI, cities and development assessment: developing trustworthy support tools** This project aims to uncover the legal, technical and ethical requirements for the trustworthy use of AI in urban development assessment. The project will generate new knowledge in the emerging field of AI urbanism, with the first conceptual investigation of the use of AI in the regulatory and political setting of development rights. The expected outcome of this project is a robust and interdisciplinary theoretical positioning of AI Urbanism within critical urban studies and planning theory, to steward Australia's effective integration of AI into planning decision making. This will provide significant social and economic benefits through more efficient and sustainable urban development process and timely housing supply.	104,480.00	229,972.00	254,145.50	128,653.50	0.00	0.00	717,251.00
	National Interest Test Statement Increasing and accelerating housing supply is an urgent national priority, exemplified by National Cabinet's target to build 1.2 million new homes by 2029. Key to timely housing delivery is an efficient planning process, but industry figures suggest individual development assessments (DAs) take, on average, 111 days in NSW. Such timeframes inhibit supply, and are evidence that government and industry lack the necessary systems and tools to efficiently respond to the demands of urban growth. This project responds, providing a critical evaluation of the opportunities Artificial Intelligence (AI) presents as a support tool for DAs. State planning agencies across Australia are currently positioning AI as a necessary tool to accelerate DAs, but this eager technology adoption is risky without critical urban research and theorisation. This project uses case studies, interviews and thought experimentation with key stakeholders across the urban planning and land development sectors to investigate critical legal, technical and ethical questions central to industry adoption and public acceptance of AI-informed DAs. The outcome is a new 'Trustworthy AIDA' conceptual framework, better preparing Australia's planning and development sector to tackle the challenge of future rapid urban growth. Translation and promotion pathways include industry associations and a series of inter/national academic and public forums. Dissemination is supported by local and international advisory panels.							
DP250101806 Morello, Prof Andrea	**Testing the limits of quantum and gravity through a spin-mechanical device** This Project aims to build a device to answer one of the most profound questions in modern science: whether gravity causes quantum mechanics to fail at the large scale. We will quantum-mechanically couple a single nuclear spin - a prime candidate for quantum computer hardware - with the motion of a mechanical oscillator - a massive body, subjected to gravity. This experiment will inform the design of heavier spin-mechanical devices, approaching the mass where gravity may induce "quantum collapse". Early prototypes will inform the design of sensors for navigation in GPS-denied environments. A full-scale device will unveil new limits to the scale at which quantum mechanics applies, with repercussions across all quantum technologies.	126,350.50	246,127.00	236,280.00	116,503.50	0.00	0.00	725,261.00
	National Interest Test Statement Quantum mechanics and gravity underpin industries with multi-billion-dollar values (quantum computing, communications and sensing; space and satellites) and national security implications (cryptography, navigation and positioning). Despite their success, these two physical theories are fundamentally incompatible. They are expected to clash for objects near the Planck mass (20 micrograms). No experiment has ever jointly tested quantum and gravity at that scale, because massive objects lose their quantumness as they get heavier, while gravity forces vanish as they get lighter. This Project will take on this challenge, by combining an unquestionably quantum object (an atomic nucleus) with a massive one (a mechanical oscillator). The experiments will unveil how the behaviour of the nucleus is affected by the motion of the oscillator, and inform the design of a scaled-up device where the gravity pull on the oscillator may "collapse" the quantum dynamics of the nucleus. Such experiment would constitute a historic landmark in humanity's understanding of the physical world. Short-term, the Project will develop powerful methods to detect mechanical motion, with applications in detecting minuscule forces. Long-term, it will inform efficient ways to resolve one of the biggest questions left open in modern science. All along, it will keep Australia at the forefront of quantum and gravity research, two fields where it operates at the international state of the art.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250101822 Bennett, Prof Jill	**Harnessing Artificial Intelligence to Reduce Loneliness** This project aims to develop Artificially Intelligent [AI] companions that are able to meaningfully engage with experiences of loneliness. Its principal innovation will be the prototyping and evaluation of digitally embodied AI companions that can respond dynamically to changing user-states (eg. emotions or moods) as an attentive human companion might. This step change in the effectiveness of AI companions is the key to addressing the socio-emotional states associated with loneliness. The project will thereby provide both the psychosocial and technical knowledge-base to enable Australia to harness AI to reduce the social and economic burden of loneliness.	163,374.00	328,065.50	204,167.00	39,475.50	0.00	0.00	735,082.00
	National Interest Test Statement This project develops world-leading, digitally embodied, Artificially Intelligent [AI] companions with the goal of reducing loneliness -- a social problem that costs Australia $2.7B p/a and contributes to lost productivity, poor health and early mortality. The project focuses principally on older people living alone or in aged-care, working closely with them to evolve AI companions, suited to their needs and preferences. Taking account of the social and emotional complexities of loneliness, the project will make significant technical advances, developing an AI module that overcomes many of the limitations of currently available AI conversational agents/chatbots. It will develop skilled AI companions capable of attuning to feelings/emotions and of supporting people (24/7) to address the challenges of loneliness within the context of longer-term plans and personal goals. These advanced AI companions will have extensive application across the aged-care sector; for (over 1M) older Australians living alone; and for other demographics. The capabilities we will develop will open-up further potential applications in areas such as education, justice, health and social services. Rapid commercialisation/licensing to industry partners will ensure that Australia leads the world in capitalising on the social and economic benefits of developing well targeted, responsible AI solutions to complex social challenges such as loneliness.							
DP250101852 Frankcombe, A/Prof Terry J	**Low-dimensional low-energy ferroelectricity for future technologies** This project aims to pioneer a novel approach in designing and developing a new generation of non-traditional low dimensional ferroelectric (FE) materials for low-energy-consumption applications in emerging technologies. It anticipates breakthroughs in FE materials and advancing defect chemistry. Outcomes include a groundbreaking materials design strategy for non-traditional materials and bridging existing gaps in materials science that constrain technological development. Potential implications include the development of fast computer technology and applications in other emerging fields, aligning with Australian priorities in Advanced Manufacturing, National Security, and Quantum Technology.	128,956.00	245,412.00	235,412.00	118,956.00	0.00	0.00	728,736.00
	National Interest Test Statement The energy consumption of emergent data-centric technologies (e.g. AI) is high and growing exponentially, threatening an energy supply crisis because the materials currently used in computing devices do not function with high energy efficiency. This project will explore a new generation of materials and intelligent devices that can provide a fundamentally technologically innovative solution to deliver energy-efficient technologies. The pursuit of such ground-breaking discoveries in functional materials aligns with the national interest in Advanced Manufacturing, which is set out as a priority by the Australian Government in its National Science and Research Priorities. Through licensing of new IP to industrial electronic technology developers, the project will drive Australian advanced technology and unlock potential for new and developing devices and applications across many sectors. This will enable a Productive & Innovative Economy by harnessing emerging technologies and creating future industries. The research outcomes will directly benefit Australia’s industry in the fields of AI, internet of things, ultra-speed information and communication technology, high-speed computing, and quantum technology, improving Australia’s innovative economy and improving the quality of life of Australians.							
DP250101866 Roces, Prof Mina	**Decolonising the History of Childhood(s), 1946-2023** This project aims to partially resolve the problem of Eurocentric bias in histories of childhood by proposing a new construction of childhood through a history of Philippine childhoods. It will allow concepts of childhood from Southeast Asia to be recognised alongside the Western norm, and demonstrate how children from non-European contexts can be empowered by criticizing indigenous constructions. Using archival sources, interviews, and ethnography, it will contribute to understanding the diversity of childhoods in Australia’s multicultural	35,409.00	66,775.00	58,468.00	27,102.00	0.00	0.00	187,754.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	society where multiple views of childhood exist, compelling international scholarship to move beyond the Euro-Atlantic context that has dominated the field, and hindered it from becoming truly global. **National Interest Test Statement** Australia is a multicultural society where multiple views of childhood including those from non-European contexts, exist side by side. Yet, the United Nations' Convention of the Rights of a Child of which Australia is a signatory, is based on Eurocentric conceptions of childhood which are imposed uncritically on the rest of the world. Southeast Asian countries find these at odds with local culture, inhibiting them from helping marginalised children. Focusing on advocacy on behalf of disadvantaged childhoods in the Philippines, this project breaks away from Western-dominated views producing the first history of childhoods and the family from the Southeast Asian region. Benefits to Australia include an increased understanding of the childhoods of its non-European migrant populations, and new insights on methods for empowering children. By analysing strategies used to empower children in poverty, malnourished children, children abandoned by fathers and migrant children, it has the potential to influence policies including Australian development assistance. Understanding non-European perspectives on childhood also enables the Australian government to think differently about immigrant children and policy provisions for them. Through a published book, journal articles, museum exhibits, and online seminars with advocates and scholars in Australia and overseas, it hopes to contribute towards a truly global discussion of childhoods.							
DP250101962 Grosjean, Prof Pauline A	**Masculinity Norms: Economic, Health, and Political Impacts Across the World** This project investigates the role of masculinity norms in explaining persistent gender gaps. Its contribution will be threefold: (i) document cross-cultural patterns of masculinity norms based on the first large scale, nationally representative survey of masculinity norms across 40 countries; (ii) understand the influence of masculinity on gender gaps in economics, health, and politics; and (iii) develop a survey experiment to identify the causal impact of masculinity norms on economic, health, and political decision-making. This research aims at improving fundamental knowledge about how cultural norms shape economic and political outcomes and anticipates delivering practical policy recommendations for more inclusive economic growth. **National Interest Test Statement** In Australia, substantial gender gaps persist in economic outcomes and wellbeing. Gender wage gaps have stagnated since the 1990s, men commit suicide twice as much as women, and gender-based violence remains tragically high, with one in three women a victim of physical or sexual violence, a phenomenon labeled a “national crisis” by PM Albanese in May 2024. Australia and other advanced economies are increasingly recognizing the role of masculinity norms as drivers of these gaps. The National Men’s Health Strategy for 2020-30 acknowledges the intersection between masculinities and public health. In May 2024, Victoria’s state parliament created a Secretary for Men’s Behaviour Change, a new role aimed at reducing violence against women. However, evidence on the role of masculinity norms is currently based on small-scale and localized studies with limited external validity. This project will expand the scope of existing research by collecting the first large-scale, nationally representative, cross cultural data on masculinity norms and understand their relationship to key economic, health, and political outcomes. Our findings will inform policy efforts to benefit men's and boys' well-being, reduce gender inequality, and, ultimately, reduce gender-based violence. We will set up international outreach and dissemination programs by cooperating with international organisations – the World Bank, EBRD, and the OECD-- and national government agencies, such as the Productivity Commission.	98,826.50	218,355.50	211,045.50	91,516.50	0.00	0.00	619,744.00
DP250102044 Nolan, Prof Justine	**Remedies for Victims of Modern Slavery in Indo-Pacific Fisheries** Modern slavery is widespread in the capture stage of fishing in the Indo-Pacific, but remedy is rare. This project aims to identify existing practical and legal obstacles to remedy, and propose solutions under Australian, regional and international laws. In doing so, the research will advance business and human rights scholarship, as well as the developing field of human rights at sea. Extensive stakeholder engagement will produce realistic mechanisms to deliver more accountability and better remedies for this significant and growing problem. Reducing modern slavery in supply chains is an Australian strategic priority and benefits include providing targeted input into the post-2025 Australian National Action Plan to Combat Modern Slavery. **National Interest Test Statement**	66,092.50	199,823.00	247,374.50	171,443.50	57,799.50	0.00	742,533.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Addressing modern slavery in the supply chains of Australian companies is a national strategic priority. The global seafood supply chain, including fishing in Australian waters and imports into Australia, is tainted by the abuse of fishers and their lack of access to remedy. It is especially apparent that the Indo-Pacific fishing industry has been built on the back of “seafood slaves”. While awareness of modern slavery in Australia has increased in the last five years among business, advocates and consumers, the provision of remedy to fishers trapped on vessels remains a critical gap. This project will examine the lack of accountability in public and private governance and propose effective remedies under national, regional and international laws for fishers caught in modern slavery. Our research will support Australian business by providing a toolkit aimed at preventing and remedying modern slavery at sea. Through engagement with Australian government officials, publications and public events, the project provides (1) critical knowledge to policymakers to support Australia in showing leadership in regional initiatives responding to this problem, and (2) will contribute to the development of a national framework to combat illegal fishing practices, which should include consideration of the people who catch the fish supplied to Australia.							
DP250102063 Bashford, Prof Alison C	**Race Science and the Human Hand: Dermatoglyphics in the Twentieth Century** This project aims to deepen our understanding of the history of physical anthropology, comparative anatomy and population genetics over the twentieth century. It will do so through analysing ‘dermatoglyphics’, the study of ridges, lines, and shape of the human (and other primate) hand. Still occasionally pursued to study human variation, as well as medical diagnostics, the project will be the first historical study of this little-understood aspect of ‘race science’, and of its legacy, including its Australian applications. This research should improve our capacity to assess the ethical dimensions of current human, medical and life sciences.	45,000.00	100,000.00	100,000.00	60,000.00	15,000.00	0.00	320,000.00
	National Interest Test Statement By advancing knowledge of genetic studies in the past, this project may improve our capacity to assess current human, medical and life sciences in Australia, including their ethical dimensions. Its historical findings may assist medical, health and education sectors, seeking to address legacies of eugenics, in formal or informal inquiries. Our research returns knowledge to communities subject to 'dermatoglyphic' research throughout the twentieth century, enabling historical understanding and possible policy improvement. It advances our understanding of Down syndrome research, and results will be made available to Down Syndrome Australia and similar advocacy groups internationally. Indigenous communities may acquire new genealogical information, research subject to AIATSIS protocols. This project will increase research capacity in Australian historical studies, by providing opportunity for doctoral and postdoctoral positions, and by connecting early career researchers to a wide international sector in the history of science and medicine.							
DP250102415 Shen, A/Prof Yang	**Enhancing Retirement Outcomes: The Role of Liquidity in Decumulation** This project demystifies the role of liquidity in the retirement phase, a less understood area but a main driver of suboptimal decumulation decisions undermining dignified retirement. Utilising advanced actuarial models and quantitative finance methods, the project assesses drawdown strategies which involve various assets and diverse retirees in a holistic framework integrating public and private sectors' participations. The outcomes include optimal decumulation strategies to enhance the quality of life in retirement and building blocks to design customised retirement income products. Additionally, the project brings scientific foundations to validate potential policy changes for governments to improve pension systems and social welfare.	41,303.00	151,721.50	225,159.00	114,740.50	0.00	0.00	532,924.00
	National Interest Test Statement Decumulation of retirement savings is challenging to navigate. Without informed strategies, Australian retirees often opt for highly liquid account-based pensions at regulated minimum drawdown rates, exposing themselves to inadequate income, longevity and investment risks which undermine a dignified retirement. To address liquidity challenges, this project devises effective drawdown strategies by disentangling the multi-faceted and evolving needs for individuals as they age. It quantifies the potential implications of alternative phased retirement income solutions and systems on decumulation decisions and their capability of mitigating numerous risks in retirement. The project addresses key policy areas of national interest as highlighted in the 2021 Retirement Income Covenant: “increasing the availability of better retirement income products that provide higher incomes and flexibility while also efficiently managing the risks faced by retirees”. Research findings will potentially benefit the entire Australian retirement landscape including regulators, the government, 4.2 million retirees, many more pre-retirees and the superannuation system with combined assets under management of $3.7 trillion. It directly supports The Treasury’s 2023 Discussion Paper on the Retirement Phase of Superannuation, which recommends solutions with longevity protection, forward-planned asset allocation considering retirement phase and income framework enabling collaborations among stakeholders.							
	Evolution of the epigenetic regulation in the female immune system							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250102459 Skvortsova, Dr Ksenia	This project aims to address the epigenetic underpinnings behind the fundamental problem of “sex disparities in immunity”. Utilising single cell long read sequencing techniques, this study expects to generate new knowledge of sex-specific gene regulation of the immune system in eight mammalian species spanning 180 million years of evolution. Expected outcomes include generation of the single cell multi-omics atlas and unravelling the mechanism and function of the female-specific epigenome dynamics in immune cells development. This should provide significant benefits to the areas of environmental change, food and health, through insights into native fauna and cattle immunity as well as sex disparities in vaccination and autoimmunity.	96,000.00	153,000.00	127,000.00	70,000.00	0.00	0.00	446,000.00
	National Interest Test Statement Across animal species, females generally develop a stronger immune response, which is advantageous in fighting infections but increases their vulnerability to inflammatory and autoimmune disorders. Understanding sex differences in immune response is crucial across several sectors, including wildlife conservation, agriculture, and vaccine and therapy development. However, the genomic basis for sex disparities remains underexplored due to male bias and the common exclusion of sex chromosomes in animal studies. Using cutting-edge technologies, this project aims to bridge this gap by generating multi-species sex-specific gene regulatory atlases of immune cell development. This research will enhance knowledge of the role of sex chromosomes in immune system function in diverse animals, from Australian marsupials and dairy cattle to humans. Research on marsupial immune system could aid conservation efforts by integrating identified immune gene markers into breeding programs to maintain genetic diversity and exclude vulnerable individuals. Through the collaboration with Agriculture Australia this project will incorporate sex chromosome-linked gene markers into dairy cattle selection programs, potentially reducing inflammatory issues like mastitis, which costs the industry over AUD 400 million annually. This partnership aims to extend the research's impact beyond academia, maximising its practical application.							
DP250102489 Wu, Dr Liao	**Accurate and fast 3D stiffness mapping via vision-guided robotic probing** This project aims to develop novel methods to generate 3D stiffness maps of deformable surfaces within confined spaces, facilitating remote estimation of mechanical properties of delicate objects with limited accessibility. This project expects to achieve high accuracy and efficiency in this challenge by seamlessly integrating computer vision, machine learning, and robotics. Expected outcomes include new frameworks and algorithms for precise 3D reconstruction using visual and tactile data, accurate single-point stiffness estimation, and efficient sampling strategies for stiffness mapping of large surfaces. This should provide significant benefits in enabling remote haptic evaluation in critical sectors such as healthcare and manufacturing.	75,645.50	154,481.00	159,402.00	80,566.50	0.00	0.00	470,095.00
	National Interest Test Statement Mapping the stiffness of deformable surfaces is crucial in both industrial and medical applications. In industrial contexts, quality inspectors use haptic assessments to detect signs of aging in rubber products. Similarly, in medical settings, surgeons rely on analysing surface stiffness distributions to identify cancerous margins during tumour dissection. This project aims to explore optimal strategies for integrating computer vision, machine learning, and robotics to address current research gaps in 3D stiffness mapping of deformable surfaces within confined spaces. Our approaches will enhance the accuracy and efficiency of existing technologies, facilitating the remote estimation of mechanical properties of delicate objects with limited accessibility. By addressing a critical need in industrial and medical robotics, this project has the potential to deliver tangible economic benefits to these sectors, which are projected to reach market values of USD 165.35 billion and USD 31.5 billion by 2028, respectively. Moreover, the research carries significant potential benefits for the Australian healthcare system. With the future potential to improve the precision of medical diagnoses and reduce the risk of relapse through more accurate identification of cancer margins, this study can make a substantial contribution to public health. Media engagements and public events will ensure widespread dissemination, enhance public understanding, and generate commercial interest.							
DP250102628 Kemp, Prof Richard I	**Inside the jury: A novel experimental technique to study jury deliberation** Despite decades of psychology research, we know almost nothing about what happens inside the jury room. Jury decision making is an inherently collaborative process in which groups discuss the evidence while trying to achieve a verdict. However most jury research has ignored the deliberation process, only studying the decisions of individual participants. This failure to adequately model deliberation has profound implications for justice. This project will use a novel	100,157.00	192,287.00	220,648.00	128,518.00	0.00	0.00	641,610.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	method to allow experimental investigation of aspects of the deliberation process to address important questions such as whether juries are self-correcting and whether they can follow judicial instructions. Results will inform policy and legal procedure around the world. **National Interest Test Statement** Current psychological studies inadequately address jury deliberation dynamics. This project establishes a new paradigm for future jury deliberation studies, for framing effective judicial directions and facilitating juries' capacity to self-correct error. Currently the law assumes, without foundation, that jurors follow judges' directions and that jury deliberations correct error and misunderstanding. Yet cases reveal jurors fail to follow judicial directions to avoid accessing error-prone social media or engage in other 'research'. This project's novel experimental psychology design provides for the first time robust testing of critical assumptions underpinning jury deliberations. Its evidence-based knowledge will inform key legal processes and policies promoting juries' application of fair trial principles, including making judicial guidance effective and determining the efficacy of judges' directions in other contexts. This improved understanding of the psychology of jury deliberation will ensure trial by jury, the gold standard of adjudication for people charged with the most serious of crimes, is enhanced and modernised, and reducing flawed jury verdicts will lead to fewer aborted trials, unnecessary appeals, quashed convictions, and fewer defendants and crime victims enduring retrials. It will minimise incalculable, unnecessary trauma and costly wasted court resources creating a potential impact on jury trial policies of national significance.							
DP250102643 Klein, Prof Natalie S	**Fixing Gaps in Ocean Governance: International Law Duties of Persons at Sea** This project focuses on international law duties held by non-state actors to protect people at sea. From seafarers during the COVID pandemic to boat migrants to naval officers, we know each individual has rights at sea. But responsibility for protecting those rights is currently shifting, with more international law obligations being imposed on shipping companies, humanitarian workers and military commanders. International law scholars and practitioners, government lawyers and advisors all need to know who owes what duties to whom and how those duties can be enforced. Answering these questions is fundamental for good ocean governance and will inform international law initiatives as well as Australia's 2022 Civil Maritime Security Strategy. **National Interest Test Statement** On any given day there are 30 million people at sea. We need to know not just what international laws provide protection, but who has international law duties to prevent harm or to assist these people at sea. International law typically assumes the state will provide protection. But recent events indicate that non-state actors, such as shipping companies and humanitarian workers, also owe duties to protect people at sea. These duties were evident when passengers and crew were stranded on cruise ships during the pandemic and when volunteers have sought to deliver aid to Gaza. Duties may arise under different bodies of international law, such as the law of the sea, international human rights law and international labour law. This project will identify what duties international law imposes on non-state actors, how those duties operate in practice and what mechanisms are available to enforce those duties. This research will close a growing gap in ocean governance and contribute to Australia's management of ocean activities and the defence of its maritime interests. The findings will support Australia to meet its own legal obligations and to enforce obligations owed by other actors. Through diverse publications, presentations and community engagement, this research will also assist Australian lawyers, advocates and government officials who are seeking to ensure that any Australians who travel, fish or work at sea receive the rights to which they are entitled.	92,666.50	196,508.00	227,157.00	141,124.50	17,809.00	0.00	675,265.00
DP250103019 Montet, Dr Benjamin T	**Detecting A New Population of Circumbinary Planets via Apsidal Precession** This project aims to use a novel detection strategy to identify and characterise potentially 100 or more circumbinary planets, or planets which orbit two stars. The significance of this project is that it will enable us to understand the wide variety of environments in which small planets do or do not form, improving our understanding of the possible locations life may exist in the galaxy. Expected outcomes include a detailed understanding of how planets form in different environments. Benefits include a significant advance in the field of circumbinary planets under Australia's leadership, setting the stage for continued growth in this field with upcoming international facilities in which Australia is a partner. **National Interest Test Statement**	59,075.00	154,630.00	195,677.50	153,934.00	53,811.50	0.00	617,128.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	This project aims to answer long-standing questions about how planets form around binary star systems, like the planet Tatooine in Star Wars. Different models of planet formation make different predictions about whether these types of planets form more or less easily when there are two stars in the system compared to when there is only one star. There are not enough detected planets orbiting binary stars to test these theories. We have developed a new method to identify these "circumbinary" planets, which we will be able to use to identify more than 100 planets. This effort will benefit Australia, building its research capacity in astronomy and placing it at the forefront of this burgeoning field. It will also enable future Australian leadership of the next generation of telescopes that will provide data to discover even more of these planets in the future. The team working on this project will work closely with international partners in North America and Europe, enabling the researchers funded through this project to highlight Australia's commitment to astrophysics and data-driven discovery on the world's stage. The technical data analysis and statistical methods developed in this work will be of broad interest and use to researchers in machine learning and related fields, strengthening links with industry partners across Australia.							
DP250103029 Tang, A/Prof Shiyang	**Revolutionising single-nucleotide variation detection via digital CRISPR** Single-nucleotide variations (SNVs), though they involve minor DNA changes where one nucleotide is replaced with another, contribute significantly to genetic differences and biological functions. Precisely detecting SNVs is crucial for advancing biological research and industry. By synergising CRISPR/Cas biosensing and microfluidic technologies, this project will develop a world-first lab-in-the-pocket platform to enable rapid, low-cost, highly sensitive, and multiplex detection of SNVs, surpassing the capabilities of state-of-the-art technologies. This platform will greatly advance molecular biology and genetics research, offering vital insights into genetic variation, biological pathways, and ecological responses to environmental factors.	107,669.00	223,405.00	234,421.50	118,685.50	0.00	0.00	684,181.00
	National Interest Test Statement The project is designed to develop a state-of-the-art biosensing platform for the field-deployable monitoring of DNA mutations. This groundbreaking technology aims to profoundly enhance our understanding of molecular biology and genetics, propelling forward technological advancements across a diverse range of biological applications and industries. The platform will facilitate rapid, efficient detection of gene mutations—delivering results within 10 minutes at a cost of less than $5 per test, setting a new benchmark for performance exceeding current technologies. This breakthrough has the potential to revolutionise industries such as food production, agriculture, and environmental management by enabling early detection of invasive species and facilitating the monitoring of climate change and pollution impacts on Australian ecosystems. The project is set to deliver significant commercial benefits for Australia through several avenues: (i) licensing the technology to biotechnological industrial partners, (ii) offering expert consultation services to help validate, scale, and de-risk the technology, and (iii) encouraging the growth of potential startups. This initiative is poised to advance gene-based detection technologies, reinforcing Australia's leadership in high-value scientific instrument manufacturing. With the global biosensing market expected to exceed USD$49 billion by 2030, this project is a strategic move to boost Australia's advanced manufacturing sector.							
DP250103039 Letnic, Prof Mike I	**Brown food webs are critical for sustaining arid ecosystems** This project investigates how brown food webs, involving dead vegetation, termites, and their predators, function as energy and nutrient channels in arid ecosystems. Experiments will test the hypothesis that brown food webs are critical for ecosystem functioning during dry periods, focusing on trophic feedback loops connecting pulses of primary productivity to brown food webs. The findings will be significant by demonstrating the linkages between green and brown food webs and showing how these two inter-linked but distinct food webs drive energy and nutrient transfer during wet and dry periods. This project will benefit biodiversity conservation and help managers prepare for droughts by revealing how brown-food webs sustain arid ecosystems.	134,103.00	235,015.50	203,239.00	177,326.50	75,000.00	0.00	824,684.00
	National Interest Test Statement There is widespread concern that there has been significant loss of biodiversity in the 70% of Australia that is defined as semi-arid or arid and that over-grazing during droughts has been one of the key drivers of this environmental change. However, there is a poor understanding of the mechanisms via which over-grazing has contributed to biodiversity loss. The goal of this proposal is to understand how brown food webs involving the transfer of energy and nutrients from senescent vegetation to arthropod detritivores such as termites and their predators play an essential role in the functioning of arid ecosystems. The results will provide a whole of ecosystem understanding of how brown food webs sustain the function and biodiversity of arid ecosystems and how grazing can disrupt brown food webs and affect biodiversity. The findings will benefit managers of conservation and pastoral lands throughout semi-arid and arid Australia who require better understanding of how ecosystems work to inform their management practices and prepare for inevitable droughts.							
DP250103133	**The Evolutionary Landscape of RNA Modification in Mammals**	130,211.00	246,955.00	219,521.50	102,777.50	0.00	0.00	699,465.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Weatheritt, A/Prof Robert J	This proposal aims to unveil ancestral and species-specific programs of RNA regulation driving mammalian evolution. By combining our latest artificial intelligence (AI) algorithms with direct RNA long-read sequencing, this project expects to generate new knowledge on the role of RNA modifications in evolution. Anticipated outcomes include an atlas of RNA modifications across species and tissues, and new computational algorithms in RNA biology. This project should provide multidisciplinary training opportunities, strengthen international collaborations in the study of RNA, and catalyse innovations in research and industry, helping to build Australia's capability in the exciting field of RNA biology.							
	National Interest Test Statement							
	RNA is essential for all biological processes across all kingdoms of life. It is also a versatile and powerful biotechnological tool. However, our lack of understanding of the native state of RNA is a major hurdle in understanding the biological role of RNA and limits our ability to develop biotechnological tools. This project will pioneer the use of artificial intelligence (AI) and innovative direct long-read RNA sequencing, to create an multiple-species atlas of the native RNA sequences including major chemical modifications variants. Outcomes will reveal mammalian-specific RNA innovations and extend our understanding of the roles of dynamic RNA control in complex organ development. The new knowledge gained and the innovative AI algorithms created by this project will advance RNA bioengineering approaches such as vaccines. The project aligns with the Science and Research Priorities of the Australian Government by generating innovative AI algorithms and knowledge to accelerate, and make cost-effective, the design of RNA. Future applications may include improvements to RNA therapeutics and vaccines, which for human health will improve the quality of life of Australians and reduce the economic burden of the health system, and in the agriculture sectors help reduce production losses from disease that costs Australian farmers ~$1 billion a year. Integration of our results into Australian RNA Production Consortium will maximise translation and commercialisation of the research.							
DP250103176 Moseby, A/Prof Katherine	**Futureproofing toxins for the protection of threatened species** Australia and New Zealand use millions of 1080 poison baits each year to control cats and foxes for the protection of threatened wildlife and agriculture. However, the future of 1080 baiting is uncertain due to 1) unknown evolving resistance by cats and foxes 2) unethical need to inject native animals with poison to understand non-target impacts 3) growing public concern over 1080 humaneness. This trans-Tasman collaboration will test for evolving 1080 resistance in cats and foxes, develop a non-invasive genetic test for sensitivity, and search for replacement humane natural toxins. Results will safeguard threatened species and agriculture by ensuring vertebrate pests can be effectively and humanely controlled with minimal non-target impact.	150,138.50	301,242.00	296,087.00	144,983.50	0.00	0.00	892,451.00
	National Interest Test Statement							
	Introduced pests such as rabbit, cats and foxes threaten many wildlife species with extinction and cost the Australian agricultural industry billions of dollars in damage annually. Australia distributes millions of 1080 poison baits each year to control these pests but there are growing concerns over 1) impacts to non-target animals 2) the likelihood that pest animals are becoming resistant to the toxin and 3) humaneness. 1080 contains fluoroacetate, a natural plant toxin found in some native Australian plants. Native wildlife vary considerably in their tolerance to 1080 depending on evolutionary exposure but introduced pest species are highly sensitive as they did not evolve in Australia. Our project will 1) develop the first genetic test for 1080 tolerance, eliminating the need for lethal and inhumane lab trials to determine the tolerance of native species to 1080. This will ensure baiting is conducted in areas where there will be minimal impact on native wildlife 2) determine if pest species are becoming resistant to 1080 poison in areas where it has been heavily used over decades. If resistance is occurring then baiting practices may need to be changed to ensure pests can be controlled effectively 3) search for alternative, more humane natural plant toxins to control cats and foxes. Our results will ensure plant toxins can be used safely and humanely by farmers and land managers to control pests into the future for the protection of livestock and wildlife.							
DP250103666 Quinlan, Prof Kate G	**Epigenetic readers guide transcription factors to their target genes** This project aims to assess how readers of epigenetic marks guide regulatory proteins (transcription factors) to their target genes by utilising advances in our understanding of the epigenetic code, the proteins that read it, and our ability to precisely manipulate it. This project expects to generate knowledge to illuminate fundamental mechanisms of gene regulation that orchestrate how cells differentiate into different cell types and how cell identity is maintained. Expected	106,327.00	219,388.00	233,156.00	120,095.00	0.00	0.00	678,966.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	outcomes of this project include improved techniques for manipulating gene expression. This should provide significant benefits, such as ways to better control the output of chosen genes via targeting engineered transcription factors directly at them. **National Interest Test Statement** The regulation of gene expression is a fundamental biological process. Gene expression is tightly controlled by transcription factors and modulating gene expression is important in bioproduction and in human biology. However, we do not understand how transcription factors find their target genes in cells and how they interpret not only the DNA sequence but also the epigenetic landscape. Our preliminary data suggests that transcription factors bind epigenetic readers to use a combination of both the underlying DNA sequence and the epigenetic landscape to identify targets in cells. Using a combination of innovative molecular biology, cell biology and genomics approaches, in this project we seek to develop a better understanding of how transcription factors find their target genes in DNA. This will change our understanding of transcription factor biology and represents a type of braille by which transcription factors scrutinise chromosomes to find target genes. The collaborative efforts of our expert international team will enhance Australia's research capacity in the area of biological sciences. The outcomes of this project have important implications for efforts to artificially control gene expression in the laboratory and benefits outside academia for bioproduction, agricultural plants and animals.							
DP250103927 Hu, Prof Jiankun	**Post-quantum Biometrics-based Authentication Key Exchange Protocol** The Australian Competition and Consumer Commission reported over $10m in identity theft loss in 2022. Bio-cryptography is emerging as a promising theoretical framework combining the advantages of cryptography and biometrics. Recently, bio-cryptography development has largely stalled due to the challenge of integrating biometrics authentication capability into the cryptography key generation/distribution. This project aims to develop a unified theoretical framework, removing the technical obstacles hindering the bio-cryptography's progress. A new knowledge base will be established. The project deliverables can address the issue of identity theft effectively and protect Australia from cyberattacks. **National Interest Test Statement** Identity crime is an ongoing issue that greatly damages Australia in many aspects: (1) Financial loss in the billions of dollars annually. (2) National security: A recent hacking attack on the Australian Parliament Servers is closely related to the vulnerable password-based authentication. (3) Social life: Most recently, hacking has occurred in Australia's medical system where hackers stole sensitive medical data and demanded a ransom from a company that managed millions of digital scripts a year. One underlying security issue is that the password cannot authenticate genuine users. While biometrics can authenticate genuine users, biometrics' privacy needs protection. Furthermore, existing biometrics authentication provides little support for the encryption function that is widely used in our daily life for cyber security. Bio-cryptography is an emerging technology that can combine the powers of biometrics and cryptography. However, the emerging quantum computing technology is expected to break completely many commonly used cryptography-based security systems. This project will develop a post-quantum bio-cryptosystem to address this technology gap. The outcomes of this project will provide a powerful tool to mitigate the identity crimes in Australia that have cost billions of dollars financial loss annually, threatened national security, and social suffering to Australians' privacy breaches. The project outcomes will be disseminated via a project website, and social media.	81,106.00	164,712.00	169,712.00	86,106.00	0.00	0.00	501,636.00
DP250103980 Gu, A/Prof Zi (Sophia)	**Engineering artificial organelles for on-demand bioenergy production** The project aims to create a generalisable and programmable artificial organelle to provide on-demand externally controlled production of bioenergy by engineering synthetic hybridised organelles mimicking chloroplasts and mitochondria. It will be achieved by compartmentalising tailor-made carbon nanozymes in a membrane structure to confine catalytic cascade reactions of photo-oxidative phosphorylation in a nanoreactor. The outcome will provide in-depth understandings of structure-activity relationships of carbon nanoparticles and intelligent artificial organelles and generate patentable methodologies and technologies. This will pave the way for vast applications of controllable biomimetic systems in bioenergy production-related industries. **National Interest Test Statement** All plant and animal cells create natural 'bioenergy' within small cell structures called organelles. Researchers have recently managed to create artificial organelles that can produce a similar type of energy, but all present	95,144.50	190,239.00	190,239.00	95,144.50	0.00	0.00	570,767.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	challenges. One main type responds to an external stimulus we can control, but we cannot 'tune' its reaction to take it more efficiently. The other is tuneable, but does not respond to external stimuli, meaning we cannot control its energy production. This project seeks to develop a completely new type of artificial organelle – one that is both controllable and tuneable – to create on-demand bioenergy. The applications for such an organelle are extensive, ranging from waste treatment to veterinary medicine and nutraceutical supplements. Additionally, by creating a 'platform technology', the project would pave the way to develop new products and processes with even greater national benefits. To promote our research beyond academia, we will use both the UNSW Industry & Innovation office and UNSW Newsroom to promote our research outcomes to industry, commercial entities and the wider community. Through licensing of IP and established relationships with industry partners SoHi and Cartago Biotech, we will ensure that this new research can be adapted into a bioenergy production strategy and associated products to create commercial, social and environmental benefits for Australia.							
DP250103991 King, A/Prof Cecile	**Beyond virus sensing: Rig-like receptors in biomolecular condensates** The immune system has receptors to detect viruses that trigger an anti-viral response. The only known function of Rig-like receptors, such as Rig-I, is to detect RNA viruses. However, our studies reveal a unique role for Rig-I in the formation of biomolecular condensates. Biomolecular condensates, rich with proteins and RNA, are liquid droplets, not unlike oil droplets in water. Within the spatial confines of a cell, these droplets provide dynamic compartments that control important cellular processes. In this proposal, we define the novel role of Rig-I in the formation of biomolecular condensates and determine how this impacts cellular function.	180,000.00	368,500.00	367,000.00	178,500.00	0.00	0.00	1,094,000.00
	National Interest Test Statement This project aims to elucidate the long-term implications of cellular stress, generating new knowledge into subcellular organisation. Biomolecular condensates are subcellular compartments that form inside plant and animal cells as a response to environmental stress, which includes immune stimuli, pathogens, toxins, temperature changes and oxidative stress. We anticipate that the project's findings will provide a new approach with new targets for modulating cellular function in the face of environmental impacts. Potential outcomes from understanding the roles that biomolecular condensates play in cellular function, as well as the rules that govern their formation, include providing better options for Australia's response to the impacts of environmental change on biological systems. The new knowledge generated in this proposal has the potential to inform a range of sectors that are key to supporting Australia's economy including health, food and the environment. In addition, the outcomes may provide benefits to future application in Australia's growing biotechnology sector that is vital to the nation's well-being. By ensuring that the project uses state-of-the-art technology, provides public access to generated datasets, and the results are shared in public and Industry focused forums, the projects outcomes will reach beyond academia to maximise future adoption and translation.							
DP250104187 Phan, Prof Tri G	**Osteoclast recycling by asymmetric partitioning of damaged mitochondria** In vertebrate animals, osteoclasts constantly resorb & remodel bone during homeostasis in response mechanical and hormonal factors that signal via the chemical RANKL. Osteoclasts are giant multinucleated cells formed by the fusion of macrophages. But they also fission into osteomorphs during RANKL-stimulated bone resorption. Very little is known about this new cell and cellular process since it was discovered in 2021. This project aims to test the idea that accumulated metabolic stress during bone resorption triggers cell fission. It will generate new knowledge about the mechanism & biology underlying this new cell type. It will enhance interdisciplinary collaboration & build Australia's research capacity & thought leadership in the field.	150,000.00	275,000.00	250,000.00	250,000.00	125,000.00	0.00	1,050,000.00
	National Interest Test Statement The skeleton is a defining characteristic of all vertebrate animals and osteoclasts are a basic unit of the skeleton that is found in all fish, amphibians, reptiles, birds, and mammals. However, very little is known about osteoclasts and how they cope with the cellular stress of breaking down bone. Knowing this is critical because the ability to remodel bone is essential to ensure the growth and survival of all vertebrate animals. The proposed research will seek to bridge critical knowledge gaps about the life cycle of osteoclasts and how a new cell we discovered called osteomorphs are able to extend the lifespan of osteoclasts by 'regenerating' their mitochondria. The findings from this research will benefit multiple disciplines of cell biology, such as immunology, bone, stem cell and developmental biology. It will develop new technologies and resources for tracking the fate of these cells that can be used by other disciplines of biology. The project will build Australia's capacity in state-of-the-art R&D technologies including intravital imaging and single cell genomic capabilities and cement our position as international leaders in these fields.							
DP250104267	**Age dating the Milky Way halo using new data from NASA's Kepler mission**	92,644.50	187,779.50	192,757.50	97,622.50	0.00	0.00	570,804.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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Stello, Prof Dennis	The project will use a radically new approach to investigate how our Galaxy formed, by fusing two fields of contemporary astrophysics -- the study of stellar oscillations and 'Galactic Archaeology'. This will dramatically improve our understanding of the fundamental physics that governs the evolution of all stars. We will probe, for the first time, the interior structure of several thousands of the oldest stars in the Galaxy to reveal the intimate details of its formation from the oscillation frequency imprint of each star. The ambitious goal to go beyond classical astronomy, which examines only the surface of stars, will be possible through access to new extremely high-precision data from one of NASA's most successful space telescopes. **National Interest Test Statement** The fundamental question addressed in the project – how our Milky Way home came into existence – helps to inform our perception of ourselves in a cosmic context, from a cultural to a psychological level. Its significance is underlined by its top priority in the Australian Government's Decadal Plan for Astronomy. To achieve it, the project will create sophisticated AI and machine learning techniques for complex data analyses. This will provide world-class training in analytic and information processing skills that are directly transferable to solve complex data analysis problems in an increasingly wide range of areas such as technology development, finance, transport, and production analytics – all highly relevant for increased efficiency in industry and government, and key to building a stronger economy. Significant benefits of the project come through international linkage and access to world-class data, making it highly cost effective. Investment in the project will strengthen Australia's involvement in a ground-breaking NASA space mission and will build the nation's capacity to develop skills directly relevant to future space programs into the next decade. This will feed into the Government's commitment to support the Australian Space Agency, in recognition of its importance as a strategic long-term plan that supports the development and application of space technologies and grows industry within Australia. The results will be promoted through regular media interaction.							
DP250104633 Li, Prof Sean S	**Unlock the Potential of Gallium Oxides for Power Electronic Applications** Power electronics, a cutting-edge circuitry device, efficiently channels power from source to load, prioritising efficiency, compactness, and resilience. Ultrawide bandgap semiconductors stand as pioneers in this field, with Ga2O3 emerging as a game-changer to surpass the boundaries set by SiC and GaN. However, its low thermal conductivity presents a significant hurdle for its integration into power electronics. This project aims to develop breakthrough technology capable of fabricating atomically thin freestanding single crystal Ga2O3 membranes with precise thickness control on a 2-inch wafer scale. It seeks to tackle head-on the critical limitation posed by Ga2O3's low thermal conductivity with a high-throughput manufacturing methodology. **National Interest Test Statement** Power electronics, which rely on efficient semiconductor power switches, play a crucial role in energy conservation. Over 50% of globally generated electricity requires conversion through these devices, so even a small improvement in efficiency could lead to significant savings in primary energy. A new generation of power devices using Ga2O3 is set to transform the power electronics sector. This technology promises to greatly reduce the size, weight, cost, and energy consumption of power systems by increasing both power density and conversion efficiency at the device level. However, its limited thermal conductivity poses a significant challenge for widespread use in power electronics. This project aims to overcome the primary limitation of Ga2O3—its low thermal conductivity—by using a high-throughput manufacturing approach. The resulting ultrathin freestanding membrane is designed to enable innovative architectural designs, addressing the challenge of low thermal conductivity and expanding the potential applications of Ga2O3. Success in this endeavour would place Australia at the forefront of a technology poised for global market dominance, potentially evolving into a tens-billion-dollar industry.	99,213.00	201,916.50	208,894.50	106,191.00	0.00	0.00	616,215.00
DP250104816 Moss, Prof Jeremy	**Dealing with Climate Disaster** In Australia climate disasters could lead to over 500,000 homes becoming uninsurable by 2030, many in already disadvantaged areas. This raises significant social justice issues for Australia and worldwide. In this project we will evaluate how climate related disasters are likely to impact the well-being of the already disadvantaged and what to do about it. We will develop a new model of insurance provision and related disaster response that draws on robust ethical and actuarial research.	22,983.50	127,873.50	196,740.50	91,850.50	0.00	0.00	439,448.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	National Interest Test Statement							
	Our project tackles a critical issue facing Australians: the escalating unavailability and unaffordability of climate disaster insurance, particularly for vulnerable populations. With over 500,000 homes at risk of becoming uninsurable by 2030 and Northern NSW residents facing exorbitant premiums, the social impact is profound with potential to worsen the housing crisis. We will bridge a crucial research gap by integrating ethics with actuarial analyses, proposing a new framework to evaluate the justice of climate disaster insurance responses, especially for vulnerable communities. Our research offers significant benefits to Australians across multiple dimensions. Economically, it addresses the unsustainable costs of climate disasters, guiding policy for fair and effective insurance mechanisms. Socially, it ensures equitable access to protection, enhancing community resilience and well-being. Environmentally, by incentivizing risk reduction, it promotes sustainable development practices. Commercially, it fosters innovation in insurance models and risk management strategies.To maximize the impact of our research beyond academia, we will employ a multifaceted communication strategy. This includes scholarly publications, conferences, stakeholder workshops, and a dedicated website. By engaging policymakers, industry stakeholders, and the public, we aim to facilitate understanding, translation, and adoption of our research findings, ensuring tangible benefits for all Australians.							
DP250104934	**Enhancing Compiler Techniques for Dynamic-Shape Deep Learning Models**	73,913.00	150,317.00	155,295.50	78,891.50	0.00	0.00	458,417.00
Xue, Prof Jingling	This project will pioneer a compiler approach to optimise dynamic-shape deep earning workloads, crucial for the performance of large language models. It aims to establish a foundation for compiler optimisation and program analysis, equipping deep learning compilers with the ability to match the efficiency of manual implementations. Expected outcomes include a deployable compiler technology integrated within the LLVM compiler infrastructure and a robust open-source compiler framework. The project promises substantial improvements in inference efficiency across various deep learning applications, such as autonomous driving and computer vision, enhancing user experience and safety, and reducing computational costs.							
	National Interest Test Statement							
	Current deep-learning compilers fall short in handling the speed and efficiency required for dynamic-shape workloads, such as varying image resolutions and prompt lengths. This project introduces cutting-edge compiler technology to enhance the speed and efficiency of deep learning inferences, crucial for AI-driven applications from smartphones to autonomous vehicles. This research closes a critical gap by pioneering novel compiler techniques, enabling practical, real-time AI applications. The project promises substantial benefits for Australia, driving economic growth through AI innovation and fostering talent development through high-degree research and postdoctoral training. It also offers environmental benefits by reducing energy consumption in data centres and social improvements in healthcare, education, and public services by enhancing deep learning solutions, thus improving user experience and safety. Culturally, the project will enhance local digital content and innovation, reinforcing Australia's position as a leader in this field. The research outcomes will be integrated into the LLVM compiler infrastructure, extensively used in academic and commercial settings. This project will significantly strengthen Australia's AI sector over the long term through open-source contributions and industry collaborations. This strategic dissemination and application approach will maximise the impact of our findings, propelling significant advancements in AI applications.							
DP250104939	**Wave Propagation and Attenuation in Unsaturated Soils**	89,144.00	185,279.00	194,757.50	98,622.50	0.00	0.00	567,803.00
Khalili, Prof Nasser	Understanding shear and dilatational waves in unsaturated soils is critical for diverse engineering disciplines. While past research has focused on wave propagation in saturated or dry soils, studies on unsaturated soils are scarce, despite their common occurrence in real-world scenarios. This research aims to bridge this gap by investigating the fundamentals of wave propagation in unsaturated soils through a multidisciplinary approach encompassing soil dynamics, constitutive modeling, and experimental investigation. The expected outcome includes development of accurate correlations for characterisation of soil properties for a range of in situ conditions, offering immediate practical applications in engineering design and practice.							
	National Interest Test Statement							
	This research focuses on how waves move through unsaturated soils, which are soils that are not completely dry or fully saturated with water. While most past studies have concentrated on either wet or dry soils, unsaturated soils are the most common in real-life situations. Gaining a better understanding of these soils is crucial for various engineering fields. The research will explore the dynamics of wave propagation through natural soils at a fundamental level by carefully examining soil behaviour under controlled laboratory conditions as well as through computer simulations. This deeper understanding will lead to many practical improvements. For instance, it will help locate and extract natural resources more efficiently, and it will enhance subsurface mapping techniques, allowing the creation of more accurate maps of what lies beneath the ground. Additionally, the findings will improve non-destructive testing methods, enabling us to assess the safety and integrity of structures without causing any damage. Furthermore, this research will contribute to better seismic hazard investigations, helping us understand							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	and prepare for earthquakes more effectively. In summary, this study will significantly enhance practices involving the movement of waves through soils, resulting in safer and more efficient infrastructure. The benefits will extend across multiple industries, ultimately helping to protect people and enhance the prosperity of the nation.							
	The University of New South Wales	6,196,959.00	12,986,246.00	13,107,188.00	7,409,032.50	1,203,324.00	112,192.50	41,014,942.00
The University of Newcastle								
DP250100171 Karayanidis, Prof Frini	**Young at Heart: Vascular mechanisms supporting healthy cognitive ageing.** This project aims to investigate the vascular mechanisms that contribute to individual variability in cognitive ability in mid-late life. It uses novel measures of regional brain arterial integrity and conventional measures of systemic blood flow to experimentally characterise the vascular mechanisms by which lifestyle choices affect brain structure/function and cognitive ability in healthy older adults. The outcomes will inform integrative models of cognitive ageing and strengthen international, cross-disciplinary collaborations in cognitive ageing neuroscience. This knowledge may inform evidence-based lifestyle approaches to promote healthy and engaged living in mid-late life and reduce the social and economic impacts of cognitive ageing.	136,705.50	281,177.00	289,710.00	145,238.50	0.00	0.00	852,831.00
	National Interest Test Statement As the number of older Australians is expected to double over the next 40 years, we urgently need to understand why it is that some people remain cognitively healthy throughout their lifespan, whereas others show slow and progressive cognitive decline from mid-late life. This project will investigate how the brain's vascular system impacts a person's cognitive ageing trajectory, using novel brain imaging techniques that are only available in our lab in Australia. We aim to demonstrate experimentally that lifestyle activities known to improve cognitive functioning, act by improving the brain's vascular health. The outcomes will produce evidence for a direct mechanism linking variability in the brain's vascular system, brain structure and function, and cognitive ability in healthy older adults. This work may have significant economic, social and cultural benefits by supporting healthy and engaged ageing, prolonging social and economic participation, and reducing reliance on healthcare resources. It will also build the capacity of young Australian researchers in healthy ageing research. Implications for healthy ageing will be disseminated through the Hunter Medical Research Institute to national and international peak bodies, state and federal government bodies, industry and community to increase knowledge and support translation in program development.							
DP250100387 Threadgold, A/Prof Steven R	**Young People, Fintech Use and Future Financial Security** Young people's rapid uptake of financial technologies (fintech) impacts their present-day financial wellbeing and capacity to create financially secure futures. This project will be the first to explore how young people navigate and understand the new landscape of fintech platforms and products, and to uncover the hitherto hidden impacts of fintech sorting and classificatory processes. We will use innovative research methods to interrogate the relationship between everyday financial practices and algorithmic platforms, developing a youth-centred approach to understanding the interface between them. This new knowledge will inform ongoing regulatory efforts, support youth sector practice and increase public understanding of fintech platforms.	64,256.50	154,988.00	143,503.00	52,771.50	0.00	0.00	415,519.00
	National Interest Test Statement This project will create important new knowledge about how young people navigate and understand the unprecedented landscape of fintech platforms and products, and about how fintech platforms are designed to sort, profile, target, and exclude consumers. In so doing it will address a significant knowledge gap. It will benefit the Australian community by providing an evidence base to support current efforts to regulate new and emerging forms of fintech, which have been a focus of The Treasury's banking and finance consultations in recent years. Understanding and use of the findings of this project outside of academia will be maximised through the project's strategic research engagement and translation plan, which includes a public research engagement forum, a public-facing report (launched at the forum and disseminated to policy-makers), media articles, animated videos designed for social media dissemination, a publically accessible project website, and regular presentations to share findings with the youth sector. In addition to supporting regulatory efforts this project will increase public knowledge of and awareness about the functionality of fintech platforms. In so doing it will support young people to make critical decisions about the platforms that they engage with, and to better understand how their data may be used.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250101335 Hua, A/Prof Susan	**Investigating veterinary nanotechnology to treat sarcoptic mange in wombats** This project aims to develop improved antiparasitic formulations to treat wombats with sarcoptic mange. Sarcoptic mange is a major parasitic disease of Australian wildlife that has particularly devastated the wombat population. This project expects to generate new knowledge in the area of veterinary medicine and pharmacology using innovative pharmaceutical approaches. Expected outcomes of this project are improved antiparasitic formulations that can effectively treat sarcoptic mange infected wombats, without the need to capture or handle the animals. This should provide significant benefits for wildlife conservation and animal health at a national and global scale and may be adapted for the treatment of other infectious diseases. **National Interest Test Statement** This project addresses an urgent and serious animal welfare issue that is rapidly decimating our native wombat population. Sarcoptic mange, a parasitic infection caused by the Sarcoptes scabiei mite, is responsible for hundreds of wombat deaths every year and has led to declines in the wombat population of up to 94% across regions in Australia. Without effective treatment, infected wombats suffer a slow and painful death, usually within 2-3 months. Sarcoptic mange is treatable with antiparasitic drugs. However, current formulations of these drugs are not optimal – with a high failure rate resulting from poor topical drug penetration and absorption through the fur and thickened/crusted skin barriers. The ‘run off’ that occurs contaminates the environment and can potentially lead to mites (and other species) acquiring resistance to the antiparasitic drug. This project aims to develop improved antiparasitic formulations using innovative pharmaceutical approaches that can effectively treat sarcoptic mange infected wombats, without the need to handle or capture the animals. Outcomes will improve disease management for Australian native animals and reduce the threat of environmental contamination. Improved treatment provides significant benefits for wildlife conservation and animal welfare and may be adapted for the treatment of other infectious diseases.	105,000.00	210,000.00	220,000.00	115,000.00	0.00	0.00	650,000.00
DP250103453 Fallon, Dr Thomas	**Synthesis and Applications of Shape-Shifting Molecules** Shape-shifting molecules have no permanent structure and exist in constant metamorphosis. This unique class of molecule has the potential to unlock applications in drug discovery, materials, and molecular devices. This project will expand and simply access to these molecules through a synthetic building block approach. From there we will prototype a range of concepts and applications spanning shape-shifting dimeric drugs, peptides, liquid crystals, and molecular devices. Expected outcomes include a synthetic platform which will greatly simply the preparation of shape-shifters to accelerate discovery, as well as developing design principles for future advanced applications. **National Interest Test Statement** Organic molecules comprise most of the living and material world around us, and their many functions derive in part from their shape, which is usually fixed and unchanging. This project will explore a class of molecules that can dynamically change shape. These “shape-shifters” offer broad opportunities for new approaches in drug discovery, molecular probes, dynamic materials, and molecular devices. However, shape-shifters have been notoriously difficult to make in the laboratory, which has stalled research and development in this area for many decades. Recent breakthroughs from our team have finally begun to solve this problem. This project will advance the field by introducing easy and practical laboratory methods to make these molecules. From there we will explore a range of prototype applications including new concepts in drug discovery (shape-shifting antibiotics and peptide mimics), advances in liquid crystals, as well as demonstrating new concepts in molecular switches and sensors. This work will advance our knowledge of these molecules and how to manipulate their properties . While this area of research is still in its infancy, it has the potential for applications in medicine and high-tech manufacturing, to the benefit of Australia’s industries. Outcomes from this project will be communicated through academic journals and conferences to promote further research. Findings will also be shared with the wider community via traditional and social media releases.	85,344.50	179,150.50	188,598.50	94,792.50	0.00	0.00	547,886.00
DP250104903 Graham, Prof Brett A	**REFRAMING THE ASCENDING SPINAL SENSORY PATHWAY** This application studies a unique population of spinal cord nerve cells that carry sensory signals to the brain. This cell category has long been considered a passive relay, providing raw signals to the brain, which then assembles perception and sends descending signals back to the spinal cord support survival. In contrast, the cells that we have discovered give rise to an extensive	127,026.50	246,938.50	226,653.50	106,741.50	0.00	0.00	707,360.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	collateral branching system in the spinal cord, allowing them to distribute an early ascending survival signal. This application will define the connectivity and function of these unique nerve cells with benefits including bio-inspired applications in control theory, computing, engineering, and robotics; as well as livestock and endangered species management.							
	National Interest Test Statement							
	Efforts to understand brain function have become a global mission with billion-dollar initiatives established in North America, Europe and Asia. These investments acknowledge the potential for neuroscience research to deliver major benefits in many areas including health, innovation and quality of life; as well as bio-inspired applications for industry across control systems, computing, engineering, and robotics. The current research proposal seeks to capitalise on and contribute to the technical and theoretical advances flowing from international efforts by advancing our understanding of how the spinal cord uses sensory information to provide early damage/threat control signals not previously appreciated. The innovative approaches to be employed will offer a new perspective on the neural mechanisms underlying spinal sensory processing and how this level of processing precedes and interacts with descending signals from the brain. Communication of these research findings will support Australia's international standing and be of major benefit to neuroscientists studying how sensory information is processed by the central nervous system. The inclusion of early career researchers, graduate and undergraduate students in the project will also help to keep Australia at the forefront of neuroscience innovation, ensuring these future research leaders are trained in the leading-edge technologies needed to progress our understanding of brain function.							
	The University of Newcastle	518,333.00	1,072,254.00	1,068,465.00	514,544.00	0.00	0.00	3,173,596.00
The University of Sydney								
DP250100022 McArthur, Prof Clare	**Understanding odour information to influence mammalian herbivore decisions** This project aims to quantify how plant odour information, its quality and utility, affect herbivore foraging decisions. It also aims to apply this knowledge to test artificial odours designed to alter food choice and so improve plant growth and survival. Expected project outcomes are an understanding of when, why and how herbivores respond to olfactory information as well as the quantitative characterisation of odour information as it degrades to "noise". Translating this knowledge should provide significant environmental and economic benefits by generating a novel, non-lethal strategy that manipulates odour information to nudge animals away from valued plants, thereby protecting threatened plant species, revegetation programs and crops.	143,533.50	243,391.00	191,854.00	91,996.50	0.00	0.00	670,775.00
	National Interest Test Statement							
	By consuming their favoured plants, mammalian herbivores shape ecosystems, destroy revegetation projects, drive rare plants towards extinction, and cost millions of dollars in lost crop production. We urgently need new ways to reduce the environmental and economic damage these herbivores cause. Plant odours provide crucial information herbivores use to find and decide which plants to eat, and artificial odours mimicking informative odours can alter this process. But key fundamental questions need answering to create odours that efficiently and predictably use or distort information to reduce damage. How closely must artificial odours match informative plant odours to be effective? Does plant quality alter the response of herbivores to these odours? Our project aims to answer these two questions and then go the next step, in applying this knowledge to a real word problem. We will test the strategic use of artificial odour as misinformation so herbivores ignore valued plants. With this new approach, our work will overcome the current stalemate in developing better management tools, urgently needed to deliver on current government strategies and initiatives to protect valuable plants across environmental and economic contexts. We can then work with end-users to translate our findings into practical methods and tools, helping restore biodiversity, sequester carbon, protect threatened plant species and reduce economic loss.							
DP250100107 White, Prof Fiona A	**Digital humans as a mixed-reality solution to real-world racism** The cultural, health, and economic costs of racism are significant. New and effective racism reduction methods that target the barriers to achieving positive intergroup contact are urgently needed. Mixed-reality (MR) technologies can create highly realistic digital humans, that provide researchers with experimental control, ecological validity, and a unique functionality to change the negative intergroup dynamic via a cooperative exchange, in more natural ways than ever	143,500.00	289,000.00	305,000.00	159,500.00	0.00	0.00	897,000.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	before. This project will uncover the optimal MR methodologies needed for an immersive, multi-sensorial and dynamic interaction to reduce racism. A significant outcome will be a scalable and effective racism-reducing MR toolkit for researchers and stakeholders to implement. **National Interest Test Statement** Racism is a growing social problem inadequately addressed by current science. With an increasing number of global ethnic-religious conflicts, racism is on the rise in Australia where racial hate speech has become an epidemic. Racism is estimated to cost Australia between $21.1 and $54.7 billion annually due to its significant psychological, cultural, and economic impacts. However, current racism reduction tools are insufficiently engaging and sensory poor, and we urgently need effective and scalable intervention tools. This project is designed to meet this critical need. By harnessing technological advancements in generative Artificial Intelligence, this project will create interactions with highly realistic digital humans called 'high fidelity mixed reality' (hfMR) to discover how negative intergroup racial dynamics can improve via optimal contact and identity-transformation embodiment. A significant outcome will be effective racism-reducing hfMR toolkits for researchers, stakeholders, and policy makers to implement, facilitating impactful racism reduction. Importantly, this project will respond to the Government's (2022) $7.5MIL commitment to a national anti-racism strategy by providing viable strategies to combat race hate speech. At a public level, outcomes will be shared amongst relevant national (Australian Human Rights Commission) and international (UK Commission on Race and Ethnic Disparities) agencies.							
DP250100118 Rideaux, Dr Reuben	**Seeing the world one step at a time** Our knowledge of perception comes from static experiments, yet our lives are very active (eg: reaching, walking). Recent work shows close perception/action links and that action can shape perception. This project uses new technologies to test dynamic perception in free-walking observers in virtual multisensory environments. It will reveal how walking modulates perception at the step rate, the influence of intention (active vs passive action) and establish the neural mechanisms underlying the perception/action link. It will advance our knowledge of how the brain integrates its twin functions of perceiving the world and acting upon it and will generate useful knowledge for information transfer and time-critical responses in active contexts. **National Interest Test Statement** Most people take thousands of steps daily, sometimes in risky environments (pedestrian crossings, building sites) and often while doing a second task (e.g., using a smartphone). We perceive the world as stable when we walk, but this is an illusion. In fact, our brains smooth out sensory wrinkles to help us perceive a stable and continuous world, but this process hides the perceptual lapses that occur during walking, which can have fatal consequences. This project brings together previously disconnected techniques and analyses from psychology, physiology, neuroscience, artificial intelligence, and virtual reality to enable breakthroughs in our fundamental knowledge of how walking impacts sensory function. Project outcomes could be harnessed to inform public safety measures and enhance the efficiency of digital displays, communication systems, and device feedback mechanisms, thereby optimizing and enriching user experiences. Additional outcomes include training the next generation of Australian researchers in cutting-edge virtual reality and artificial intelligence technology; two skills predicted to play an increasingly important role in Australia's future.	118,274.00	251,467.50	278,698.50	145,505.00	0.00	0.00	793,945.00
DP250100305 Merchant, A/Prof Andrew	**Plant source-sink dynamics and stomatal sensitivity using mobile NMR.** Using unique custom-made nuclear magnetic resonance sensors, this research quantifies the dynamics of source-sink (leaf to seed) transfer of material in plants and its variation during resource limited and stressful environmental conditions. Further, this research identifies the influence of leaf hydration (water content) and environmental conditions on leaf stomatal aperture, a process that governs leaf carbon and water relations. This dual focus, addresses two significant gaps in our understanding of plant function and will lead to 1) new metrics for crop selection to improve food security and 2) more informed intervention to mitigate stressful environmental conditions. **National Interest Test Statement** This project quantifies seed development and plant water relations using non-invasive real-time, custom-made technology. This unique capacity allows us to characterise the dynamics of seed development and its sensitivity to changes in growth conditions enabling the selection of advantageous germplasm. This project specifically capitalises on the capacity of Australia's rain-fed and irrigated cropping systems to provide superior quality grains to	174,652.00	267,964.00	185,300.00	113,094.00	21,106.00	0.00	762,116.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	both domestic and international markets. We use advanced technology developed in collaboration with international partner and educate the next generation of researchers to produce translational research outputs such as improved germplasm and novel selection tools for plant improvement. By adopting world-first technology this work will place Australia and Germany at the forefront of agricultural research with the unique capacity to comprehensively monitor seed real-time yield development and plant water use. Ultimately, this project will improve both the resilience and capacity of Australia's agricultural industries to provide nutritious and higher quality food with a more efficient use of resources.							
DP250100343	**Proactive harm prevention for virtual and augmented reality technologies**	62,807.50	148,159.50	180,389.00	95,037.00	0.00	0.00	486,393.00
Gray, Dr Joanne E	The project aims to develop a regulatory framework for emerging virtual and augmented reality technologies to proactively prevent harms. It addresses significant issues such as harassment, privacy infringements, exploitation and discrimination in immersive technologies. The research will examine different industry visions and their impacts, focusing on harms to marginalised users. Expected outcomes include a deeper understanding of these technologies' trajectories and actionable policy recommendations. The benefits will be safer, more equitable immersive systems and evidence-based regulations, contributing socially and culturally to Australia.							
	National Interest Test Statement							
	Australia has the opportunity to be a global leader in the regulation of augmented and virtual reality technologies (AR/VR). These technologies allow users to experience completely virtual environments (VR) or merge digital elements with real-world views (AR) and they are rapidly expanding beyond gaming and entertainment into sectors including education, healthcare, manufacturing, engineering, and retail. The versatility and wide applicability of AR/VR offers significant economic and social benefits, but these technologies also have the potential to cause harm, including privacy infringements, harassment, exploitation and discrimination. Our project aims to support proactive policymaking to ensure AR/VR technologies are designed and deployed in a way that is safe and inclusive for all Australians. We address critical knowledge gaps about the corporate interests driving AR/VR innovations and the nature of AR/VR harms, especially for marginalised users. Building on this new knowledge, we will host co-design workshops with policymakers in Australia and Singapore—a major technology hub in the Asia Pacific—to develop public-interest-based regulatory frameworks for AR/VR that are designed to enable public oversight and industry accountability as the field evolves. Given the continued growth of the global AR/VR economy, this project represents a strategic investment in Australia’s digital future.							
DP250100454	**The Transformation of Chinese Temple Theatre Architecture**	115,041.00	257,092.00	246,899.50	104,848.50	0.00	0.00	723,881.00
Zhao, A/Prof Xiaohuan	This project aims to examine the form and transformation of Chinese temple theatre architecture. As the predominant venue for ritual and theatrical performances in premodern and contemporary rural China, the temple theatre provides an insight into the dual function of temples as a sacred space for worship and a secular space for entertainment. The project expects to develop a new model for analysing the evolution of Chinese temple theatre architecture and the complex interaction between the sacred and the secular. The project should provide significant benefits, such as furthering the understanding of the liminal/liminoid link between temple and theatre and adding a new dimension to the spatial turn in theatre and performance studies.							
	National Interest Test Statement							
	The international collaborative research project will generate new knowledge to significantly advance our understanding of Chinese theatrical and architectural conventions and the evolution of Chinese temple, theatre and architecture, while also enhancing cultural exchange and academic cooperation between Australia and China. Enhanced cultural exchange and academic cooperation underpin Australia’s capacity to engage with China, its largest trading partner and primary source of international students, tourists and immigrants, thereby benefitting the Australian economy. The project will also contribute to future Australian research and policymaking on ethnic integration and social inclusion by offering fresh insights into the pivotal role of temples in the social and spiritual lives of community members from many religions. A further contribution of the project comes from our multidimensional approach that integrates the disciplines of anthropology, ethnography, archaeology, architecture, history, religion, theatre and performance studies, thereby bolstering Australia’s reputation as a global leader in Chinese temple, theatre and architecture scholarship. To ensure widespread comprehension and uptake of our research outcomes, proactive engagement with cultural and professional associations, organisation of public events and utilisation of media outlets and digital platforms for extensive dissemination and community engagement will be undertaken in Australia, China and beyond.							
DP250100462	**Communication-Cyber-Human System Co-design for Human-Machine Collaboration**	104,106.00	210,712.00	209,462.00	102,856.00	0.00	0.00	627,136.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Li, Prof Yonghui	This project aims to pioneer fundamental theories and technologies crucial for advancing wireless Human-Machine Collaboration (HMC) within the context of Industry 5.0, an emerging industrial transformation. The project will lay the groundwork for co-designing wireless communications and cyber-human collaborative mechanisms to optimise operational efficiency and prioritise human well-being in wireless HMC. Anticipated outcomes include models, analytical frameworks, and optimisation tools tailored for wireless HMC systems. These innovations hold the potential to significantly reshape Australia's manufacturing sector, delivering substantial economic and societal advantages by reducing operational costs and enhancing efficiency. **National Interest Test Statement** The project aims to develop fundamental sciences for wireless human-machine collaboration (wHMC) to enable harmonious interaction between humans and intelligent machines in the emerging Industry 5.0. wHMC requires the co-design of tightly integrated communication and cyber-human control systems. Currently, there is a lack of theoretical foundation and practical frameworks for seamlessly fusing automated machines and human control loops to create safe, scalable, and flexible wHMC systems with assured performance. This project will establish the research foundation for wHMC, unlocking its full potential as a transformative force in advanced manufacturing. It aligns with Australia's focus on advanced manufacturing and digital transformation. The developed wHMC technologies will drive significant benefits for Australia. Economically, wHMC systems will revolutionise the manufacturing, healthcare, and agriculture sectors by reducing operational costs and enhancing efficiency. This is particularly crucial for Australia, which has high labour costs and stringent safety standards. Socially, wHMC will improve workplace safety and foster innovation and collaboration, contributing to overall social well-being. Environmentally, the enhanced efficiency and automation in various sectors will lead to more sustainable practices. Proof-of-concept experiments for wHMC will be developed to promote understanding and demonstrate its potential to tackle intricate manufacturing challenges.							
DP250100514 Lenzen, Prof Manfred	**Developing sustainable degrowth futures to meet ambitious climate targets** This project aims to explore future degrowth pathways where Australia aligns its greenhouse gas emissions with a 1.5°C climate target while also improving wellbeing. By developing innovative modeling techniques, it will create a new interdisciplinary research stream in industrial ecology. The project will generate significant new knowledge to reveal how public provisioning, sufficiency, universal basic services and other societal reforms can enable Australians to experience well-being in a downscaled, environmentally sustainable economy. Expected outcomes include a framework for investigating robust degrowth climate mitigation scenarios. The project directly benefits Australia's commitment to Net Zero and the Sustainable Development Goals. **National Interest Test Statement** Australia has adopted 43% emissions reduction and 82% renewable electricity by 2030 and net zero emissions by 2050. These targets will likely be missed as the current rate of renewable infrastructure expansion is too slow to offset the emissions-increasing effects of economic and population growth. Researchers have begun to explore degrowth as an alternative to technology-driven green growth. In the EU, degrowth research is well-recognised and funded, attracting hundreds of scholars; in Australia it is almost entirely absent. This project will fill a critical gap in Australia's climate mitigation research capability. The project will model degrowth futures under which Australia would transition to a downscaled, environmentally and socially sustainable economy. It will benefit Australians by exploring whether the most ambitious climate goals could be met and citizens' wellbeing improved. Modelling tools from this project can be used by policy-makers, sustainability practitioners and scholars to test key degrowth policies for their efficiency on improved social provisioning and cohesion, better mitigation, adaptation and resilience. Project outcomes will be discussed at a workshop and through direct dialogues with national and international collaborators and stakeholders, including from the UN, with the aim of leveraging this research for global climate governance. Qualitative storylines will underpin results dissemination to wider audiences through media and public debate.	121,090.00	246,193.00	178,103.00	53,000.00	0.00	0.00	598,386.00
DP250100522 Betts, Prof Alison V	**Climate change mitigation strategies for food security in northeast India** India, a major agriculture exporter, is at risk of climate-induced food insecurity, a fast-growing global threat. This project aims to identify strategies for climate change resilience in the northeast Nagaland region through a study of past and present agriculture, earlier climate adaptations, vanishing traditional knowledge and dietary health. Working with local communities, it is expected to deliver new data to mitigate climate-related disasters, which jeopardize regional stability. Anticipated outcomes include policy recommendations and test projects to	106,653.50	225,393.00	234,853.00	206,235.50	90,122.00	0.00	863,257.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	improve farming practices and address climate change impacts. As well as India, the project should deliver significant benefits for Australia, a major trade and diplomatic partner. **National Interest Test Statement** India is a fast-growing major economy but also a nation prone to instability. Over 80% of the population lives in areas at risk from the effects of climate change, such as extreme weather events, unusually high or low temperatures and unexpected floods and droughts, all of which endanger the water supply, agriculture, health and infrastructure. Economic and social turmoil resulting from threats to food security in India – Australia's fourth-largest export market, a fellow member of The Quad diplomatic partnership and one of the world's biggest food producers – would adversely affect this country and have global implications, while posing the risk of financial crises and famine locally. Focusing on Nagaland, a highly vulnerable region in India's northeast, this project will use techniques derived from archaeology and the environmental sciences to help local communities to develop food security strategies and resilience in the face of climate change, by uncovering the deep history of Naga agriculture, recording past responses to environmental variability, rescuing fast-fading traditional knowledge and documenting the wide variety of current farming practices. The findings, which will reduce the risk of regional insecurity and population migration, will be presented in accessible form to Naga communities to maximise their potential for direct translation.							
DP250100530 White, Dr Thomas E	**The dark side: weaving nocturnality into pollination resilience networks** This project aims to identify the drivers of resilience in insect/plant pollination systems, as applied to the Australian alps. It will generate an innovative framework for understanding this vital mutualism in its full complexity by integrating diurnal and nocturnal pollination networks via multilayer models, and validating them in the field. Expected outcomes span new techniques for characterising pollination systems, and enhanced capacity to predict their resilience and vulnerability amidst environmental change. Key expected benefits include management strategies for the scientifically and culturally significant Australian alpine meadows, and the export of methods to support analogous efforts in vulnerable ecosystems worldwide. **National Interest Test Statement** This project addresses a critical gap in our understanding of pollination networks by integrating nocturnal interactions into the study of ecosystem resilience. Given that Australia hosts a rich diversity of nocturnal flora and fauna, including approximately 40000 moth species and a suite of nocturnally pollinated plants, this research is of national environmental, social, and cultural importance. It will provide insights into the full diel complexity of pollination, which is crucial for predicting the stability of ecosystems under environmental stress. The iconic Australian alpine meadows, a focal point of this study, are not only a biodiversity hotspot but also under immediate threat from climate change, invasive species, and habitat degradation. By examining the interplay between diurnal and nocturnal pollination networks, this project will uncover vulnerabilities and inform conservation strategies, ensuring the preservation of these vital landscapes. The outcomes will have broad implications for biodiversity conservation, agricultural productivity, and environmental policy, aligning with national interests in sustainable development and ecological stewardship. This innovative and timely research leverages Australia's unique biodiversity to advance global understanding of ecological resilience, positioning Australia at the forefront of complex systems science and conservation biology.	68,257.00	137,819.00	137,819.00	68,257.00	0.00	0.00	412,152.00
DP250100576 Li, Dr Fengwang	**Diagnostics and management of heat for electrolyser upscaling** This project aims to understand the issue of heat generation and its impact on CO2 electrolysis. CO2 electrolysis enables production of renewable fuels and chemicals from Earth-abundant sources of CO2 and water, but the thermal management poses a challenge in scaling up the process. This project expects to generate new knowledge in electrocatalysis using in-situ characterisation and theoretical modelling. Expected outcomes include innovative cooling strategies and designs for large-scale CO2 electrolysers, which will significantly benefit carbon emissions reduction in Australia. The successful implementation of these outcomes will make it possible to store intermittent renewable electricity over long term and produce sustainable chemicals. **National Interest Test Statement** Carbon dioxide (CO2) electrolysers offer a promising solution for recycling CO2 and storing renewable electricity from solar and wind. Powered by electrical energy, CO2 electrolysers produce fuels and chemicals that are in	109,950.00	221,050.00	222,350.00	111,250.00	0.00	0.00	664,600.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	high demand across industries—a market valued at over $300 billion, including everyday materials such as plastics and Lycra. By storing and transporting energy through chemical bonds, we can safely and efficiently harness intermittent renewable energy for both domestic use and export. However, a significant challenge in scaling up CO2 electrolysers is the excessive heat they generate, which can compromise stability of materials, quality of products, and overall efficiency of electrolyser components. Presently, over 50% of the energy input is lost as heat. This project seeks to address this issue by employing novel methods to monitor heat production and developing advanced heat mitigation strategies specifically for large-scale CO2 electrolysers. The project is expected to generate patentable technologies that will be leveraged by Australia's leading renewable energy sectors, facilitating the adoption of this sustainable technology. The project will enhance public awareness of net-zero goals through the dissemination of research findings via media channels and social media platforms. The project is poised to play a pivotal role in Australia's journey towards a global leader in reducing carbon emissions and in generating and exporting sustainable energy.							
DP250100658 Armfield, Prof Steven W	**In-situ investigation of dissolved oxygen fluxes in weir pools and rivers** This project aims to understand the turbulent mixing processes by which dissolved oxygen is transported from the surface of rivers and lakes into the water column by using unprecedented high-fidelity in-situ measurements. Australian inland rivers often go through prolonged periods of low flow and strong thermal stratification under which turbulent mixing is dramatically reduced resulting in low dissolved oxygen levels. These conditions can lead to large-scale fish kill events in fragile and endangered ecosystems. This study will develop gas transfer relationships that can be used in river hydraulic models by catchment managers to predict and manage the occurrence of high-risk conditions and enable proactive river management.	132,976.50	246,088.50	179,319.00	66,207.00	0.00	0.00	624,591.00
	National Interest Test Statement Large-scale fish kill events in Australia's inland rivers can occur when dissolved oxygen levels fall below critical limits. These events are a significant threat to the ecology of river systems, the endangered animal species that live within them, and the health and livelihoods of the communities that live alongside the rivers. When oxygen levels within the water column decrease, toxic heavy metals can be released from sediments, bacteria grow from decaying fish, both requiring expensive treatment before the water can be used for drinking or agriculture. Understanding the occurrence of these events and being able to predict and prevent them is an urgent priority. This project will discover the complex relationships which quantify the rate at which oxygen from the air enters and mixes into Australia's unique river systems. It will develop predictive models that can be used by river managers to determine the amount of oxygen supply from the ambient air into the river water under different flow and weather conditions. These models, which will be communicated to stakeholders who manage our river systems, can be used to estimate overall oxygen levels within the rivers and then to determine the minimum flow releases to prevent fish kills and plan the deployment or optimal usage of aeration systems or other interventions, ultimately safeguarding these valuable social, cultural, environmental and economic assets.							
DP250100702 Panagiotelis, A/Prof Anastasios N	**Breaking Down Silos: Optimal Aligned Decisions via Forecast Reconciliation** This project aims to develop new forecasting methods, where forecasts are needed at different levels of aggregation, such as store level and total regional demand in retail. This project expects to generate new knowledge in terms of forecasting methods that are robust to extreme events such as supply chain disruptions, while ensuring decisions made by different agents in an organisation are aligned. An interdisciplinary approach, using techniques from mathematical optimisation and statistics will be taken. Expected outcomes include improved forecasting methods placed on a rigorous footing by new theory. This should provide significant benefits, including efficient retail operations and better planning of infrastructure investment in energy.	121,045.00	235,776.50	191,702.00	76,970.50	0.00	0.00	625,494.00
	National Interest Test Statement The project concerns forecasting in large organisations, where forecasts are needed at a disaggregate level (e.g. individual retail stores) and an aggregate level (e.g. total sales across all stores supplied by a single warehouse). Ensuring that forecasts of disaggregate data add up to the forecast of aggregate data is critical to ensure that decisions are aligned across the organisation. The project will develop new methods for forecasting that inform decisions to minimise economic costs in an uncertain environment. The research will lead to economic benefits via management of inventories, planning, and risk management reducing costs for businesses and government organisations, across industries including retail, finance and energy. In the case of energy, environmental benefits will also be realised via a more cost effective transition to zero carbon electricity generation. With its emphasis on economic costs, the project will improve forecasting methods already used widely in industry. This existing translation of research into practice has been a consequence of the direct efforts of the researchers, and their development of freely available software implementations of their forecasting methods. Through these established links with industry, as well as a continued commitment to open source software, the new research outcomes of this project have a high likelihood of adoption by the broader Australian and international community.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250100762	**Developing an analytic theory of monoidal categories**	89,956.00	184,912.00	196,412.00	101,456.00	0.00	0.00	572,736.00
Tubbenhauer, Dr Daniel	The project's aim is to introduce fundamentally new methods to the field of monoidal categories by using an innovative analytic approach. Monoidal categories are ubiquitous in mathematics and cognate fields such as computer science. However, current techniques draw almost exclusively from algebraic and combinatorial ideas which are closer to the origin of the theory of monoidal categories. The project will overcome current limitations by introducing interdisciplinary methods and applying them to pressing open problems where the usual approaches fail. The outcome will be new results in representation theory and a new theory to study monoidal categories. This will have benefits within mathematics and also in physics/chemistry in the long run.							
	National Interest Test Statement							
	Advances in mathematics underpin essential competencies in our science, engineering, and technology-driven world. Two key fields—representation theory and category theory—rely heavily on algebraic tools. This project introduces analytic and probabilistic methods from analytic number theory to address unsolved problems in these areas. Beyond our dependence on wireless communication and the internet, this proposal's mathematics—combinatorics, representation, and category theory—will enable next-generation technology in quantum computing, machine learning, signal processing, and neuroscience. These mathematical subjects keep Australians connected, informed, and safe, ensuring Australia remains globally competitive in key sectors. The value of fundamental research in mathematics for today's and tomorrow's world is immense. This project will also maintain Australia's prestigious international standing in representation and category theory, strengthen ties with a vibrant international community, attract top international researchers, and train a new generation of mathematicians. To maximize the research outcomes' impact beyond academia, we organize workshops and seminars for knowledge exchange and communicate findings through public talks, media outreach, and online platforms. By fostering understanding, translation, and adoption of the research, the project will drive societal progress and innovation.							
DP250100822	**Self-Healing Ionic Liquid Lubricants**	126,188.50	266,779.00	287,691.50	147,101.00	0.00	0.00	827,760.00
Warr, Prof Gregory W	Aims: This project aims to develop environmentally-friendly lubricants for high vacuum and high temperature applications. Significance: By combining the novel properties of ionic liquids and self-assembled of molecular bilayers, this project will create new fundamental understanding of how ionic liquid structure and intermolecular forces affect dynamic amphiphile assembly structure. Expected Outcomes: This new understanding will establish the design rules for creating new, environmentally-benign lubricants. Benefits: This will address the urgent need to replace toxic components of current generation liquid lubricants to create safer, longer-lasting, more energy-efficient formulations effective over a wide range of operating conditions.							
	National Interest Test Statement							
	Polyfluorinated compounds (PFCs), widely used in lubricants in aerospace and automotive industries and for vacuum applications, are persistent pollutants that contaminate soil, water and air, and through bioaccumulation present serious, long-term health threats. This project aims to discover new, high performing, versatile, safe lubricants to replace current PFC-based products that are toxic to humans and detrimental to the environment, and for which there are currently no viable replacements. We aim to not only replace current toxic lubricants; By combining cutting edge experimental techniques to understand how molecules and ions assemble into lubricating layers, we will design new materials that more effectively dissipate friction and can recover from damage. Unlike molecular-based lubricants, using ionic liquids enables them to function for longer times and under extremes of temperature and pressure without evaporating, also reducing the environmental and economic impact of wear-and-tear. The novel lubricant technologies discovered in this project are expected to generate opportunities for local manufacturing and benefit Australian industry, yielding opportunities for economic growth and job creation.							
DP250100848	**Chiral Metal-Organic Frameworks for Optical Switches**	94,960.00	192,838.50	154,840.50	56,962.00	0.00	0.00	499,601.00
D'Alessandro, Prof Deanna M	This project aims to develop advanced Metal-Organic Framework materials that make ultrafast and energy-efficient processing of light signals possible, without the need for electronic processing. New knowledge will be gained on the interplay between nonlinear optical properties and the chiral structures of the materials, including new switching mechanisms based on host-guest and electrochemical stimuli. The expected outcomes of this project include the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	development of novel thin film devices for optical switching. This should provide significant benefits because such devices have widespread technological relevance across the communications, medical and defence sectors where faster and more energy-efficient information processing is critical. **National Interest Test Statement** Telecommunications networks use light signals sent through fibre to transfer information quickly over long distances, and electronic circuits to process and store the transmitted information. However, electronic processing is relatively slow and prone to errors caused by heat and other factors. We will develop advanced materials that make ultrafast and efficient processing of light signals possible, without the need for electronic processing. The discoveries we make to achieve materials with these properties will be published and will enable new partnerships in information technology across the communications, medical and defence sectors. The translation of our research will increase the speed, energy-efficiency and security of information handling and storage in our telecommunications networks. This new knowledge will allow Australia to better harness its significant investment in fibre optic infrastructure, such as the National Broadband Network, and create opportunities for manufacturing new materials and devices, with associated training and jobs.							
DP250100871 Ford, Prof Michele T	**Generative AI attacks on workers' freedom of association in Southeast Asia** This project aims to assess the role of Generative Artificial Intelligence in digital attacks on freedom of association and attempts to resist them in Indonesia, the Philippines and Thailand. The project expects to generate new knowledge about the risks to human rights posed by AI using an innovative methodology built on qualitative approaches and cutting-edge digital techniques. Expected outcomes include a typology of digital attacks on freedom of association and responses to them and a prototype large language model capable of generating counter narratives. This should provide significant benefits to Australia, supporting its commitment to promoting Responsible AI Technologies and furthering its geo-strategic interests in Southeast Asia. **National Interest Test Statement** The knowledge generated in this project supports Australia's international priorities, which include a commitment to ethical use of artificial intelligence, democracy in our region and the promotion of the United Nations Sustainable Development Goals. Australia is a founding member of the Global Partnership on Artificial Intelligence, formed to foster the development of AI technologies that respect values including human rights. The protocols created for developing purpose-specific large language models capable of identifying and countering digital repression as part of the project will support Australia's efforts to demonstrate international leadership in promoting responsible and ethical AI technologies. It is also in Australia's interest to have stable and democratic neighbours, as reflected in the government's Southeast Asia Economic Strategy and the level of development assistance Australia provides to the region, worth $775.4 million in 2023–24. In addition, the project aligns with Australia's commitment to the Sustainable Development Goals, supporting progress towards Goal 8 on Decent Work and Economic Growth; Goal 10 on Reduced Inequalities; and Goal 16 on Peace, Justice and Strong Institutions, which aspires to, among other goals, develop effective, accountable, and transparent institutions, promote the rule of law at the national and international level and ensure equal access to justice for all.	55,144.50	174,303.00	225,659.50	106,501.00	0.00	0.00	561,608.00
DP250100887 Miller, Prof Kristie L	**Human Exceptionalism: Mental Time Travel in Humans and Non-human Animals** This project investigates mental time travel in humans and our closest relatives, chimpanzees. This capacity underlies far reaching abilities in humans and is often taken to distinguish the human from the non-human mind. The project will utilise new experimental methods to probe different ways humans and animals represent when an event is located. It will generate better understanding of this capacity and shed light on whether it is uniquely human, using an interdisciplinary approach including cognitive ethology, psychology, and philosophy. Expected outcomes include the development and implementation of new theoretical and experimental frameworks, and benefits in understanding human and animal cognition. **National Interest Test Statement** Historically, it was often claimed that consciousness is unique to humans, and that this grounds certain treatment of animals. As this claim about consciousness has become increasingly disputed, the idea has arisen that what	57,714.00	123,334.50	120,782.50	55,162.00	0.00	0.00	356,993.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	makes humans unique is that they can mentally time travel. This project seeks to better understand mental time travel by investigating how this ability develops from childhood to adulthood, and whether it can be found in our closest non-human relatives, chimpanzees. This project will connect Australian research and policy development with a bourgeoning international movement that aims to better understand whether non-human animals have long-term interests that we should be considered when making decisions about their treatment. It will inform critical national debates about how we treat non-human animal in farming, medical research, and as companion animals and well as illuminating the cognitive mechanisms that ground human agency. This will connect Australia to a broader research network, contribute to important national policy decisions regarding non-human animals, contribute to important social and community dialogue about the role of non-human animals in our society, and to a furthered understanding of the relationship between humans and other animals.							
DP250100907 Chen, Prof Yuan	**Tailoring high-purity carbon from methane abatement via Joule-heating** This project aims to demonstrate efficient carbon material structural controls via a new direct Joule heating approach to produce multiple high-purity and high-value carbon products. This project expects to address a key challenge in splitting methane (the second most abundant greenhouse gas) into hydrogen and solid carbon materials without emitting carbon dioxide. Expected outcomes include new knowledge on carbon material formation, reaction kinetics, heat and mass transfer, and environmental and market impacts under new conditions. These will incentivise the industrial adoption of methane pyrolysis for methane abatement, carbon material, and hydrogen production, reducing greenhouse gas emissions and building a more sustainable society.	125,421.50	266,168.50	287,565.50	146,818.50	0.00	0.00	825,974.00
	National Interest Test Statement Methane is a primary component of natural gas. Its capability to trap atmospheric heat is 28 times that of carbon dioxide. Methane also produces 62% of hydrogen currently used globally, which releases 600 million tons of carbon dioxide annually. Methane is released into the atmosphere from many different sources: oil and natural gas systems, farms, wastewater treatment plants, landfills, and coal mines. It is the second most abundant human-influenced greenhouse gas. Existing methane removal methods depend on converting methane to carbon dioxide, producing more greenhouse gas emissions. This project will address this challenge with a novel technique: splitting methane into hydrogen and solid carbon materials without directly emitting carbon dioxide, powered by renewable electricity. The project will demonstrate that the resulting solid carbon materials can be used as conductive components to make fast-charging batteries and black pigments in inks/plants. The project will generate new scientific knowledge on controlling nanoscale structures of carbon materials. The research outcomes will enable the new methane removal method to increase its progression to become technology-ready. It will pave the way for the Australian industry's subsequent technical development and commercial adoption. Reducing methane emissions and producing "clean" hydrogen and solid carbon products with reduced carbon dioxide emissions will bring environmental benefits and build a more sustainable society.							
DP250101050 Roberts, A/Prof Thomas H	**Food Quality of Australian Indigenous Grains: Impacts of Plant Environment** Little is documented about the viability of grains from Australian native grasses for commercial food applications and how this is influenced by plant growth environment. This project aims to fill this gap in our understanding by co-designing and disseminating knowledge with Gomeroi researchers. The project expects to (1) develop recommendations for native grain production based on insights into the environmental effects on grain quality for four native grasses, (2) train research students, and (3) enhance Indigenous partnership on Gomeroi Country in northern NSW. Benefits resulting from the project are the promotion of best-practice management of native grasslands and support for the development of an Indigenous-led native grains industry.	145,836.50	291,312.00	292,090.00	146,614.50	0.00	0.00	875,853.00
	National Interest Test Statement Indigenous Australians have managed, harvested, and processed the seeds of native grasses for food for millennia—a testimony to the nutritional value of these grains. Native grasses grow throughout Australia, having evolved to thrive in challenging environments, including those too hot or dry for crops like wheat. An Indigenous-led native grains industry has the potential to produce cultural, environmental, and health benefits for Aboriginal communities and the broader Australian population. Co-designing scientific, culturally responsive research of direct benefit for Indigenous communities is paramount. Knowledge of the interactions among environmental factors (including soil type, temperature, and water availability) and grain quality (including grain size and nutrient composition) is needed for commercialisation of native grain production by Indigenous enterprises. In collaboration with Gomeroi/Gamilaraay communities in northern NSW, this project will determine environmental effects on grain quality of four species of native grasses used historically as sources of food: Button Grass, Curly Mitchell Grass, Native Millet, and Weeping Grass. We will generate knowledge critical for managing native grasslands for grain production and for the success of Indigenous-led native food initiatives. Our project's findings will be shared through regular workshops with Gamilaraay co-designers and stakeholders and with the broader community via newsletters, webinars and articles.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250101073 Warren, A/Prof Charles R	**Stoichiometric flexibility shapes microbial function and community assembly** This project aims to investigate how variation in resource supply shapes the function and assembly of soil and gut microbial systems. This project expects to reveal how flexibility in elemental stoichiometry is not only a key physiological adaptation to fluctuating and nutritionally unbalanced resource supply, but also scales up and affects community assembly and ecosystem processes. Expected outcomes of this project include a new nutritional framework centred on variability that yields a step-change in understanding how microbial systems function. This should improve our ability to predict the outcomes of interventions to the human microbiome, and shifts in biogeochemical cycles due to environmental change.	100,994.50	198,265.00	194,593.50	97,323.00	0.00	0.00	591,176.00
	National Interest Test Statement Understanding how microbial communities are assembled and function is a fundamental question in ecology. Fluctuating and nutritionally imbalanced resource supplies are common features of many microbial ecosystems, yet few studies have considered their role in shaping microbial communities and their function. Our working hypothesis is that in soil and gut ecosystems these nutritional challenges are met by different means of storing carbon within cells, and these physiological adaptations scale up and affect community assembly and ecosystem processes. The project will have applications in agricultural, and biomedical research because understanding how communities assemble and function is key to the scientific manipulation of gut and soil microbiomes. For example, within the last 10 years it has become evident that the gut microbiome plays a fundamental role in human disease, as well as production/companion animal health. Predicting how nutrition shapes soil microbial communities and their function has consequence for agricultural practices including fertilizer application and retention of nutrients within ecosystems. Project findings will be directly disseminated to scientific peers via peer-reviewed papers and conferences. Our project will be embedded within the Charles Perkins Centre which has at its core the goal of accelerating the translation of fundamental research to ease the burden of chronic diseases.							
DP250101107 Clarke, A/Prof Ronald J	**Revealing hidden membrane protein regulation via electrostatic switches** Aims: 1) Discover mechanisms of ion pump regulation based on electrical lipid-protein interactions; 2) Discover the role of lipid asymmetry in determining ion pump activity. Significance: 1) Provide deeper understanding of membrane biophysics; 2) Provide knowledge of the function of an unresolved region of ion pump structures. Expected outcomes: 1) Identification of the effects of membrane interaction of ion pumps on their structure, function, and mechanism; 2) Pinpointing of the amino acids and lipids responsible for membrane interaction; 3) Isolation of the regulatory mechanisms involved in the membrane interaction of ion pumps. Benefits: Refocussing of ion pump research on the surrounding membrane.	138,800.00	275,800.00	277,000.00	140,000.00	0.00	0.00	831,600.00
	National Interest Test Statement This project addresses the question of how cellular membrane proteins – in particular, pumps for the cross-membrane transport of key ions – are controlled at a molecular level. These pumps determine such fundamental processes as nerve function, muscle contraction and digestion, and constitute a sizeable proportion of all drug targets. While major progress has been made in revealing the structure of specific ion pumps, the puzzle is still incomplete and we do not yet know how the pumps actually work in a living organism. This is a key knowledge gap, which if tackled, will feed into structure-activity studies for new drugs. With drug resistance an ever-increasing problem, the identification of new drug targets is of vital importance and future benefit to Australia. Using a frontier recording instrument that is the only one of its kind in the Southern Hemisphere, this project aims to break through the current difficulties in measuring pump molecular interactions with the cell membrane, and thus complete the puzzle . Our success in delivering a holistic understanding of both the ion pumps and their surrounding membrane (without which the pumps cannot function) would make Australia a focus of global research attention. Major conferences and meetings and a broader media presence will ensure wide dissemination of our findings. World-class training for Australian early career scholars at the exciting interface of biology, chemistry and physics is a further beneficial project outcome.							
DP250101244 El-Zein, Prof Abbas H	**Microplastic retention and mobility in unsaturated top soils** The project aims to develop a theory of the retention and migration of micro- and nanoplastics (MP/NP) in unsaturated topsoils and quantify fluxes of MP/NP into adjacent water bodies. It expects to generate new knowledge on the interactions between MP/NP and soil's air-water-solid phases. This will be achieved through an integrated set of experimental and computational investigations at scales from	137,653.00	228,484.00	158,200.00	84,266.50	16,897.50	0.00	625,501.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	nanometres to metres. Expected outcomes are new knowledge on, and predictive models for, transport of MP/NP with co-contaminants in topsoils. This should provide significant benefits including better protection from plastic waste of human health and ground-, fresh- and marine water, and new technologies for soil remediation. **National Interest Test Statement** Plastic debris are in the top ten pressures on Australian coasts, accounting for 84% of Australian beach litter, and plastic remains the waste with the lowest recovery (87%) in Australia, with yearly cost to marine economies greater than $430M. This project aims to advance our understanding of the way plastic debris travel in soils and into adjacent water resources such as aquifers and to develop soil-based solutions for removing plastic from polluted water. It will address a major knowledge gap by investigating the effects of a) rain/drought, b) plastic ageing and c) mobility of smaller nanoplastic debris that are more easily absorbed by humans, animals and plants; compelling evidence exists about the importance of these poorly understood factors. The knowledge and techniques generated by this project will contribute to better management of plastic waste and a circular economy in Australia, with consequent economic benefits. It will generate direct and long-term environmental, social and cultural benefits for Australians by contributing to more pristine aquatic and terrestrial ecosystems, including iconic beaches and sites of cultural and heritage value, and health benefits from lower exposure to plastic. Research outcomes will be promoted in press releases, social, print and audio-visual media, as well as a one-day workshop. Target audiences are soil and water resources stakeholders, including State and Federal policy makers, industry partners and community organisations.							
DP250101306 Dehghani, Prof Fariba	**Design a highly conductive, flexible and functional polymer** The project aims to address significant challenges in applications of an electroconductive polymer, pivotal for diverse industries. It delves into fundamental research, uncovering microscale charge transfer mechanisms within this polymer system. Expected outcomes include novel copolymers with enhanced flexibility, conductivity, and capability for immobilisation of functional compounds advancing biosensors and other applications (e.g. actuator, smart textile). This research revolutionises polymer science, positioning Australia as a technology leader. Economic, environmental, and social benefits include intellectual property creation, industry innovation, and addressing global challenges in medicine, agriculture, and environmental monitoring. **National Interest Test Statement** We aim to address challenges exist in conductive polymer, poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) like high processing costs, brittleness, delamination, and the difficulty to fabricate uniform films at a large scale without compromising conductivity. These lightweight polymers will enable Australian manufacturers to design devices for electronics, semiconductors, insulators, soft actuators, smart textiles, energy storage, biosensors, and biomedicine. We will develop a scalable process for creating flexible-robust-conductive films, giving Australia a competitive edge in the global market for advanced materials & electronics. This will strengthen Australia's economy and reinforce its position as a leader in technology-driven industries. We will create proprietary technology products with projected annual market value of $50 billion, positioning Australia to revolutionize industries like electrostatic coatings, flexible electronics, bioelectronics, energy storage, actuators, & biosensors and capitalize on new market opportunities. This opens avenues for extensive applications, particularly in portable biosensors for rapid biomarker detection in vital sectors like medicine, food, environment, and agriculture. It stimulates economic growth, creates jobs, and diversifies industries. By this new conductive polymers, Australia will secure its position as a global leader in advanced materials and pave the way for sustained prosperity in the 21st century.	104,439.00	224,920.00	151,587.00	31,106.00	0.00	0.00	512,052.00
DP250101359 Ying, Prof Yiming	**Advancing Fair Machine Learning with Theory and Algorithms** This project aims to enhance fairness in machine learning by creating specialized algorithms for intricate performance measures, vital in domains like finance, healthcare, and criminal justice. Its objectives include developing a unified machine learning framework for complex fairness metrics (e.g., area under ROC/PRC curve fairness, Harmonic mean fairness) and designing scalable fairness-aware learning algorithms with sound theoretical foundations. The outcome includes a set of fairness-aware learning algorithms that contribute to equitable decision-making in high-stakes contexts. Its success will yield a transferable approach to mitigate the disparate impacts of AI systems for decision-making. **National Interest Test Statement**	114,107.00	233,539.50	159,829.50	40,397.00	0.00	0.00	547,873.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	As Machine Learning technologies integrate into daily life, there are mounting concerns about their potential to perpetuate societal biases which can result in detrimental decisions for marginalised communities, highlighting the need for algorithmic fairness. In Australia, fairness is one of the eight AI ethics principles, with the government's 2024 response to the Safe and Responsible AI consultation emphasising concerns about algorithmic bias. This project addresses these concerns by tackling the significant research gap in developing fair learning algorithms that robustly handle diverse and complex performance measures in high-stakes applications such as healthcare, criminal justice, and the credit industry. The research innovates in creating efficient optimisation algorithms with theoretical guarantees capable of managing massive streaming data. Developments from this project will bolster Australia's competitiveness in fostering a future where algorithmic fairness pervades various sectors, thus mitigating the disproportionate impacts of AI systems on decision-making processes. The software generated will be available under an open-source license, while scholarly articles will be disseminated in conferences and journals. Patenting will be explored, offering potential for commercialisation and licensing opportunities. The benefits of this research will extend to the broader Australian public, promoting equitable AI practices and enhancing public trust in AI technologies.							
DP250101443	**The Climate Economy: Emerging Strategies for Australia**	143,361.50	288,488.50	273,215.50	128,088.50	0.00	0.00	833,154.00
Bryant, Dr Gareth	This project aims to improve Australia’s economic response to climate change by evaluating the strategies that are being developed to meet decarbonisation and resilience goals. It will generate new knowledge about the ‘climate economy’ using an innovative method to understand its ‘hybrid’ actors, policies and institutions. Expected outcomes of this project include a new conceptual toolkit and evidence-based strategies for researchers and practitioners to engage and improve Australia’s emerging climate economy. This should provide significant benefits by building capacity among policy makers, investors, and citizens to pursue effective, democratic, and just climate responses in an era of political-economic transformation.							
	National Interest Test Statement							
	Australia has responded to its international competitors by announcing a suite of ambitious economy-wide policy initiatives to boost and steer investment in critical climate infrastructure and industries. Focusing on energy, transport and water infrastructure, this project will investigate these government initiatives that aim to achieve net-zero emissions and climate adaptation goals while simultaneously enhancing national and economic security and delivering wider community benefits. In doing so, it will address a research gap in existing knowledge about the new kinds of institutions and policy tools that are involved in developing and implementing this ‘climate economy’ and how these changes affect policy outcomes and public engagement. By developing evidence-based strategies for governments, industries and civil society organisations, this project will contribute to securing Australia’s economic prosperity and increase resilience to climate and other risks. It will also build the capacity of citizens to understand and engage with these strategies so that the benefits of economic transformation are widely shared. The project will promote its outcomes by publishing an independent review and policy briefs for policy makers, investors and civil society organisations, and an interactive online map and budget so that members of the public can better follow climate policies, finance and projects in Australia.							
DP250101510	**A Heterarchical Model for Soil Erosion from Internal Flow to Global Failure**	38,712.00	167,424.00	250,924.00	122,212.00	0.00	0.00	579,272.00
Marks, Dr Benjamin	This project will develop a new approach to understand soil erosion in earth dams, from internal mechanisms to large-scale failures. It fills a significant gap in existing models, which cannot fully represent the complex, multi-scale processes of internal erosion. This approach combines detailed laboratory and field experiments with sophisticated computational modelling. It will create a reliable tool for predicting and mitigating dam failures, improving safety, resource management, and sustainability in water infrastructure. The escalating climate crisis and the imperative for the energy transition have triggered an unprecedented surge in global dam construction, and this model will help reduce the risks of these structures.							
	National Interest Test Statement							
	There are no adequately accurate models to predict the onset of failure in dams. This is because existing models miss the connection between the behaviour of individual particles and the failure of the whole dam. This Project will address this by developing a comprehensive multi-scale model for soil erosion. This new heterarchical model directly responds to the lack of existing models that integrate the physics of erosion from particle-scale to large-scale failures, crucial for safeguarding against climate-induced disasters. The model will be validated against laboratory experiments using two cutting edge techniques, X-ray radiography and Spatial Time Domain Reflectometry. The model will be tested against data from custom built field scale dams which will be instrumented and monitored. This research can prevent costly dam failures, saving resources and enhancing water management. Environmentally, it promotes ecosystem protection by forecasting and mitigating erosion risks. Socially, it will ensure community safety through improved infrastructure resilience. Culturally, it can aid in preserving historical dams, which are an important part of Australia's heritage. To maximise the research's impact, we will disseminate findings through open access research publications, scholarly conferences and will host a workshop							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	on the topic. We aim to integrate the research into engineering practice, contributing to long-term national benefit and international research collaborations.							
DP250101530 Zreiqat, Prof Hala	**Hyperboloidal Curvature as a Novel Stem Cell Senescence Regulator** This project aims to understand how hyperboloidal curvature influences cell senescence and its underlying mechanisms in mesenchymal stem cells. Hyperboloidal curvature plays a significant role in deciding normal stem cells' behaviour and function. Yet, the impact of these hyperboloidal curvatures on senescent stem cells remains to be explored. The project will bring together complementary expertise by combining biomaterial, cell and molecular biology, and engineering to gain an in-depth understanding of the underlying mechanisms of cellular senescence and rejuvenation. The anticipated outcomes will strengthen Australia's research capacity and generate new knowledge of significance for our fundamental understanding of cellular senescence. **National Interest Test Statement** This project will develop novel stem cell rejuvenation scaffolds with surface Gaussian curvatures with the efforts of complementary disciplines of biomaterial, stem cell biology, and geroscience. It will also provide the first evidence to unravel the association between hyperboloidal curvature, stem cell senescence, and cellular mechanical property, filling a significant gap in our understanding of the mechanisms driving stem-cell senescence and rejuvenation. This project will enormously add to stem cell biology, geroscience, and biomaterial development knowledge base. The theoretical and fundamental innovations will enhance Australia's standing in health-related biomaterial development and manufacturing, tissue regeneration and geroscience. Meanwhile, this project will deliver significant benefits to the R&D of next-generation biomaterials for various anti-ageing applications. The global market for synthetic bone substitutes is around $2 billion a year, and we will explore options for commercialising our scaffold manufacturing the technologies/patents arising from this project. Finally, as older people make up a considerable and disproportionately increasing proportion of Australia's population, and the main spending pressures continue to be in health, age pensions, and aged care, and spending pressures will gradually consume another 4.75% points of Australia's GDP over the next 40 years. This project will potentially alleviate the healthcare burden in the coming decades.	102,315.50	212,206.50	225,853.50	115,962.50	0.00	0.00	656,338.00
DP250101655 Rognon, A/Prof Pierre	**Moving mountains efficiently** This project aims to address the energy problem arising from excavating granular materials such as soil, ore, coal and fragmented rock. Combining newly developed X-ray imaging techniques and numerical simulations, the project expects to identify where, when and how energy is dissipated while digging and ploughing through these materials. The overarching aim is to improve the energy efficiency of earth moving equipment by finding optimal motion sequences for ground engaging tools. This should provide significant benefits to the construction and mining industry including energy-cost saving and emission reduction. **National Interest Test Statement** Excavation of soils, sands and fragmented rocks is pivotal to two industrial sectors that are essential to Australia's economy: mining and construction; these yield 15% of the GDP and employ 10% of the national workforce. Current excavation methods are sub-optimal and consume vast amount of expensive and CO2 emitting energy. In finding new energy-efficient excavation methods, the project will cut the energy cost crippling these sectors by billions of dollar per year and avoid the associated emissions of millions of tons per year of CO2 for Australia alone. The resulting gain in productivity will lead to a reduction in the cost of developing Australia's public infrastructure including roads, airports and tunnels. This is particularly important in the current national context of unprecedented infrastructure development, financed by $75b in taxpayer money this decade. It will also provide a competitive edge to national civil and mining companies, which suffer from $10 billion in excavation-energy related losses every year. These companies represent 20% of the ASX market and contribute to 35% of Australia's exports. Concurrently, the reduction in CO2 emission will greatly assist Australia in meeting its target on net zero greenhouse gas emissions by 2050. The CIs routinely collaborate with major national construction and mining companies; this will ideally serve the translation of the research outcomes into new practical excavation methods.	41,462.00	159,832.00	234,778.50	116,408.50	0.00	0.00	552,481.00
DP250101689 Hilliard, Prof Christopher R	**Human Rights and Corporal Punishment: Australia and Britain, 1970-2000** This project aims to provide a transnational and comparative history of efforts to abolish corporal punishment in Australia and Britain, and to explain the partial success of these efforts. It expects to generate new knowledge about human rights and children's rights campaigns based on extensive archival research,	48,810.50	98,773.00	72,506.50	22,544.00	0.00	0.00	242,634.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	including the analysis of recently declassified material. Expected outcomes include an explanation of why abolitionists succeeded in banning the hitting of children in schools but not in the home. Anticipated benefits include a better identification of paths to reform in this space than the idea, common in the public health literature, that scientific studies and human rights reports will 'trickle down' into public opinion. **National Interest Test Statement** Neuroscientists and child psychologists have demonstrated that the physical punishment of children has adverse consequences on the brain development and mental health of children into adulthood. The widespread use of corporal punishment by carers is a pressing health concern for young Australians. International human rights bodies condemn the physical punishment of children and young people. Liberal democracies face a countervailing pressure to respect parents' choices about how to raise their children. Today 65 countries have full legal bans on the punishment of children and young people. Australia and the United Kingdom have outlawed it in schools but not in the home. Why are Australia and Britain outliers? And why have parents' right to smack their children proved more resilient than teachers' powers to cane their pupils, when not so long ago the two were in lockstep? This project will use unpublished archival sources from approximately 1970 to 2000 to fill this gap in knowledge and provide this explanation. The research has the potential to benefit Australians socially and culturally by drawing out the lessons of this still-live history: historical case studies from the recent past provide an opportunity to think through these dilemmas more clearly and dispassionately. Through a policy paper and other public-facing outputs the project team will promote its findings beyond academia to maximise understanding of this history and its ongoing consequences.							
DP250101739 Gramoli, A/Prof Vincent C	**Fair Ordering of Decentralised Access to Resources** This project aims to enable a decentralised platform that ensures client requests are performed in a fair order. This will generate new knowledge which will be significant because current techniques for decentralised management do not prevent participants from manipulating the order in which resources are accessed. Expected outcomes are a new definition of the fair ordering property; a new protocol that provably achieves the property; and a prototype implementation showing the feasibility of these innovations. This should provide benefits such as technology capacity building for Australia, and when eventually deployed in the Decentralised Finance industry, it could grow that industry and protect users from losses. **National Interest Test Statement** Australia is distinctive with a large area, population which is especially spread out geographically, and multiple levels of government and other organisations that cooperate to provide services. Thus Australia should be at the forefront of providing its people and businesses with remote online access to request use of resources which are managed in a decentralized fashion. These resources would range across natural ones such as water, energy, finances, and information. This project will prevent hackers from reordering requests for unfair benefit. The problem already arises frequently in the context of deregulated financial services, where malicious users reorder other user trades to benefit themselves. This is commonly referred to front running attacks, back running attacks or sandwich attacks, which benefit hackers to hundreds of millions of US dollars every year in blockchain environments. This project will offer new approaches using cryptographic techniques so that the ordering of requests that cannot be altered by malicious activities. Hence such a solution will ensure Australian citizens can have access to resources in a fair way, regardless of cyber attacks.	77,167.00	156,729.00	163,044.00	83,482.00	0.00	0.00	480,422.00
DP250101885 Maalsen, Dr Sophia W	**Deep learning: Governing the City in the Age of Artificial Intelligence** The diffusion of AI across city life & city space will transform cities & their governance. First-mover cities (eg London, Singapore, NY) are devising novel frameworks to govern AI urbanism, AIs' emergent capabilities and the risks autonomous, algorithmic decision-making pose to urban life. Australian cities, on the precipice of this transformation, urgently require such frameworks. Analysing the governance of AI urbanism internationally, this project aims to develop new empirical understanding of and conceptual frameworks for urban governance involving non-human intelligences. Its outcomes will guide the development of appropriate institutions and practices to govern AI urbanism to mitigate inherent risks and enhance urban outcomes. **National Interest Test Statement**	75,202.50	206,636.50	248,800.50	117,366.50	0.00	0.00	648,006.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Cities are now in a new phase described as ‘AI urbanism’ in which the diffusion of AI deeply influences urban life, governance and planning. AI is being adopted by public and private organisations, spanning algorithmic design and decision-making, robotics, public safety, mobility management, service delivery and more. National policy in Australia expects AI will make ‘better towns, cities and infrastructure’, but that can only occur if Australian cities marshall the appropriate set of institutions, the relevant combinations of expertise and practices, and effective regulatory mechanisms. This project identifies key lessons from the ‘first mover’ sites of urban AI application inside and outside Australia and translates these learnings into the Australian context. Through its findings, methodologies and outputs including a podcast it will position Australian urban scholarship at the cutting edge of international debates and position urban governance practitioners to take advantage of first-mover lessons. The lessons learned will be vital to devising a uniquely Australian approach to governing the risks and capability of AI in producing better cities.							
DP250101942 Cairney, Prof Julie M	**Hydrogen and the deformation of alloys** This project will provide a knowledge base for the solutions required for safe use of metals and alloys in hydrogen-rich service environments. Alloys can become brittle and catastrophically fail in the presence of hydrogen. Understanding this problem is a necessary requirement for the development of an Australian hydrogen industry. Advanced microscopy and modelling will be used to determine now hydrogen affects the strength of the individual subcomponents, or microstructures, that make up alloys, allowing us to build a mechanism map that will guide the development of embrittlement resistant alloys.	161,747.50	330,953.00	348,324.00	179,118.50	0.00	0.00	1,020,143.00
	National Interest Test Statement Australia’s National Hydrogen Strategy anticipates substantial economic benefits, predicting the creation of around 7,600 new high-skill jobs and a contribution of $11 billion per year to GDP by 2040-2050. However, a major roadblock is that hydrogen can make metallic infrastructure brittle and potentially fail. In this project we will break this complicated problem down by determining the individual responses of the different micro-scale components of alloys when deformed in the presence of hydrogen. We can then predict how these components will influence the overall alloy behaviour, allowing the design of future alloys alloys with favourable structures. We will achieve this by utilising new advanced microscopy techniques pioneered in our lab and a modern approach to modelling hydrogen behaviour that combines density functional theory and machine learning. This comprehensive, first of its kind study will result in new knowledge and new analysis methods that will be useful for researchers designing new durable metal alloys that are less susceptible to embrittlement and can be used for the safe generation, storage, and transportation of hydrogen. In the long term, success with this project will ensure that Australia is able to receive the substantial economic and environmental benefits of this clean energy source.							
DP250101953 Seebacher, Prof Frank	**Determining endocrine-mediated plastic responses to transient heat waves** This project aims to determine the resilience of animals to heat waves, measure the underlying mechanisms and model these mathematically. It expects to use a novel approach by analysing impacts of transient changes in warming rates and magnitudes on hormone-mediated effects on biological functions. Expected outcomes include filling a knowledge gap by showing the vulnerability of animals to dynamic heating events, and developing a mathematical model that can predict resilience resulting from compensatory plastic responses. Benefits include advancing the knowledge base leading to improved management of the climate crisis, and national and international collaboration will promote research excellence and enhance staff and student training.	94,283.50	185,020.50	187,766.00	97,029.00	0.00	0.00	564,099.00
	National Interest Test Statement Heat waves are an increasing threat to humans and natural systems. Australia is particularly vulnerable to heat waves and is already experiencing extreme ecological impacts, e.g. coral bleaching on the Great Barrier Reef. Australia will therefore benefit from new approaches facilitating more effective responses to heating events. This project proposes a novel approach to analyse the resilience of animals to heat waves with different rates and magnitudes of temperature change. Innovative science is the foundation for effective environmental management. The outcomes of this project will help build the foundation for next-generation environmental management particularly by providing a mathematical model as a diagnostic tool. The model is calibrated with experimental data and can predict the resilience of animals to climate heating events. Inputs can include experimental data, and measured or predicted climate data. Identifying areas of particular vulnerability will improve effectiveness of funding allocations for management interventions, which will be of economic and environmental benefit for Australia. We will target conservation and management forums (journals, meetings, organisations) to publicise the applied aspect of this project. The project will foster national and international research collaboration between investigators and their laboratories, and the resultant staff and student training will be of social and economic benefits to Australia.							
DP250102124	**Cementless carbon-negative concrete for buildings and the built environment**	115,921.50	237,168.50	163,459.00	42,212.00	0.00	0.00	558,761.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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Ranzi, Prof Gianluca	This project aims to develop a cementless carbon-negative concrete technology that addresses current decarbonisation needs of the cement industry that is responsible for about 8% of the world's CO2. The project expects to generate new knowledge in this area to enable the establishment of a concrete technology that will act as a secure and significant carbon sink while remaining structurally sound and durable. Expected project outcomes consist in the establishment of the new concrete technology with negative carbon-embodied characteristics for mass production and for a wide range of applications in buildings and the built environment. This will lead to significant benefits for the Australian building and construction industry.							
	National Interest Test Statement							
	The building/construction sector accounts for 37% of the world's CO2 emissions and is currently off track to achieve decarbonisation by 2050 with a widening gap between the actual and the necessary decarbonization pathways. Concrete is responsible for a significant carbon footprint of the construction sector because cement (one of its key components) produces about 8% of the world's CO2. It is critical for Australia to find ways of competing in the construction industry using research-based methods, and the project's technological cutting-edge developments are expected to have a positive impact on the capacity of the Australian construction industry through the development of a new cementless carbon-negative technology for reducing the carbon footprint of buildings and for supporting the implementation of effective strategies to achieve net-zero and negative-carbon constructions while relying on available concrete production equipment and processes to enable an efficient industrial translation of the technology in view of the requirements to meet the 2030 and 2050 net-zero construction targets. In the increasingly competitive international market, Australian companies and professionals will benefit from having access to a new cementless carbon-negative concrete technology to deliver cutting edge solutions that produce carbon-negative and healthier buildings and urban solutions.							
DP250102180	**Unravelling sea level, climate and coral reef responses to global change**	170,760.00	353,675.50	370,144.50	187,229.00	0.00	0.00	1,081,809.00
Webster, Prof Jody M	The Earth's climate has swung between intervals with massive ice sheets to times where ice sheets retreated. The impact of these transitions on sea level, tropical/subtropical seasonal climate and their consequences for coral reefs are not well understood. This project will investigate a globally unique sequence of drowned fossil reefs offshore Hawaii to decipher in unprecedented detail rapid changes in these impacts during transitions in ice sheet extent over the past 500,000 years. We will advance our understanding of the fundamental drivers of sea level, tropical/subtropical climate and coral reef ecosystem responses during periods of major and abrupt climate instability.							
	National Interest Test Statement							
	Earth's climate system is influenced by complex interactions between energy from the sun, atmospheric CO2, ice sheet dynamics and global sea level changes. We broadly understand the interplay between these factors but the specifics of the leads, lags and timing result in significant uncertainties about future global projections. This project investigates catastrophic and abrupt sea-level rise (several to tens of metres) from ice sheet retreat, what impact annual global climate change (i.e. global warming) has on seasonal-interannual climate phenomena (i.e. droughts, floods and marine heat waves), and how coral reef ecosystems respond to these changes. To investigate these parameters the project draws on insights from drowned fossil reefs offshore Hawaii, a site that preserves a detailed and globally unique history of change over the past 500,000 years. The project outcomes apply globally, including for Australia's coastal zone and the World Heritage listed Great Barrier Reef. The national and international significance of our project is underpinned by a $27 million investment by the International Ocean Discovery Program (IODP) to collect the fossil reef samples we will utilise.							
DP250102186	**Cross-scale Neurobiology of Compositional Cognition**	142,979.50	356,634.50	395,468.00	181,813.00	0.00	0.00	1,076,895.00
O'Callaghan, Dr Claire	Despite its critical role in cognition and in modern neuro-inspired artificial intelligence, the neural mechanisms of compositional cognitive processes in the human brain remain elusive. Our distinguished interdisciplinary team – leveraging expertise in psychopharmacology, neuroimaging, and neural modelling – is poised to illuminate this complexity. We will combine dynamic neural signatures during cognitive tasks, the perturbation of neurochemical systems, and advanced biophysical models to test our novel neuromodulatory compositionality hypothesis. Our research will provide unprecedented insights into the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	neurobiology of compositional cognition, and in this way, will accelerate the convergence of neuroscience and artificial intelligence. **National Interest Test Statement** From learning a new concept in the classroom, to mastering a new sport, or navigating a new city, we are constantly challenged by situations that require us to build on and adapt our existing knowledge. This ability to recombine knowledge in new ways is a core feature of human intelligence. We use it every time we solve a new problem, learn a new concept or create a new thought. Despite its ubiquity in our daily lives, we do not know how the brain achieves this. This interdisciplinary project uses state-of-the-art neuroscience techniques to show the neural, chemical and computational brain processes that enable us to reuse and recombine knowledge. Impairments in this core cognitive capacity lead to learning deficits and rigid thinking patterns, which affect people during development and normal ageing. By identifying the underlying neural-chemical brain processes, the project will inform new pharmacological, brain stimulation and cognitive training strategies to improve learning and creativity, leading to profound social and economic benefits for Australia. Beyond this, the human capacity to reuse and recombine knowledge is a major inspiration for modern artificial intelligence. By identifying the computational processes, the project is designed to directly inform biologically-inspired artificial intelligence algorithms, with the potential for widespread commercial applications and significant economic benefits.							
DP250102223 Kindt, Prof Julia C	**Herodotus, Thucydides, and the 'Discovery' of Truth in Ancient Greece** Ancient history has much to tell us about the polarization in the political cultures of many Western societies today. More specifically, it speaks to larger questions emerging from contested notions of truth and truthfulness at the heart of this polarization. This project aims to explore how truth first emerged as a problem among some thinkers in Classical Greece. It expects to generate the first study of the social, political, and intellectual conditions that led to the emergence of truth as a social value. Outcomes include a better understanding of what is at stake in our joint commitment to the real and factual, and what would be lost if we give up on it now - with broad benefits for our grasp of political cultures past and present.	55,000.00	122,500.00	117,500.00	50,000.00	0.00	0.00	345,000.00
	National Interest Test Statement Australia, like many other Western democracies, is currently witnessing an increasing internal polarization. We can't seem to agree any more on many fundamental issues and consensus-finding – essential to a healthy democracy – becomes ever more difficult. Most worryingly, it is not just that we disagree on many questions of general concern; with notions of truth and truthfulness themselves becoming contested we seem at risk of losing our shared grip of 'the real' and factual. This project speaks to these problems. It reveals what is at stake in the current situation by returning to ancient Greece as the time and place when notions of truth and truthfulness were first 'discovered' in the history of the West. By exploring the circumstances surrounding the emergence of truth as a problem among certain ancient Greek thinkers it helps us to understand what is at stake in the current situation and what would be lost if we give up on our joint commitment of the factual and real now. Findings of the project will not only be shared with the wider public in public-facing lectures, articles, and workshops, members of the public will also be directly involved in the project through a series of 'humanities salons' housed at Sydney University.							
DP250102294 Kesten, Prof Dr Onur	**Online Dispute Resolution: A Market Design Approach** In the last five years, to contain the billions of dollars worth costs of the formal court system, several areas of Australian legislation mandated that individuals seek dispute resolution services before resorting to the machinery of formal justice. Using a state-of-the-art combination of theory and experiments, this project aims to study mediation in an analytic and tractable setting through the lens of the emerging field of market design. The goal is to develop optimal, fair and neutral mediation protocols and compare and contrast their performances with current methods in the industry. The project will provide direct benefits to society via the deployment of the first digital and not-for-profit dispute resolution platform in the world.	21,785.50	51,421.50	98,413.00	128,145.50	59,368.50	0.00	359,134.00
	National Interest Test Statement Over the past five years, legislation has increasingly required individuals to seek dispute resolution services before going to court. Online dispute resolution (ODR) systems offer numerous advantages over traditional mediation, including better accessibility, convenience, cost-effectiveness, and faster resolution. Despite their global prevalence, ODR systems are underutilized in Australia. This project will benefit the society in three significant ways. Firstly, the research addresses critical questions for the mediation industry by identifying the most effective ODR protocols. The outcomes can significantly reduce social, financial, and environmental costs, freeing valuable resources for other sectors. Secondly, the results will inform practical policy and institutional design, promoting better integration between law and economics—two of Australia's key fields. Thirdly, the project offers significant							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	educational and training benefits by supporting undergraduate and graduate student research, providing opportunities to engage with ODR developments. The findings will be disseminated through publications and meetings with practitioners, and an online platform featuring the project's outcomes. By advancing ODR system effectiveness and utilization, this project will enhance the mediation industry and contribute to broader societal and economic benefits, supporting Australia's national interests in fostering innovative, efficient, and accessible dispute resolution mechanisms.							
DP250102461 Todd, Dr Jemma L	**Re-Imagining Pain: Mental Imagery Impact on Pain Perception** This project aims to explore how mental imagery influences pain perception, anxiety, and expectancy. By leveraging cutting-edge virtual reality technology, we'll uncover the role of mental imagery in pain experiences. Our interdisciplinary team, collaborating internationally, will conduct controlled experiments and ecologically valid experience sampling, to better understand the impact of mental imagery on pain perception. The outcomes may pave the way for novel interventions beyond this project, benefiting over 3 million Australians suffering from chronic pain. This research not only enhances our understanding of pain dynamics but also holds potential for future cost-effective clinical treatments, reducing suffering and healthcare costs.	101,000.00	217,500.00	233,000.00	116,500.00	0.00	0.00	668,000.00
	National Interest Test Statement This project addresses critical gaps in our understanding of pain, an everyday experience that can become debilitating. Current psychological models focus on thoughts and feelings about pain, but completely neglect the role of mental imagery, despite its frequent, distressing, and intrusive nature in people experiencing pain. Our research seeks to advance knowledge in pain research and theory by exploring the causal relationship between mental imagery and increased pain perception. Using rigorous experimental designs and innovative approaches like virtual reality, we will delineate the role of specific aspects of mental imagery, building a more comprehensive model of pain. Our collaboration with leading international experts in pain and imagery will inform further research in cognitive science, and applied research to prevent everyday pain experiences from becoming debilitating. Chronic pain affects one in five people (over 3 million Australians) and currently lacks effective treatments due to an incomplete understanding of its mechanisms. Our studies provide a foundation for developing scalable, low-cost treatments that could improve quality of life for people with chronic pain, offering significant healthcare, economic, and societal benefits for Australia. Additionally, we will promote our research outcomes beyond academia through public outreach, working with healthcare providers, and via media channels, ensuring maximum reach, translation, and adoption of findings.							
DP250102562 Huber, Dr Daniel	**Decoding Stellar Physics with NASA's James Webb Space Telescope** A detailed understanding of stars underpins much of modern astronomy, ranging from galaxies to planets orbiting other stars. One of the most poorly understood processes in stars is convection, the periodic up and downwelling of gas cells on the surfaces of stars. This project will use data from NASA's James Webb Space Telescope to study stellar convection at infrared wavelengths for the first time. Expected outcomes include the stringent tests of state-of-the-art models of convection, and insights how convection affects our understanding of exoplanet atmospheres. Expected benefits include strengthening Australia's leadership in major growth areas in astronomy and training students with cutting-edge data from a NASA flagship mission.	76,209.50	155,367.50	161,382.50	82,224.50	0.00	0.00	475,184.00
	National Interest Test Statement Gaining insights into stars underpins much of modern astronomy. Current studies focus on the variability of stars in visible light. This project will leverage data from the most powerful NASA space telescope ever built - the James Webb Space Telescope (JWST) - to study the variability of stars in infrared light for the first time. Australia has a long-standing reputation for excellence in astronomy research, and we aim to see Australia recognised as a world centre for excellence in stellar astrophysics. This will strengthen Australia's leadership in research using space telescopes, including possible future partnerships with the growing Australian space industry. The project will benefit Australians by training students in the use of data from the world's premier astronomical facility, providing them with analytical and computational skills that have wide applicability. The innovative project will also establish Australia's reputation as a world-leading user of JWST data, bolstering international collaborations with world-leading institutions working with space-based data. The launch of JWST has sparked an incredible public interest in astrophysics in Australia and around the world. Through the large visibility of JWST in the media, the project will attract young Australians to take up careers in science and technology. Results from this project will be promoted to the public via extensive resources available via the media offices of NASA and the University of Sydney.							
DP250102645	**Lord Howe Island Genomic Observatory** The vast majority of extinctions have occurred on islands. Island conservation	104,483.00	227,141.00	227,569.50	104,911.50	0.00	0.00	664,105.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Lo, Prof Nathan	programs have traditionally focussed on vertebrates, with invertebrates largely ignored. We will establish a 'genomic observatory' on World Heritage Listed Lord Howe Island (LHI) by comprehensively characterising its terrestrial invertebrate fauna. We will combine cutting edge DNA methods with traditional taxonomy to enable future monitoring of LHI's biodiversity, and investigate its evolutionary past. We will utilise extensive collections made before and after the LHI Rodent Eradication Project (2019) to analyse its effects on invertebrate abundance. Our project will provide a model system for safeguarding island ecosystems against future anthropogenic change.							
	National Interest Test Statement							
	Our project will address the Australian Government's Strategic Research Priority: "Environmental change - options for responding and adapting to the impacts of environmental change on biological systems…". The project will provide a significant advance in our understanding of Lord Howe Island's arthropod biodiversity, which will help to safeguard LHI's ecosystems against future anthropogenic change. The project will provide an important platform for future projects that monitor LHI's other fauna and flora, to protect against invasive species, and prevent the extinction of endemics. The project will contribute to several goals of the Lord Howe Biodiversity Management Plan, including Objectives 14 (To improve knowledge and management of threatened and significant fauna species) and 14.1.1 (Conduct species-specific fauna research based on identified research priorities into the ecology of priority species, particularly with regards to reproductive ecology and habitat requirements) and Corporate Plan Item 4.4 (Improve awareness and understanding of the environment through education and research. Action 2: Encourage appropriate environmental research which is of benefit to LHI environment and community). Lord Howe Island's spectacular geography and significant number of endemic species led to it being added to the World Heritage List in 1982. Our project will contribute to the preservation of this area, for the benefit of future generations of Australians.							
DP250102777	**Optimising Future E-Fuel Blends for Spray Atomization and Combustion**	96,439.00	199,420.00	212,899.50	109,918.50	0.00	0.00	618,677.00
Masri, Prof Assaad R	Aims: This project aims to establish a scientific framework that exploits single-component e-fuels/powerfuels to formulate blends that atomize into optimal sprays for clean and efficient combustion. This will be demonstrated using novel, hybrid flash-air-assisted atomizers, and canonical burners. Advanced laser diagnostic methods will be employed to measure the spray quality and flame structure. Significance: The generated e-fuel blends will power future carbon-neutral energy conversion systems. Expected outcomes include predictive methods to tune the selection of e-fuel blends based on novel data sets. Benefits: This new approach will inform and guide Australia's transition from fossil-based fuels to optimal blends of carbon-neutral fuels.							
	National Interest Test Statement							
	E-fuels, also termed "green" because they are generated from renewable sources, are integral to the global transition towards net-zero-carbon. Liquid e-fuels offer attractive advantages over gaseous alternatives such as hydrogen or ammonia because they are common single-component liquids that do not have compatibility issues and can be easily transported using existing networks, infrastructure, and shipping methods. This project addresses the fundamental scientific challenges which remain unsolved yet critical towards the exploitation of single-component liquid e-fuels to enable novel blends that can optimize the processes of atomization and combustion. This will be achieved by resolving two outstanding research gaps: (i) efficient break-up of liquid e-fuel blends, and (ii) stable turbulent combustion of these sprays with minimal formation of pollutants. The resulting e-fuel blends will not only benefit a cleaner global environment but have the potential to yield economic gain to Australia through novel e-fuel manufacturing industries. This project will train the next generation of scientists who will position Australia as a leading power in the deployment of green e-fuels and facilitate its drive towards decarbonization. The project will leverage existing links with industry to communicate the advances to the mining, manufacturing, and transport sectors, to encourage uptake, and to exploit a unique opportunity to develop more efficient production methods for liquid e-fuels.							
DP250102931	**Wiring Australian Cities: Making Space for Telecommunications**	101,215.50	204,656.50	216,753.50	113,312.50	0.00	0.00	635,938.00
Iveson, Prof Kurt J	This project aims to critically examine the ways that land, labour, materials, finance and territorial authority are assembled and contested in the process of wiring and rewiring Australian cities for telecommunications connectivity. The project will generate new knowledge on how the wiring of Australian cities is achieved, and the geographical and social impacts of the wiring process. Outputs including innovative visualisation tools will generate original insights into the making and materiality of infrastructure space. This will provide significant benefits, including new approaches to identifying and addressing on-going							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	challenges of making space for telecommunications in crowded urban environments. **National Interest Test Statement** Present-day communication relies on millions of kilometres of copper wire and fibre-optic cable that stretch between and within cities. At a time when Australian cities are once again being rewired for telecommunications in a $2.4 billion upgrade to the NBN, this timely project will be the first to study the sweeping social, political, economic and environmental impacts associated with wiring Australian cities. It will examine the ways that land, labour, finance government powers and natural resources are assembled and contested in the process of wiring Australian cities for telecommunications connectivity. The new knowledge generated by the project benefit Australian governments, industries and communities who are managing the challenges and impacts of re-wiring urban environments for broadband connectivity. This will foster better cities, informing efforts to ensure that the process of infrastructural improvement is technically effective, and is also equitable and sustainable. Through engagement with telecommunications industry operators and regulators, and through media and public exhibitions to engage with communities, the project will help to connect and build the capacity of stakeholders who are involved in the on-going process of wiring cities.							
DP250102961 Sarina, A/Prof Sarina	**Recasting Metal Surface by light for High Selective Epoxide Production** Epoxides, including propylene oxide, ethylene oxide etc, serve as crucial chemical building blocks with the epoxide market projected to surge to USD 86 billion by 2029, optimizing their production becomes imperative. High selectivity for epoxide products poses a significant challenge, due to the instability of metal-based catalytic materials. This project endeavors to overcome this obstacle by harnessing the power of light to either inhibit or reverse the surface oxidation of metal catalysts. By doing so, we aim to drastically enhance the selectivity of epoxide products. This innovative approach holds the potential to reshape the landscape of epoxide manufacturing, paving the way for a more prosperous and environmentally friendly future. **National Interest Test Statement** The current rapid industrial development increases the reliance on non-renewable energy and the release of carbon dioxide into atmosphere - which in turn lead to energy and environmental crises globally. This project develops chemical production method utilizing sunlight as the major driving force, focusing on the epoxide compound production from raw chemicals. Epoxides, are pivotal chemical building blocks utilized in the production of numerous commodity chemicals, such as polyurethanes and polyesters. The epoxides market is projected to attain a value of USD 86 billion by 2029. However, the current heating-based industry resulted high energy consumption and greenhouse gas emission. The technique that drives this synthesis by sunlight is providing an energy-saving and environmentally sustainable method to power these important industries. This project is to develop a cutting-edge, advanced catalytic platform on which to achieve photo-controllable chemical synthesis for epoxide containing products by utilizing Australian abundant sunlight as energy source. In summary, the timely technique that we are developing through this project will control and harness light as a source of green energy and as a means to control the attributes and function of advanced industrial synthesis.	80,818.00	144,136.00	126,636.00	63,318.00	0.00	0.00	414,908.00
DP250103080 Ho-Baillie, Prof Anita W	**Perovskite transistor memories for neuromorphic intelligent applications** In the era of big data, efficient in-memory computing overcomes traditional computing architecture bottlenecks. Inspired by neural networks, artificial synaptic memory, or non-volatile memory, in the form of floating-gate field-effect transistor (FG-FET) holds great promise. Metal halide perovskite FG-FETs offer cost-effective, energy-efficient solutions, especially for flexible and wearable devices and offer additional photo-memory capability for image recognition. This project aims to discover lead-free perovskites with reduced dimensional structure to enhance charge mobility and photosensitivity for non-volatile memory. The anticipated outcome is the first demonstration of perovskite transistors in synaptic floating-gate memories. **National Interest Test Statement** This project aims to develop non-volatile memory devices, inspired synapses in human neuronal networks, for high-efficiency and low-energy in-memory computing. Such devices can be realized by floating-gate field-effect (FG-FET) transistors as they do not require additional capacitor or resistor for memory functions. Two-dimensional lead-free metal halide perovskites with excellent semiconductor properties are suitable materials for these transistors. Current developments have been limited to optimizing transistor components in a piece-wise manner. Therefore, this project aims to demonstrate a fully integrated rationally designed floating-gate synaptic memory via a multi-national collaborative and integrative research approach. Expected outcomes will benefit one of Australia's critical technologies, "machine learning, including neural networks and deep learning" technology for	120,144.00	225,627.00	210,999.50	105,516.50	0.00	0.00	662,287.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	“neuromorphic computing” application. Applications can be further extended to wearables or flexible electronics due to perovskites’ compatibility with flexible substrates and solution-based fabrications. Their tunable opto-electronic properties enable additional photo-memory, useful for image recognition. This project will bring social and economic benefits to Australia by training a new generation of scientists and engineers for the growing field of global neuromorphic computing.							
DP250103135 Williams, Prof Stefan B	**Introspection for Resilient Robotic Perception in Challenging Environments** The project aims to enhance robotic perception in challenging environments such as murky water and extreme weather where state-of-the-art approaches fail. By developing new representations and processing architectures capable of introspection, it enables robots to recognise and adapt to their own perceptual limitations. Expected outcomes are robotic systems with unprecedented resilience in challenging application domains like infrastructure monitoring and autonomous driving. This should bring economic benefit to Australia with broad robotic deployments in environmental monitoring and understanding of critical marine and terrestrial ecosystems, parks, and infrastructure, and improved mobility for the elderly and disabled.	54,104.00	154,918.00	207,401.50	106,587.50	0.00	0.00	523,011.00
	National Interest Test Statement Robots are poised to play a critical role in Australia’s future. Managing our agricultural and ecological resources and ageing infrastructure and transport systems will increasingly rely on resilient robotic systems. However, robots are not ready for widespread deployment as their perception systems fail in challenging conditions such as murky water and adverse weather. This project will develop the knowledge required to construct resilient robotic systems that introspect to reason and act on the limitations of their perception systems. This will allow much broader deployment across diverse application areas critical to a secure and sustainable economic future. It will improve monitoring, understanding and management of critical ecosystems and infrastructure and environmental change in marine ecosystems such as the Great Barrier Reef which is worth billions of dollars annually and is of critical ecological importance on a global scale. It will improve assessment of parks, fisheries and shipping lanes and enable maintenance of cables, pipelines, roads and buildings. We will promote this work beyond academia through ongoing outreach programs employing traditional and social media, by publishing tools and tutorials and by supporting clubs and activities open to the general public. As the technologies of this program reach maturity we will continue our long history of engaging with industry and government partners to bridge the gap to practical deployment.							
DP250103207 Liao, Prof Xiaozhou	**Atomic-scale mechanisms of mechanical behaviours of metallic materials** This project aims to utilise atomic-resolution in-situ deformation transmission electron microscopy to unravel the mechanisms governing the mechanical behaviours of metallic materials. The mechanical properties of materials depend on their atomic-scale deformation responses under stress. These deformation behaviours are further influenced by local microstructures, a relationship that remains inadequately comprehended. Successful completion of the project will reveal how different microstructural features of materials impact their mechanical properties. This should guide the design of metallic structures with optimal mechanical performance, offering substantial benefits to Australian metallurgical and related industries.	99,015.50	203,356.50	214,753.50	110,412.50	0.00	0.00	627,538.00
	National Interest Test Statement Understanding the stress-induced atomic-scale behaviour of materials is crucial for determining how microstructures impact their mechanical properties and for designing materials with superior mechanical performance for advanced structural applications. However, experimental investigations in this area have been challenging due to the lack of appropriate techniques. This project aims to leverage the latest advancements in microscopy technology to explore the atomic mechanisms of defect interactions in metallic materials and to understand their impact on mechanical properties. The outcomes of this project will guide the future design of ultra-strong and tough metallic materials, enhancing the competitiveness of Australia’s metallurgical industry. This could lead to the development of lighter and more energy-efficient vehicles, making road travel more cost-effective for Australians, reducing environmental impact, and promoting sustainable transportation solutions. To maximise the understanding, translation, use, and adoption of the research beyond academia, we will engage with industry partners, participate in public outreach initiatives, and disseminate findings through various media channels and industry conferences. Collaborations with manufacturing firms and policy makers will be sought to ensure practical application and commercial development of the new knowledge.							
DP250103280	**The Socio-Economic Impacts of Colonialisation in Australia** The economic history of Australia is very deeply linked to its colonisation. Using	58,331.00	181,023.00	247,922.00	231,206.00	105,976.00	0.00	824,458.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Vidal-Fernandez, A/Prof Marian	newly collected British and Irish records of settlers, Australian arrival records and subsequent censuses, together with current and recent rich administrative health records and surveys, this proposal will create a rich dataset to measure the impact that British colonialisation had on Australia on a range of socio-demographic and economic outcomes in the short and long-run. Understanding the dynamics of these foundational periods is crucial for shedding light on the root causes of contemporary disparities among disadvantaged Australians and informing effective policy measures. **National Interest Test Statement** Australia's current socio-demographic landscape is shaped by its colonial history. Nonetheless, our knowledge of the lasting impact that Australian colonialism had on current socio-economic outcomes is scarce. Unraveling the dynamics of foundational periods is crucial for understanding the root causes of current socio-economic disparities among Australians. This novel project exploits the power of merging large-scale data and text from historical records, censuses, gazettes, and newspapers in Australia and the UK, together with current Australian surveys, to measure the impact that maritime travel mortality, colonialists' characteristics, and sentiments expressed in such documents had on the socio-economic outcomes of Australians up to the present day. We create an unprecedented, user-friendly, Open Access dataset, fostering high-quality projects in all social sciences globally, and accessible to history teachers and the public, expanding the evidence-based knowledge and views that Australians have about their history, and possibly impacting Australian school curriculums. In addition, this project supports mentoring of undergraduate, PhD, and early career researchers, thereby enhancing Australia's research capabilities. The results of this project will be disseminated widely among the community through open access news articles, anticipated high levels of media attention, and public events and workshops in collaboration with state libraries and historical societies.							
DP250103360 Ho, Prof Simon Y	**The biological drivers of evolutionary rate variation** Phylogenomic data provide valuable opportunities for studying evolutionary rates and timescales. These analyses require theoretical and statistical tools based on molecular clocks. This project will use recently developed frameworks for exploring and testing evolutionary rate signals in phylogenomic data. This information will be used to test for drivers of evolutionary rate variation at the genome scale, using whole genome sequences from birds, ruminants, and other organisms. The project has strong potential to provide valuable insights into the biological factors that govern molecular evolution at the genome scale. **National Interest Test Statement** The evolutionary processes that have generated the vast diversity of form and function show enormous variation across the Tree of Life. This project aims to answer how rates of evolution vary across species and across their genomes and physical traits, and to identify the main biological and environmental drivers of evolutionary rates. This investigation will be performed on an unprecedented scale, which is only possible because of recent innovations in this field of research. The project will take advantage of new methods and apply them to large data sets from a range of animals and plants, with detailed studies of birds, Australasian marsupials, ruminant mammals, flowering plants, and other groups. This project will contribute to a greater understanding of fundamental evolutionary processes, including the biological and environmental factors that have driven the evolution of large components of Australia's faunal and floral diversity and will continue to do so in the future. The project will provide training opportunities for emerging researchers, while new approaches will be incorporated into national training workshops to encourage their uptake. Research collaborations with Denmark, China, and the USA will be strengthened through exchange of knowledge and expertise. The research outcomes of the project will be communicated to broad audiences through scientific publications and popular media, including news articles aimed a broad audience, podcasts, and public talks.	80,709.50	165,944.50	182,241.50	97,006.50	0.00	0.00	525,902.00
DP250103393 Fardouly, Dr Jasmine	**Beyond Unrealistic Standards: Regulating Social Media Ads for Body Image** The proposed project aims to develop legal/policy initiatives to reduce the harm of social media ads on users' body image by making them more inclusive and attainable. This project will generate new knowledge on the acceptability of these initiatives among key stakeholders, including consumers, influencers, advertisers, and brands. It will also generate key psychological, economic, and legal evidence for the effectiveness of these initiatives using interdisciplinary approaches. Expected outcomes of this project include an evidence base with potential for rapid policy translation to improve social media. This should provide significant social and economic benefits by reducing the burden of body dissatisfaction in Australia and globally.	123,656.50	278,722.00	216,949.00	61,883.50	0.00	0.00	681,211.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement							
	The promotion of unattainable beauty ideals in social media ads can be harmful to users' body image, leading to devastating social, psychological, and physical outcomes. Current government initiatives to improve ads for body image are ineffective, and there is limited research on other approaches to guide government decisions. The proposed project will develop new legal/policy initiatives in collaboration with key stakeholders, including adolescent and adult consumers, social media influencers, advertisers, brands, and policymakers to promote more inclusive and attainable beauty ideals in social media ads. It will also generate key psychological, economic, and legal evidence for the effectiveness of these initiatives. Thus, the project will provide an evidence base with the potential for rapid policy translation to improve social media. By moving beyond unrealistic beauty standards and the burden of body dissatisfaction, this research will provide significant social and economic benefits for Australians in helping improve people's quality of life, social relationships, and future career success. The results of the project will be disseminated to industry leaders, advertising bodies, and policymakers in Australia via a policy report and end-user seminar. These will trigger the discussion of the next steps to improve social media, positioning Australia as a world leader in implementing evidence-based initiatives to make social media a safe environment for users' body image.							
DP250103558	**Dynamic Presentation of Physical Cues to Engineer Aging Models**	140,000.00	260,000.00	242,500.00	122,500.00	0.00	0.00	765,000.00
Lim, A/Prof Khoon S	The lack of suitable aging models is a major roadblock to unravelling the fundamental mechanisms driving human aging. Thus, we aim to engineer physiologically relevant in vitro aging models ie aging in a dish. We will focus on physical properties (structure and mechanical stiffness), which will be programmed to undergo temporal changes at varying resolutions, magnitudes, and time scales. We anticipate novel reproducible models that will recapitulate the dynamic microenvironmental changes in physical properties during the aging process. These aging models will generate new knowledge including novel cellular aging mechanisms by decoupling matrix composition and physical properties, as well as methods to track cellular phenotypic changes.							
	National Interest Test Statement							
	Aging is an inevitable process that causes time-dependent deterioration of physiological processes necessary for human survival. To date, the multi-faceted interplay of mechanisms driving human aging remains poorly understood. Animal models are currently considered as gold standards for aging studies, but lack translatability to humans. Thus, this project focuses on engineering physiologically relevant in vitro aging models - aging in a dish. Novel reproducible models that will recapitulate the dynamic microenvironmental changes in physical properties during the aging process will be created and potentially replace the use of animal models. Future benefits of the project outcomes include catalysing the development of next generation dynamic biomaterials that are not limited to aging, but also other applications including tissue engineering, regenerative medicine, tissue models, disease modelling and drug discovery. As the demand for biomaterials usage has increased globally, with a market size poised to reach $249 billion by 2028, this is a key area of investment for Australian research and materials industry. This project is expected to lead to future commercial benefits in national priority areas of advanced manufacturing of high-value, high-performance materials, by technology licensing and transfer to existing and new industry partners.							
DP250103783	**Pioneering Federated Real-Time Video Analytics**	82,500.00	165,000.00	165,000.00	82,500.00	0.00	0.00	495,000.00
Zhou, A/Prof Bing B	Real-time video applications will fundamentally change our future work and lives. This project proposes deep-learning solutions combined with federated analytics, to address fundamental limitations of existing solutions bottlenecked by large video size, limited bandwidth, and data privacy. The project will generate new knowledge of combined deep learning and distributed computing to achieve real-time video delivery and intelligent video analytics with low delay, high accuracy, and protected privacy. The expected outcome includes novel algorithms and principles, and a practical system to realise them in the real world. It will provide significant benefits for all organisations and users who utilise real-time videos in daily work and life.							
	National Interest Test Statement							
	Real-time video delivery and analytics are essential technologies for modern societies, with important applications such as smart building management, smart health, smart traffic monitoring and control, and video conferencing, which have been crucial in post-pandemic era. This project develops novel methods and technologies for high-quality real-time video delivery and analytics in dynamically varying, bandwidth-limited, and insecure networks. Additionally, it significantly enhances privacy protection by ensuring that sensitive information in real-time videos remains secure while allowing necessary analytics. The successful completion of this project will lead to the broader adoption of applications based on high-quality real-time video analytics. Modern digital applications, such as smart livestock farming, precision agriculture, remote healthcare, online clinics, and remote education, will promote automation, reduce labour costs, and decrease the need for transportation, particularly benefiting regional areas of Australia. Consequently, this project offers significant economic, commercial, environmental, and							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	social benefits to the Australian community. The developed system can be well demonstrated to the public, industrial partners, and policymakers with visualised gains, showcasing its practical applications and effectiveness in real-world scenarios, thereby maximising understanding, translation, use, and adoption of the research beyond academia.							
DP250103877 Maggi, A/Prof Federico	**Soil carbonates: the missing link in the soil carbon budget** This project aims to address the knowledge gaps about the role of inorganic carbon in soil carbon turnover and its impact on climate-change mitigation. The significance of this research lies in the fact that inorganic carbon accounts for over 30% of soil carbon but is little studied despite it is affected by climate change and land-use practices. The expected outcomes include the development of a soil carbon turnover model that integrates inorganic carbon processes and the mapping of soil inorganic carbon stock changes due to climate change and irrigation across Australia. The benefits of this research will be improved understanding and management of soil carbon stocks, contributing to more effective climate-change mitigation strategies.	94,489.50	285,766.00	344,809.00	281,579.00	128,046.50	0.00	1,134,690.00
	National Interest Test Statement Soil plays a crucial role in mitigating climate change by storing and recycling more carbon than anything else on Earth. Soil carbon can help Australian agriculture achieve carbon neutrality by 2050, while simultaneously increasing the export value of the industry. However, while the focus has addressed organic carbon over the past decades, the way organic and inorganic carbon in combination affect soil's carbon storage is not fully understood. Inorganic carbon, which makes up more than 30%, is impacted by climate change and land-use practices such as irrigation and fertilization, and its link to organic carbon is poorly understood and quantified. Here we propose to generalise a soil carbon turnover model to incorporate inorganic carbon processes in order to model soil inorganic carbon stock changes due to climate change (warming and drying) and map hotspots is dissolution of inorganic carbon due to irrigation in drying and drought-prone areas across Australia. This improved understanding will facilitate management and policy design, including in the economic strategies supporting governmental agencies and private trading of carbon credit units (ACCU), with the estimated volume of 110 million units valued more than 4 billion Australian dollars.							
DP250104166 Li, Prof Qing	**Computational Optimisation of Nonlinear Flexible Mechanical Metamaterials** Aims: This project aims to explore new design approaches for flexible metamaterials attaining prescribed unusual mechanical properties. Significance: The project expects to fill a key methodological gap in "inverse design" of novel flexible metamaterials for achieving exceptional mechanical performance by developing new optimisation algorithms in nonlinear/path-dependent and nondeterministic context. Expected outcome: The study will provide a systematic design framework and enhance our design capacity for developing novel mechanical metamaterials. Benefits: New methodology and designs will potentially lead to technological innovation in soft robot, wearable device, stretchable battery, implant/stent, benefiting our socioeconomic system.	125,914.50	245,299.50	241,376.00	121,991.00	0.00	0.00	734,581.00
	National Interest Test Statement High performance materials constantly play a vital role in driving scientific discovery and technological innovation. As a brand-new class of materials, metamaterials exhibit a range of extraordinary physical properties through its elegant multiscale structures other than material constituents per se. As a more recent and highly potential branch, mechanical metamaterials achieve exceptional mechanical properties via motion, deformation, and stress-strain response through their well-designed architectures. The initial efforts have largely focused on metamaterials for negative mechanical properties in linear context, such as negative Poisson's ratio, negative shear modulus, and negative thermal expansion coefficients. This project will explore the nonlinear regime of deformation by developing new design optimisation algorithms for novel flexible metamaterials. The research will largely broaden the scopes and generate richer mechanical gain and a greater potential. The outcomes will enable a series of technological breakthroughs ranging from soft robotics, stretchable LIB battery, wearable medical sensors, arterial stents, cushion insoles, and soft implants to impact mitigation. The research training will provide the postdoc researcher, PhD and Hons students with an excellent opportunity to work on an exciting research frontier. The project will promote collaboration with leading institutions and develop academic/industrial partnerships in the field.							
DP250104311 Huang, Prof Dr Jun	**Solar-catalytic glycerol upcycling with co-manufacturing green hydrogen** Sustainable and economically viable bio-refining necessitates an efficient method for utilizing the surplus glycerol generated as a by-product in biodiesel industries.	104,945.50	211,891.00	213,891.00	106,945.50	0.00	0.00	637,673.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	This project aims to construct the solar-driven nanocatalysts and develop new flow reactor to convert glycerol into high-value-added chemicals and green hydrogen fuel simultaneously. The endeavor promises a substantial contribution to advancing the science and technology of achieving 100% atom efficiency in bio-refining, opening avenues for exploring novel chemical and energy sources. Ultimately, this initiative holds the potential to bring about significant economic and social benefits by establishing a competitive business in the chemical and fuel industries of Australia.							
	National Interest Test Statement The project aims to convert biomass waste, specifically glycerol, into valuable chemical feedstock while concurrently generating hydrogen—an essential renewable energy source. Glycerol, a by-product of biodiesel, lacks effective conversion methods. Through innovating new catalysts and a continuous flow reaction system, the project aims to surmount this challenge, enhancing industrial feasibility. It addresses the biofuel sector's imperative for sustainable waste management, easing glycerol disposal and fostering economic opportunities. Additionally, co-producing hydrogen diminishes reliance on fossil fuels and environmental impact. Crucially, it aligns with Australia's strategic interests, potentially boosting the economy through hydrogen export. This project advances sustainability and economic development goals, offering transformative benefits to industry and the environment. Through regulatory support and knowledge dissemination, adoption of this breakthrough technology can substantially contribute to The Australian Government's Net Zero Plan, steering Australia toward an efficient, productive, high-wage economy and positioning it as a renewable energy superpower.							
DP250104964 Zhang, A/Prof Hao	**Structural steel reuse for designing carbon neutral buildings** The project will develop a novel approach for reliability-based design of steel structures with reused steel members. The project will (1) quantify the uncertain properties of reused steel members, (2) conduct reliability calibration to develop design guidelines, and (3) develop a time-dependent reliability method to assess the reusability of existing structures. The design method from this project – the first of its kind globally – will ensure a safety level comparable to structures with new materials, thus not passing risk on to customers. It will enable the Australian and global construction industry to explore the opportunities to reuse steels in construction to achieve significant environmental benefits including net zero emissions.	65,683.50	136,861.50	126,996.00	55,818.00	0.00	0.00	385,359.00
	National Interest Test Statement Approximately half of the world’s steel is used in the construction industry, which contributes significantly to global greenhouse gas emissions. Steel-making from recycling is still energy and carbon intensive. A much more sustainable approach is reuse, i.e., salvaged steel members from old buildings are repurposed directly in new constructions, thus eliminating the energy-intensive remelting process. Despite its great environmental benefit, reuse of structural steel is currently rare in Australia, mainly due to the lack of quantitative guidance for steel reuse in terms of safe design, service life prediction and reusability assessment. The fundamental experimental and reliability studies conducted in this project will produce new knowledge about the properties and structural behaviour of reused steel components, and to provide the industry with the scientific basis for safe design and management of structures consisting of reused steel members. Outcomes from the project will enable the Australian steel construction industry to explore the opportunities for reuse of steel to achieve considerable environmental and social benefits. This will thus contribute to the Australian Government's national mission of emission reduction of 43% by 2030 and Net Zero emissions by 2050.							
	The University of Sydney	5,812,267.50	12,230,855.00	12,191,277.50	6,194,206.50	421,516.50	0.00	36,850,123.00
University of Technology Sydney								
DP250100348 Wang, Prof Qilin	**Next-generation genomic disease surveillance in urban wastewater systems** This project aims to develop an innovative surveillance system capable of quantifying various pathogens and predicting case numbers and healthcare burdens of diverse infectious diseases via wastewater based epidemiology. Current epidemiology approach is retrospective, hindering timely intervention and threatening public health and the economy. This project expects to create a novel	79,196.00	165,892.00	172,552.00	85,856.00	0.00	0.00	503,496.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	surveillance system through wastewater based epidemiology to enable timely intervention and resource allocation. Expected outcomes include a broad-spectrum quantitative metagenomic tool for quantifying pathogens, and models for predicting case numbers and healthcare burdens using pathogen concentrations. This should provide benefits for water and health sectors. **National Interest Test Statement** Human pathogens threaten public health, causing various infectious disease outbreaks and costing the Australian economy billions of dollars annually. Currently, there is an urgent need for proactive identification of diverse human pathogens circulating in the community and predicting their associated infection case numbers and healthcare system burdens. This project aims to develop an innovative wastewater-based surveillance system capable of simultaneously detecting various human pathogens and accurately predicting their associated case numbers, hospital admissions, and intensive care unit admissions, weeks in advance. This will provide insights to assist public health authorities in policymaking and resource planning for outbreaks. Ultimately, the proposed system will reduce pathogen infections and alleviate taxpayers' financial burden by reducing the cost of hospital/medical treatments and loss of productivity due to human pathogen infections, bringing tangible health, social and economic benefits for the entire Australian population. The outcomes are adaptable to different regions and countries. This initiative positions Australia as a global leader in wastewater-based early warning systems for outbreak management and opens a global market for commercialization. The project team's networks with water industry and health department will ensure that the research results reach water and health authorities for implementation, and outcomes achieved beyond academia.							
DP250100362 Ji, A/Prof JC	**Bio-Inspired Novel Vibration Isolators Incorporating Triple-Functionality** This project aims to develop bio-inspired novel vibration isolators by innovative integration of quasi-zero stiffness structures with magnetorheological elastomer driven by vibration energy. The project creates a new concept of transforming harmful vibration energy to mitigate vibration itself and expects to generate new design methodologies in vibration isolation. Expected outcomes include new vibration isolation knowledge, and a three-function based framework leveraging bio-inspired mechanisms for self-adaptive and self-powering abilities. Success of the project provides significant benefits to many systems in aerospace, defence and manufacturing engineering, where vibration protections are essential for safety, operation and economy.	78,238.50	162,760.00	169,153.00	84,631.50	0.00	0.00	494,783.00
	National Interest Test Statement Low-frequency vibrations, such as those occurring in flexible structures and tall buildings, military vehicles, naval ships and mobile mining machinery, can cause a range of problems if not properly mitigated. Prolonged exposure to vibrations can lead to fatigue and degradation in these structures, cause lower back pain or even disability in vehicle drivers and machinery operators, and cause inaccuracies and malfunctions of sensitive equipment. Inspired by skeletal and neuromuscular systems from nature, we propose a new approach to minimise vibration-caused adverse impacts on structures, equipment and people, by converting harmful vibration energy to counteract the vibration itself, leading to bio-inspired novel isolators with triple functionality. These isolators will have broad applications for naval, defence, aerospace, civil and mining industries, where vibration protections are essential for safety, operation and the economy. For example, the implementation of the isolators into mobile mining machinery could greatly reduce vibration-induced musculoskeletal injuries, benefiting one-third of the machinery operators in the Australian mining industry. This project is expected to expand the knowledge base of bio-inspired vibration isolation technology and enhance research capability in this area through researcher training. Our established industry networks will facilitate the promotion and translation of our research outcomes within the mining and manufacturing sectors.							
DP250100382 Vijeyarasa, A/Prof Ramona	**Auditing the auditors: Assessing capacity for gender-responsive law-making** This Project will discover if and how legislative scrutiny advances gender equality. By investigating parliamentary gender audit committees in Tasmania, the ACT, Canada and Spain, we will generate new comparative knowledge on the influence, relevance and contribution of gender audit committees to law-making, breaking ground in exploring the capacity of auditing to enhance legislation for a diversity of women. The project will create a qualitative and quantitative dataset on gender audits based on the team's expertise in parliamentary scrutiny, gendered citizenship and gender equality. Its timely comparative findings will enable the Australian government to learn from state and global experiences to achieve its gender equality ambitions.	69,684.00	153,476.00	164,080.50	80,288.50	0.00	0.00	467,529.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement							
	A gender unequal society has profound consequences. Australia slipped down the World Economic Forum's Global Gender Gap Index from 15th in 2006 to 50th out of 156 countries in 2021. The Government has committed to restoring Australia's gender equality global leadership through its Working for Women Strategy 2024-2034. This project will provide evidence to bring the missing gender perspective to legislation, enabling the Government's gender equality work. Using Tasmania's Joint Sessional Gender and Equality Audit Committee, the ACT's Standing Committee on the Economy and Gender and Economic Equality and comparative knowledge generated from long-standing committees in Canada and Spain, this project will determine whether auditing of bills by parliamentary committees is effective and if so, how. By evaluating whether auditing of parliamentary bills can re-centre women's experiences in law-making, we will arrive at an understanding of whether law's potential to advance gender equality has been optimised. The Project will offer a framework to be adapted and translated to the parliamentary work of Australian states and territories and even federally. Leveraging existing contacts with parliamentarians e.g. Commonwealth Women Parliamentarians and non-profit organisations, the findings will help improve the work of existing committee members, while providing a platform to advocate for the experiences of a diversity of women to directly or indirectly shape law reform.							
DP250100430	**Comparing public and private provision of healthcare**	16,000.00	102,603.00	176,725.00	90,122.00	0.00	0.00	385,450.00
Kettlewell, Dr Nathan R	This project aims to investigate whether birth setting (private or public hospital) matters for maternal/child health and wellbeing outcomes. The project expects to generate new knowledge by using state-of-the-art methods in econometric evaluation, combined with rich administrative data. The expected outcomes include an improved understanding of how our health care system is functioning in relation to births, accounting for systematic differences in people's choice of birth setting, as well as fostering new interdisciplinary collaborations. This should provide significant benefits including better oversight in hospital care and facilitate more informed choices for women giving birth.							
	National Interest Test Statement							
	'Is it better to give birth in a public or private hospital in Australia?' This is a recurring question across generations of parents. It can be framed as a choice under uncertainty regarding both risks and benefits. Our project aims to provide new knowledge on these risks and benefits by using state-of-the-art methods in econometric evaluation to estimate the effect of birth setting on birth outcomes, including both maternal and child health indicators, mental wellbeing, intervention rates, hospital service utilisation, and the probability of future pregnancy. We aim to equip regulators and administrators with the requisite knowledge to govern the actions of hospitals and treating physicians by identifying whether and how private provision of health care is leading to better (or worse) outcomes. The interplay between public and private provision of health care is controversial and divisive; access to private care for those who can afford it raises questions about equity and fairness, while the different incentives for physicians in each sector might actually work against private patients, a risk that may not be clear to them. Our results will benefit Australians by providing empirical evidence for better oversight and regulation in the provision of care across both sectors, and empower women to make better informed choices on birth setting. Findings will be communicated to clinicians and policy makers through professional networks and non-academic research outputs.							
DP250100455	**Frameworks for Human-AI Interactions: Models, Experiments, and Policies**	21,500.00	134,566.00	222,157.00	139,747.00	30,656.00	0.00	548,626.00
Anufriev, Prof Mikhail	This project explores human-algorithm interactions for the designing and implementation of economic and social policies in complex environments, employing experimental economics and computational economic theory. The specific focus is on differences between policies designed for humans versus robots and variations in human behaviour under each. The project's significance lies in providing insights for adapting and leveraging policies toward more positive economic outcomes in the age of advanced technologies. Through innovative experiments at both the micro and macro policy levels, this research aims to formulate specific advice on optimal policy design for effective outcomes in the evolving realm of human-AI interaction.							
	National Interest Test Statement							
	Our society is undergoing a significant transformation driven by a new generation of Artificial Intelligence. AI is expanding into healthcare, transportation, manufacturing, and finance. Designed to help achieve human goals and surpass our limits of rationality, AI systems are also met with resentment due to their opaqueness and potential to displace human jobs. Fair and safe AI should align with human preferences, and its effectiveness relies on human trust and seamless interactions with humans. This project will explore the complexities of human-AI interactions using a multidisciplinary approach that integrates game theory, experimental economics, and computational methods. We aim to analyse human behaviour to understand what promotes or hinders AI adoption and develop policies for improved AI integration. To this end, we will develop economic experiments to study how the presence of AI influences human decisions and how humans design rules for AI systems interacting with humans. The practical implications will be discussed with policymakers and industry professionals through workshops and roundtables. The project will inform the Australian Federal Government's AI Ethics Framework, including its principles related to human, societal, and environmental well-being, and fairness. A deeper							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	understanding of AI-human interactions will help position Australia at the forefront of AI adoption trends, boosting productivity and enhancing well-being.							
DP250100463 Liu, A/Prof Bo	**The Paradox of Generative Data: Ensuring Security and Privacy** The project aims to address the security and privacy challenges associated with generative data. The project will examine the current approaches and techniques for ensuring the safety and privacy of generative data, and use this knowledge to develop controllable and traceable data generation methods, new privacy protection methods, and forensic techniques. The result will be a comprehensive suite of tools and techniques for generating secure and private synthetic data, preserving individual privacy, and detecting fake data and manipulation across multiple modalities. This solution will help to ensure the security and privacy of artificial data in critical applications such as machine learning and artificial intelligence. **National Interest Test Statement** Generative AI, such as ChatGPT, is producing an increasing amount of data for Australian organisations and individuals. This surge poses security and privacy challenges, including identity fraud, privacy leakage and misinformation. Our research aims to develop a comprehensive suite of tools and techniques for generating secure and private generative data, preserving individual privacy, and detecting fake data and manipulation across various data types, including text, audio, image, and video. The outcomes of this project hold significant potential benefits for Australians across multiple domains. Economically, improved security and privacy measures for generative data can protect copyrights, boosting the creative economy. Socially, they can reduce identity fraud and enhance trust in digital interactions. Commercially, it fosters innovation in data-reliant industries like autonomous vehicles, smart agriculture, and environmental monitoring, thereby creating job opportunities. Culturally, it preserves and promotes Australia's cultural heritage in the digital age. To maximize the impact of our research beyond academia, we will share our findings through various channels, including conferences, workshops, and public presentations, to increase understanding and adoption of our research outcomes. In addition, the output of the project will enable the development of user-friendly tools that industries can use to enhance the security and privacy of generative data.	82,106.00	166,712.00	171,712.00	87,106.00	0.00	0.00	507,636.00
DP250100780 Hansbro, Prof Phil M	**Roles of critical epithelial cell types in responses to metabolites** The mechanisms that enable the gut and lung epithelium to respond to stimuli and perform its function to maintain homeostasis are critical, but ill-defined. We have developed novel tools and expertise that enable the elucidation of how specialised epithelial M cells and Tuft cells: 1. respond to bacterial metabolites and signal to immune cells to maintain homeostasis; 2. interact; and 3. how metabolite signals are altered in their absence in the gut and 4. lung. We will define the molecular crosstalk mechanisms that coordinate epithelial-immune function. This will unlock the potential to advance treatments and preventions (e.g. vaccines), enhancing our ability to combat major mucosal diseases threatening Australia's livestock and people. **National Interest Test Statement** 1. Maintaining the gut and lungs is critical for life. Their barriers absorb metabolites that are transduced to immune cells to instruct their development and maturation. This is crucial for normal gut and lung homeostasis as well as immunity and protection of the tissues. Specialised cells in the gut and lung barriers perform these functions but how they do this is not understood. These cells are difficult to study but we have developed unique tools (reporter & knock-out mice) that enable us to elucidate these events. We will expose these mice to a range of metabolites with known biological effects. We will analyse all the genes and proteins in all cell types in the gut and lungs of these mice. We will define how metabolites change the numbers of cells and how they drive changes in immune cells. We will also determine how these cells interact and define how metabolite signals are altered in their absence. 2. Understanding these processes will define what are the optimal metabolites to induce by diet, microbiota or adding the metabolites themselves. This will have major benefits for gut and lung health in farm animals, pets and people, which in future can be translated into agricultural and medical treatments resulting in health, economic and commercial benefits. 3. Adoption of our findings will be promoted and translated through publications, conferences, agricultural and medical societies, public engagement and popular books as we regularly do.	111,000.00	224,000.00	227,500.00	114,500.00	0.00	0.00	677,000.00
DP250100999 Duggin, A/Prof Iain G	**Resolving mechanisms of cell division across the tree of life** This project aims to identify principles of cell division that span the tree of life. It will determine the fundamental mechanism of cell division in an archaeal model organism that is common in Australian salt-lake environments (Haloferax	94,235.00	193,220.00	208,670.00	109,685.00	0.00	0.00	605,810.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	volcanii), and thereby identify key commonalities and differences amongst archaeal, bacterial, and eukaryotic cell division mechanisms. This is expected to lead to future improvements in the selectivity of a wide range of treatments targeting cell division, such as antimicrobials and the control of archaeal methane emissions in agriculture. The project also takes a pioneering step towards the ground-up engineering of stable synthetic archaeal division and nano-fiber systems in advanced bio-manufacturing.							
	National Interest Test Statement							
	This project aims to decipher how archaeal cells divide. Archaea are one of the three major groupings of life on earth, but very little is known of their replication compared to other cells. By understanding how archaea divide, this project expects to contribute to identifying the important features of this process in all cells, including bacteria and complex cells like human cells. Such comparisons will benefit the design of specific therapeutic interventions seeking to inhibit cell division, such as antimicrobial and anticancer treatments. Archaea are recognised as central players in global carbon and nitrogen cycles and in the origin of complex cellular life. For example, archaea are the cause of essentially all biological generation of methane. The project's outcomes could inform the development of interventions to reduce the replication of methane-generating archaea in agriculture, reducing global warming. The project also aims to build a new synthetic biology platform for deciphering how protein molecules work together in archaeal division. This can be utilized in diverse applications of synthetic biology for use in biotechnology, medicine or agriculture. This will sit at the leading edge of a large emerging market for synthetic biology that has been forecast as a 'critical technology' in Australian government priority research reports and by CSIRO.							
DP250101003	**Dynamics of non-spherical particles: towards advanced bio-magnetometry**	105,809.00	221,087.00	235,360.00	120,082.00	0.00	0.00	682,338.00
Lin, Dr Gungun	The project aims to understand how tiny, non-spherical magnetic particles move in fluids and develop new methods for controlling their transportation and detecting them with magnetic sensors sensitively. Filling the knowledge gaps is the key to the development of revolutionary bio-magnetometry techniques. The expected outcomes of the project include cutting-edge technologies and know-how to isolate and detect magnetically-functionalized biological species in bodily fluids, food, and contaminated water samples. The project outcomes are anticipated to benefit Australian agricultural production and aquatic ecosystems and enhance the management of drugs, as well as the remediation of polluted water and lands.							
	National Interest Test Statement							
	Agricultural, aquatic, biomedical and environmental testing demand rapid and on-site screening of diverse biological particles. These particles often have inherently distinct non-spherical shapes, including disease-causing bacteria, algae, blood cells, and yeast cells. The shape of these bioparticles provide crucial information about environmental changes and the status of diseases, informing decision-making in areas such as climate change, healthcare, food safety and production. Magnetic materials are widely used for labelling biological particles, enabling the development of advanced particle separation and detection techniques for these applications. However, existing techniques overlook the shape of non-spherical particles, leading to inefficient separation and detection of these biological particles. Our project will generate essential knowledge about the interactions between magnetic fields, particle shapes, and fluid flows in microscale channels. This will drive the development of next-generation technologies for efficiently separating and detecting non-spherical biological particles. Australians will benefit through lower production costs and an improvement in the safety and quality of products in the agriculture, aquatic, healthcare and environmental sectors. Research outcomes will be promoted via engagement with industry partners and participating in conferences on sensor technologies, analytical chemistry, life sciences, and biomedicine.							
DP250101026	**The wonderful, fluorescent, massive world of tiny invisible things.**	97,886.00	204,769.50	199,221.00	92,337.50	0.00	0.00	594,214.00
Landers, Prof Dr Rachel E	This project aims to address the lack of representative science content for children by creating animated hybrid documentary science stories for ages 11-12 featuring a diversity of scientists (especially women) as protagonists which can in turn influence STEM career choices. The project expects to generate new knowledge pioneering a new model of science communication translating scientific research visual data into engaging animated narratives, enhancing diversity and scientific visual literacy for children. Outcomes are an education-focused series showcasing diversity for broadcast and the classroom. Benefits include user-tested, science content for students and a lucrative, exportable economic model of practice for Australian filmmakers.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement This project is about pioneering an innovative new model of communication that challenges the way children are traditionally taught about science. The under-representation of women and people from culturally diverse backgrounds in STEM is well-known – currently only 15% of the STEM workforce is women - but to date efforts to correct the problem have failed to improve participation. By delivering this project, award-winning filmmakers, scientists and animators will design and test a new model of communicating science to primary school aged children. The project will produce a suite of learning resources that will include an animated science series and graphic science textbooks linked to curriculum, a scholarly book, and a science communication documentary. The research-driven, user-tested series will be made available for broadcast and for use within Australian classrooms by teachers and students. All outputs will be used to help boost interest in STEM careers amongst children, whilst fostering a culture of scientific curiosity and discovery within broader society. Benefits to the community will include the nurturing of a more inclusive, gender-balanced and resilient workforce, helping to deliver on urgent Australian government priorities relating to gender equity initiatives in STEM. Further benefits will include other fields adopting the developed model for the translation of their own important discoveries and the communication of other types of complex information.							
DP250101576 Long, A/Prof Guodong	**Federated Foundation Models for Recommendations** Foundation model (FM) is a machine learning term to describe the technology of developing large language models. This project aims to develop an FM-empowered recommendation framework with powerful modeling capacity, privacy preservation, and fine-grained personalisation. The project's outcomes can enhance existing recommendation models by leveraging the changing preferences of users and evolving tendencies with privacy preservation. The project can benefit Australian users by improving recommendation services with greater privacy protection and better user experience. Anticipated outcomes include new knowledge, algorithms, and toolkits for use in developing new service architecture in real applications, such as video and commercial goods.	73,064.50	138,887.00	131,903.00	66,080.50	0.00	0.00	409,935.00
	National Interest Test Statement Recommender systems are essential in our daily lives to recommend content like news, movies, and products while filtering out those we are not interested in. Modern -recommender systems have recently been renovated using new AI technology, namely foundation models that are the same technology as ChatGPT from OpenAI. These systems have much powerful capability to make recommendations by understanding user behaviour, however, they need to collect our private data like browsing histories and locations, which increases the risks of privacy leakage. This project aims to protect user privacy by decomposing data storage and recommendation model training. The proposed research aligns with Australia's National Science and Research Priorities in Cybersecurity and CSRIO's Australian AI Strategy. It will improve Australia's well-being by enabling organisations to use Australian users' data with privacy preservation. For example, the government can utilize the recommender system to generate suggestions for people who are in need. The project's proposed framework can help service providers conduct recommendations with better compliance with privacy law, e.g. GDPR, and also create new recommendation applications that were hampered by privacy concerns. By working with existing industry partners and UTS' collaboration network, we will adopt the proposed framework to industrial applications, e.g. billboard recommendations, and suggestion recommendations for self-management healthcare.							
DP250101725 Yang, A/Prof Yang	**4D Printing and Origami Shape-Morphing Antennas for CubeSat Applications** The project aims to discover a new research direction of antenna propagation by developing a new class of time-space 4D (three dimensions in space plus one dimension in time) antennas using emerging printable shape-memory materials for antenna beam-steering and propagation. This research fills a research gap in shape-transformable antenna designs. The project will critically impact CubeSat antennas in the microwave band (S/C/X/K/Ka-band) for motor-free, self-deployable CubeSat applications. The project outcome will benefit Australian industries of advanced manufacturing, satellite communications and defence, taking advantage of proposed 4D printing antenna technologies, aligning with the national strategy of "affordable access to space".	93,818.50	194,159.50	197,352.00	97,011.00	0.00	0.00	582,341.00
	National Interest Test Statement CubeSats, modular standardised small satellites, have gained significant popularity in the past decade. CubeSat antennas, essential for maintaining reliable communication between space and Earth, occupy a substantial portion of the satellite system. Reducing their weight and size is critical to easing payload pressure for easier launches. Current CubeSat antenna technologies are constrained by traditional three-dimensional (3D) design and manufacturing limitations. 4D printing CubeSat antennas with motor-free self-deployment mechanisms remain unexplored. The proposed project aims to create 4D (3D in space plus 1D in time) passive beam-steering antennas with motor-free self-deploying and self-folding mechanisms using shape-transformable 4D printing materials. This project will also support the in-space fabrication of additively manufactured CubeSat antenna arrays, focusing							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	on Earth Observation and Communications Technologies. Successfully delivering this project will place Australia at the forefront of reliable satellite communications research, enhancing the execution and longevity of CubeSat missions. Leveraging advanced 3D printing facilities, the project will provide a "Made in Australia" solution using locally hosted resources. Students involved will receive world-class training in advanced manufacturing facilities and CubeSat antenna design, equipping them with practical skills beyond academia and maximising the use and adoption of the research in their future careers.							
DP250101827 Ding, Dr Can	**Advancing Millimeter-Wave Base Station Antennas for 5G and 6G Deployment** The crucial mm-wave spectrum of 5G, pivotal for unlocking the full potential of next-generation networks, remains largely untapped. This project aims to pioneer the design and development of an innovative mm-wave base station with significantly reduced financial costs and energy consumption, paving the way for mm-wave network deployment. Central to this endeavor is the elimination of the amplitude modulation module required in current designs for beamforming. This introduces two scientific challenges, which can be addressed by the development of two groundbreaking antenna techniques: 'polarization-mixing enabled beamforming' and 'near-field beam focusing lenses'.	95,208.50	197,199.50	208,746.00	106,755.00	0.00	0.00	607,909.00
	National Interest Test Statement 5G mobile networks are crucial drivers for the next wave of industrial innovation and economic growth, boasting a service market value of USD 28.9 billion in 2023, and are expected to reach USD 250 billion by 2032. However, the deployment of 5G networks—particularly in the higher millimetre-wave frequency bands—has been slow, largely due to the high manufacturing costs and energy consumption of '5G-ready' base stations. This project aims to develop new antenna technologies that can significantly reduce these associated costs. This project will facilitate the large-scale deployment of cost-effective and energy-efficient wireless networks in the future. The advancement in wireless networks will benefit Australians with enhanced quality in telecommunication services and enable transformative technologies such as smart cities, smart agriculture, and advanced robotics, thereby driving economic growth across multiple sectors. The antenna array to be developed in this project also holds significant commercial potential. Leveraging on our existing industrial collaborations, we will actively promote our research outcomes at industrial workshops. For future research translation, we plan to collaborate with Australian manufacturers to boost Australia's advanced manufacturing capabilities and work with telecommunications operators to facilitate the integration of new base station antennas across Australian neighbourhoods.							
DP250102243 Siminski, Prof Peter M	**Inequality and intergenerational mobility: measuring what matters and why** This project aims to enhance the methodological and theoretical foundations for measuring economic inequality and social mobility, and to understand their drivers. It will propose new measures of inequality and intergenerational mobility, provide theoretical foundations for mobility measures, explore parents' aspirations for their children, and explore mechanisms of intergenerational persistence of disadvantage. Expected outcomes of this project include enhanced research capacity on economic inequality, strengthening collaboration between Australian and global leaders, and through postdoctoral appointments. This will provide significant benefits including methodological and theoretical advances of global significance	49,071.50	140,207.50	202,703.50	162,482.50	50,915.00	0.00	605,380.00
	National Interest Test Statement Equality of opportunity is a key principle of Australian society. It motivates many areas of government policy, including taxes and transfers, education, health, housing, social services and labour market policy. This project consists of ten interdependent studies, which will together provide a clear contemporary picture of Australian economic inequality and intergenerational mobility, and their drivers. It will therefore inform policies which enhance economic opportunity in Australia. Particular foci include the roles of housing, tax avoidance, inheritances and gifts, income tax progressivity, and the causal intergenerational effects of welfare receipt, labour market shocks, parental careers, and peer influences. It will leverage rich, newly available, administrative and survey data. It will also collect new data on Australians' aspirations for their children, and their perceptions of inequality and mobility. It will study how those views are shaped by earlier experiences, and how they affect parenting behaviour. The project design includes extensive engagement with external stakeholders, especially government bodies and advocacy groups, as well as dissemination in academic and non-academic forums. Whilst the focus is Australia, each study will also make theoretical and methodological contributions to the international understanding of economic inequality and mobility.							
DP250102613	**Molecular engineering of boron nanomaterials for future technologies** Boron based nanomaterials have novel properties, but it has been challenging to	93,918.50	195,759.50	169,464.50	67,623.50	0.00	0.00	526,766.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Huang, Prof Zhenguo	develop controllable fabrication. This project aims to fabricate boron nanomaterials with the desired following features, in single or multiple aspects: thickness, composition, lateral sizes, porosity, surface area and functionality. The project will advance our fundamental knowledge in materials chemistry, chemical engineering, materials engineering and physics. It is expected to take us closer to unlocking the potential of boron nanomaterials for real-world applications in, for example, water treatment, electronics and catalysis. **National Interest Test Statement** Boron nanomaterials are emerging versatile functional materials with potential applications ranging from energy generation to environmental sensing and catalysis. Their unique physical and chemical properties make them a more effective and low-cost alternative to materials currently used in these applications. However, their use is hindered by the lack of reliable synthesis processes. Therefore, this project aims to develop new efficient and cost-effective fabrication methods for boron nanomaterials to support next-generation technologies. The effectiveness of these materials will then be tested in real world scenarios – energy, water and environmental sensing – which are relevant to Australia. Adoption of the new materials will be facilitated through collaboration with our existing and emerging industry partners in Australia. The research outcomes have potential to open up new opportunities for: chemical manufacturing in Australia; the harvesting of sustainable osmotic energy; and the production of gas sensors that could be used for food spoilage detection and tracking of air pollution. Boron nanomaterials will also have potential applications in the manufacture of solar-driven water evaporation systems that could benefit Australians during droughts. Integrated into this project are training opportunities for researchers to build knowledge and capability in materials sciences.							
DP250102952 Ying, Prof Mingsheng	**Foundation of Refinement Techniques for Quantum Programming** This project aims to build a theoretical foundation for refinement techniques in quantum programming, addressing challenges of lacking compelling applications and applicable software for quantum computing. With advancements like IBM's 1000+ qubit Condor, quantum hardware is moving from prototypes to practical use. The project establishes a systematic framework for quantum programming using proven methods of program refinement, ensuring correctness and safety. Anticipated outcomes include formal semantics, a refinement calculus, and practical tools for quantum machine learning applications. The project's success strengthens Australia's leadership in quantum computing, contributing to the nation's global standing. **National Interest Test Statement** Quantum computers have the potential to solve complex problems in fields such as cryptography, optimisation, drug discovery and material science much faster than classical computers. The past decade has witnessed rapid expansion in quantum computing hardware capabilities but to unlock their full potential, we also need to develop quantum software in a comprehensive and systematic way. Because human intuition is better suited for classical computing than quantum computing, quantum programming is more error-prone, making it difficult to ensure the correctness of quantum programs. This project tackles this challenge by establishing the theoretical groundwork for refinement techniques in quantum programming. As Australia houses key players like Silicon Quantum Computing, successful outcomes from this project will fortify the country's leadership in quantum computing. The anticipated software development tools and methodologies can seamlessly integrate with Australia's quantum hardware, enhancing its value and contributing to the National Science and Research Priority of "advanced manufacturing". To promote our research beyond academia, we intend to release key software components as open-source projects, conduct workshops and training sessions for professionals and policymakers at industry events like Quantum Australia, and partner with leading Australian quantum technology companies such as Q-CTRL to integrate our quantum software tools into practical applications.	80,606.00	165,712.00	174,712.00	89,606.00	0.00	0.00	510,636.00
DP250103612 Lin, Prof Chin-Teng	**Mind-reading AI to translate silent speech into words** The project aims to develop a system that can translate words that are not spoken aloud into speech for people to communicate and interact through their thoughts. It proposes an unprecedented model to process words in sentences to produce natural language. The system will adapt to individuals. Expected outcomes include new understanding of how the brain processes language, artificial intelligence (AI) models for interpreting data from brains and recognising speech elements, and a novel online feedback system to improve how humans and AI interact. The system could transform care sectors, assistive technologies, defence and entertainment as well as advancing AI, human computer interface, robotics, linguistics and computational neuroscience.	93,609.00	187,812.00	192,710.00	98,507.00	0.00	0.00	572,638.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement This project aims to develop an AI system that can translate certain thoughts, such as silent speech, into text. By using non-invasive brainwave measurements, it will overcome the current impediment of easily translating silent speech into words, which would benefit an extensive range of Australian end-users. In the care sector, patients suffering from temporary paralysis or people living with a disability will be able to communicate and interact much easier with other people and with assistive technologies. This would not only lessen the increasing care demands on an already challenged workforce, but also improve human quality of life. Other plausible application areas are in the automotive, defence and news/entertainment industries. Promotion of the research outcomes beyond academia will be achieved through various means. Firstly, open-source publication of the AI model and source code will allow the general public and industry to test and adopt the results, paving the path for technological and social adoption. Secondly, public-facing workshops, mainstream media publications and industry seminars will further assist potential translation, especially by collaboration with the fast-growing Australian assistive technologies industry sector. This is expected to result in job creation by enhancing Australia's technological and commercial capacity, as well as socially contribute to safer, more effective and economically viable AI technologies 'made in Australia'.							
DP250103803 Huang, Prof Zhenguo	**Hydrogen storage and delivery by novel hydrogen-rich molecules** As an energy carrier to store and deliver the energy produced from intermittent wind and solar sources, hydrogen can play a pivotal role in our transition to a cleaner, more sustainable energy future. Through novel chemical syntheses, materials fabrication, and catalysis, this project aims to develop hydrogen-rich lightweight molecules that are able to be efficiently manufactured at scale. These outcomes will drive new commercial and export opportunities for domestic chemical processing and manufacturing industries, contribute to decarbonising industries currently reliant on fossil fuels and energy-intensive processes, and accelerate development of a green and sustainable hydrogen economy.	85,000.00	170,000.00	185,000.00	100,000.00	0.00	0.00	540,000.00
	National Interest Test Statement Australia is poised to be a world leader in green hydrogen, through our own transition to green energy and as a key global hydrogen supplier. Currently, hydrogen gas is either compressed or liquefied for storage and delivery, which are costly and unsafe options, and roadblocks in Australia's development of a large-scale hydrogen economy. Therefore, this project will develop a new materials-based hydrogen storage solution to store and transport hydrogen at large scale (up to hundreds of tonnes) that is safe, reliable and cost-effective. In so doing, the project will generate new knowledge for the design and syntheses of these novel hydrogen storage materials. Adoption of our research outcomes will be facilitated through collaborations with our existing and emerging industry partners in Australia's growing hydrogen sector. The research outcomes are also expected to have broader economic and commercial opportunities for other Australian industries, including chemical manufacturing, green fertiliser production and transport. Our research is expected to contribute to decarbonising the Australian economy, to the development of an export pipeline for Australian green hydrogen and to the Australia's National Hydrogen Strategy.							
	University of Technology Sydney	1,419,951.00	3,118,822.50	3,409,721.50	1,792,421.00	81,571.00	0.00	9,822,487.00
University of Wollongong								
DP250100297 Sims, Prof Aidan D	**Twisted algebras for Zappa–Szép products of categories** This project in pure mathematics aims to significantly advance our understanding of twisted algebras, especially operator algebras, using the investigators' recent discoveries about sophisticated composite structures called Zappa–Szép products. It expects to generate new knowledge about twisted algebras, which permeate the mathematical theory used to model quantum states of matter such as topological insulators. Expected outcomes include flexible techniques for constructing twisted algebras for use further along the research pipeline, and cross-pollination of ideas within mathematics. Benefits include enhanced international collaboration and increased Australian capacity in pure mathematics, particularly algebra and operator algebras.	90,466.50	185,923.50	196,528.50	101,071.50	0.00	0.00	573,990.00
	National Interest Test Statement Long-term commercial impact of fundamental mathematics research is common, but the specifics are difficult to predict. It typically arises through the development of new technologies based on the use of mathematical concepts in other disciplines. This project will discover new models for noncommutative phenomena, at the frontier of the study of operator algebras, which underpin quantum mechanics - the physics that made possible the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	development of the transistors and light-emitting diodes (LEDs) from which devices like the one on which you are probably reading this text are built. Impact also arises through mathematically skilled individuals going on to work in industry and the public sector, and helping demonstrate the significant benefits of mathematical research. At least five of the investigators' PhD graduates currently work in Australian government agencies, driving policy; at least six more contribute to economic activity in the finance, green tech, data science and security sectors. Others are now internationally-based researchers, contributing to Australia's collaborative network. This project supports world-leading research, expands Australia's knowledge base in mathematics, and fosters Australian international competitiveness. Its capacity-building aspects will train individuals who will enhance Australia's international reputation, our ability to make data-driven decisions, and our economy more broadly.							
DP250100594	**High-resolution imaging of mitochondrial DNA replication**	104,500.00	223,000.00	245,000.00	126,500.00	0.00	0.00	699,000.00
Lewis, Dr Jacob S	This project aims to study the molecular mechanisms of the mitochondrial replisome, the machinery that copies mitochondrial DNA. While DNA replication in the cell nucleus has been extensively studied for decades, processes that define mitochondrial DNA replication are poorly understood. This interdisciplinary effort will merge cutting-edge cryo-EM with novel single-molecule biophysical tools to establish the architecture of human mitochondrial replication and define how it coordinates synthesis of the two DNA strands. Expected outcomes of this project include a high-resolution understanding of a fundamental biological process, development of novel biophysical methodology, and training of the next generation of interdisciplinary scientists.							
	National Interest Test Statement							
	Every time a cell divides, its mitochondrial DNA must be precisely duplicated to ensure the cell's energy production and viability, a fundamental aspect of cellular biology. This project will delve into the core mechanisms of the copying of human mitochondrial DNA. By employing advanced electron and light microscopy techniques, we aim to reveal the structures and dynamic activities of the proteins that copy mitochondrial DNA on their native DNA substrates. This research will deepen our fundamental understanding of mitochondrial biology. The resulting biochemical reagents and novel imaging methods will be useful to biotechnological research and anyone studying chromosome biology at the molecular level. Additionally, the findings from this project could open new avenues for exploring how cellular energy metabolism is linked to maintaining broader biological functions in aging. The project will also provide outstanding multidisciplinary training opportunities for Australian researchers and strengthen Australia's capabilities in the cutting-edge fields of biophysics and electron microscopy.							
DP250101705	**Laser-Ionisable Tags for Broad Metabolic Imaging of Tissues and Cells**	107,811.50	223,447.00	233,507.00	117,871.50	0.00	0.00	682,637.00
Ellis, A/Prof Shane R	Mass spectrometry imaging can map molecular distributions within tissues for investigating region-specific metabolic processes. However, many important molecules are not detectable. This project aims to develop new chemical approaches and imaging technology for enhanced imaging of elusive metabolites. This will greatly improve the scientific impact of mass spectrometric imaging and create new insights into metabolite compositions, distributions and reprogramming in biological systems. Expected benefits are development of new technology and chemistry to unravel biochemical distributions and functions in heterogeneous tissues and cells that, in the future, could improve disease understanding and support biotechnology development.							
	National Interest Test Statement							
	New molecular imaging technologies and chemical methods will be developed to allow for more comprehensive mapping of biomolecules present in tissues and cells. This can lead to the development of improved disease diagnostic and disease classification tools relevant for humans, animals and plants that complement conventional histopathology and benefit the Australian population. This project will position Australian research at the forefront of the rapidly emerging mass spectrometry imaging and single cell metabolomics fields that are now attracting significant interest from industry practitioners, including instrument vendors and pharmaceutical companies. Developments made within the project may lead to new Australian intellectual property and industrial collaborations, with carry over benefits for the Australian economy. The research program will also train young researchers in developing and applying state-of-the-art technologies that will ensure they are well placed to contribute to Australia's knowledge economy beyond this project.							
DP250102201	**Sustaining critical infrastructure: the integral role of port workers**	61,901.50	153,584.50	172,181.50	80,498.50	0.00	0.00	468,166.00
Warren, Dr Andrew	This project will investigate the integral work sustaining critical infrastructures for the safe, reliable movement of shipped goods. Maritime ports are key trading zones for the nation but also chokepoints facing geopolitical, economic and							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	environmental disruptions. The project will take a place-based approach to understand how port workers interact, advance local environmental knowledge, and foster teamwork to ensure the circulation of goods amidst ever-present disruption risks. Expected outcomes include new insights on the workforce collaboration and knowledge required to cope with a more disruptive world, an evidence base for sustaining critical infrastructures, and recommendations for reproducing key skills in safety-critical domains. **National Interest Test Statement** Infrastructure is critical to the national economy and the prosperity of Australian society. Yet, there is a poor understanding of the skilled workforces sustaining critical infrastructure amid heightened disruption risks related to economic volatility, geopolitical tensions, climate change, and natural hazards. Responding to this research gap, the project will focus on Australia's maritime ports to advance knowledge regarding the mix of skills, collaboration, and environmental knowledges needed to sustain critical infrastructures. The research will benefit Australians by contributing new understandings of how worsening disruption risks are managed collectively by groups of interconnected workers who sustain the networked functions of critical infrastructure. As a trade-dependent island nation, Australia relies on maritime ports as infrastructure for connecting commodities, businesses and households to the wider world. Through on-the-ground and on-the-water research, the project will provide new knowledge on how place-specific knowledge and skilled labour sustain critical infrastructure in working environments that are dynamic and risky. To maximise understanding and translation of the research, outcomes will be promoted beyond academia through the creation and dissemination of material, including StoryMaps, an open-access, public-facing interactive spatial dataset, a plain-English policy brief, and stakeholder consultation culminating in a research showcase and roundtable.							
DP250102216 Seuffert, Prof Nan M	**Voices, Listening and Law and Policy Reform on Violence Against Women** This project aims to develop innovative approaches to listening to women's voices in law and policy reform on violence against women, which is a national priority. While reform processes now commonly elicit victim/survivors voices, with the implicit promise of listening, participants often report that they are not heard. Research shows meaningful change is limited. There is a gap in research on how women's voices are adduced, heard and responded to. This project addresses this gap by generating new knowledge on best practices for listening to diverse groups of vicitm-survivors, with the potential to enhance the outcomes of law and policy reform and to address the urgent need for new pathways and processes for justice for these women. **National Interest Test Statement** This project addresses issues identified by the Commonwealth, state and territory governments as urgent priorities for Australia: domestic and family violence (DFV); sexual violence against women and girls; and sexual harassment in the workforce. It is the first systematic study, in Australia and internationally, to focus on the ethics and politics of listening to women's voices and law reform in these areas, and to produce a best-practice model of effective listening to foster transformative change. By engaging with victim-survivors from a variety of lived experiences, including Aboriginal and Torres Strait Islander women, culturally and linguistically diverse women, and women from LBGTI+ communities, we ask how can law reform implement better listening practices. The project aims to develop new knowledge which will assist with ensuring that the law effectively listens and responds to the lived experiences of violence against women. This knowledge can also contribute to improved wellbeing of women in Australia from listening to their voices and being heard, and from improved law reform efforts responding to those voices.	31,039.50	127,349.00	196,479.00	100,169.50	0.00	0.00	455,037.00
DP250103040 Schmulow, A/Prof Andrew D	**A new "Treating Customers Fairly" law for Australia's financial industry.** The project aims to investigate the Treating Customers Fairly regime law (put forward by an Australian Law Reform Commission (Commission) Inquiry into reforming our financial sector legislation), by utilising, for the first time, an internationally comparative critique of existing Treating Customers Fairly regimes in the UK, South Africa and New Zealand. This project will generate new knowledge: a blueprint for adoption into Australia of such a regime, in line with the Commission's suggested government policy direction. The outcomes include significantly enhanced consumer protection and effective law enforcement. Benefits include a much simplified, more effective law, governing every consumer, and every financial product in Australia.	111,935.00	198,314.00	168,643.00	82,264.00	0.00	0.00	561,156.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement							
	This project will provide a blueprint for principles-based legislation, based on the "Treating Customers Fairly" model, for our financial industry (banks, insurers, financial advice, Superannuation). It will analyse the successes and failures of the adoption of the same model into the United Kingdom, South Africa and New Zealand. It will address the gap identified by the Banking Royal Commission, namely that our current legislation is not fit for purpose and should be replaced with a model in which norms of behaviour are enforced, instead of relying on narrow, technical prescriptive provisions giving rise to tokenistic responses. Our hypothesis is that this model will more effectively address misconduct and consumer harm, as it is arguably the leading model, internationally, for driving good conduct and preventing consumer harm in the financial industry. This project has significant potential to restore trust in our financial industry and prevent misconduct. No other industry affects as many consumers, and to such a great degree. As such the potential for impact for the community and the broader economy from this project is unparalleled. We will promote our findings to members of Parliament, regulators, policymakers, journalists, to the Attorney-General's department and Treasury and to government inquiries as we did with pilot research to the Australian Law Reform Commission which, as a result, recommended a regulatory architecture that would accommodate a TCF model.							
	University of Wollongong	507,654.00	1,111,618.00	1,212,339.00	608,375.00	0.00	0.00	3,439,986.00
Western Sydney University								
DP250101116	**Revealing Universal and Cultural Origins of Music-Induced Affect**	113,490.00	245,081.50	281,704.00	212,192.50	62,080.00	0.00	914,548.00
Milne, A/Prof Andrew J	Across almost all human cultures, music has a remarkable capacity to communicate different affects (emotions and feelings). However it is unknown which, if any, associations between music-acoustical features and affects are universal, and which are cultural. In a music cognition field-research program of unprecedented scope, we aim to estimate how tones in melodic, polyphonic, harmonic, and rhythmic contexts influence affective responses, and the extent to which these effects are mediated by cultural mechanisms (familiarity and association). The findings will have profound implications for the use of sound and music in therapeutic applications and will help identify ways to bridge cultural divides through intercultural musical appreciation.							
	National Interest Test Statement							
	In almost every human culture, music has a remarkable capacity for communicating emotions and feelings. However, it is unknown how and to what extent this is due to the music itself or to its cultural uses and associations. Through applied research in several international communities engaged in a wide variety of music, this project aims to understand how humans use music to communicate with each other at a fundamental level. Outcomes include a deeper knowledge of how human brains process and respond to different types of music and sound, according to their acoustic properties and typical uses in cultural contexts such as celebration, mourning, lullabies, and religion. By sharing results and algorithms with music psychologists, therapists, educators, and streaming platforms, this project will enable the following social, cultural and economic benefits for Australia: – The development of more effective and reliable forms of music for health and well-being, including in aged care and mental health contexts (annual cost of mental illness in Australia is $60 billion). – Fostering social cohesion and intercultural empathy and respect in Australia through music (annual cost of racism in Australia is $38 billion due to health impacts). – Enhancing distribution and sales of intercultural music in Australia and worldwide.							
DP250101325	**The origins and development of human analogical reasoning**	39,379.00	179,190.50	280,295.00	240,252.00	99,768.50	0.00	838,885.00
Hespos, Prof Susan	Effective learning depends critically on the ability to perceive and combine abstract representations. This project aims to reveal how our impressive capacity for analogical reasoning emerges during the first years of life. Our interdisciplinary approach will generate new knowledge about nascent analogical abilities in preverbal infants, clarify how language supports this emerging capacity, and reveal how neural markers of analogy change across the lifespan. Expected outcomes are a comprehensive picture of individual differences in early learning abilities that can support improved learning opportunities and interventions, and novel paradigms that transfer to species-comparison studies exploring the unique aspects of human cognition.							
	National Interest Test Statement							
	The cornerstone of higher reasoning is our ability to perceive relations between objects, events, or ideas, and to compare those relations across situations. We use this ability – termed analogical reasoning – every day, for							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	example, you read a map by mentally aligning the image on your phone with real-life landmarks and streets as you navigate. Since analogical reasoning is the vital foundation for effective learning, particularly in mathematics and science, clarifying how analogical abilities emerge and develop is key to understanding why some children learn more readily than others. This project brings a new, interdisciplinary approach to understanding analogical abilities in early childhood, which will generate new knowledge about nascent abilities in preverbal infants, clarify how language supports this emerging capacity in preschoolers, and reveal how neural markers of analogy change across the lifespan. These findings are poised to advance our understanding of fundamental learning processes that make human cognition unique. Research outcomes will empower parents and educators with evidence-based insights about how children develop and how best to support their learning in this critical period (Priority Focus Area #2, The Early Years Strategy 2024-2034). This benefits Australia by helping to support positive outcomes across children's future health, wellbeing, educational achievement and productivity.							
DP250101453 Escudero, Prof Paola	**Understanding the mastery of multiple languages and dialects** This project will provide a unifying theory of how subsequent languages are acquired after mastering two languages or dialects. We will use an approach encompassing corpus, computational, psycho- and socio- linguistics. Expected outcomes include a deep understanding of how multilingual and multidialect mastery proceeds, how these are represented in the brain, and how they manifest in communicative contexts. Benefits include evidence-based knowledge for the advancement and consolidation of a) multilingual programs in all educational settings, b) multilingual speech recognition and synthesis and artificial intelligence, and c) linguistic and social integration in multicultural societies in Australia and worldwide.	110,345.00	205,685.00	192,126.50	96,786.50	0.00	0.00	604,943.00
	National Interest Test Statement Despite Australia's multicultural and linguistic diversity, learners continue to miss out on the known academic, cognitive, economic, psychological, and social benefits of multilingualism. Just 9% of year 12 students complete language studies, leading some to refer to Australia as a "graveyard for languages" stuck in a "monolingual mindset". To reverse this worrying trend, this project aims to unravel the mystery of language control in polyglots: people who master three or more languages. Innovative computational and experimental approaches will be used to simulate and predict polyglot strategies, followed by novel experiments to validate the model, resulting in a new theoretical and computational model of how multilinguals harness knowledge from languages by seamlessly controlling them. The research team will disseminate findings to language advocacy and education policy stakeholders to influence implementation of language learning in all preschools and primary schools nationwide and expand it at high school level. These policy changes would turbocharge language learning in young Australians and align Australia with other countries. Additionally, by driving improvements to existing technologies like Duolingo and automatic speech recognition, the project's outcomes can facilitate more effective communication across multilingual boundaries in Australia and worldwide to confer the lifelong cognitive, health, social and lifestyle advantages inherent to multilingualism.							
DP250101775 Tam, Prof Vivian W	**Hybrid nanoreinforced recycled concrete for sustainable building** This project aims to develop a durable recycled concrete using nanotechnology that can store and release thermal energy in response to temperature changes. This research will unveil fundamental insights into producing defect-free few-layer graphene dispersion from graphite and will explore hybrid nano-reinforcing effect on properties of phase change material-infused recycled concrete to address critical issues of poor bonding, porous microstructure and low thermal performance. The expected outcome is to develop a sustainable building material that can significantly reduce energy demand for heating and cooling in buildings, contributing to a net-zero emissions future and cost savings in the construction industry.	94,034.50	192,219.00	194,369.00	96,184.50	0.00	0.00	576,807.00
	National Interest Test Statement As global energy consumption continues to rapidly rise, so does the urgency of reducing reliance on energy-inefficient traditional heating and cooling methods in buildings. This project aims to bridge gaps in Australia's construction sector through innovative integration of phase change material with recycled aggregate, reinforced by graphene and calcium carbonate hybrid nanofillers for ultra-high-strength concrete with superior thermal energy storage capabilities. The proposed innovation enables the production of valuable and sustainable concrete for modern building applications. This endeavour will additionally: (1) advance deep understanding of chemistry associated with phase change material; and (2) establish novel design principles for hybrid non-reinforcement of phase change material integrated recycled concrete, leveraging the complementary properties of graphene and calcium carbonate. The energy savings achieved using the proposed concrete will not only bring economic benefits but also contribute to environmental preservation by recycling waste and reducing carbon emissions. Deploying cutting-edge innovation in EnergyPlus modelling and life cycle assessment will undoubtedly widen the dissemination and application of this project, which drives scientific advancements and effectively addresses multifaceted societal challenges for the future.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250102495	**Disability and Digital Citizenship**	211,788.50	436,764.50	449,113.50	435,656.00	426,828.00	215,309.50	2,175,460.00
Goggin, Prof Gerard M	This project investigates people with disability's full participation in the digital age by advancing a new conceptualization of digital citizenship. Via a co-designed benchmark Australian study, the project generates knowledge on how people with disability experience digital technology, barriers encountered and how to address inequities. Expected outcomes include an evidence base on the nature and state-of-play of disability digital citizenship, and resources to support embedding of inclusive design in future technology. The project's benefits should help optimise national digital policy, and strengthen national research capabilities in the emerging area of inclusive and accessible technology.							
	National Interest Test Statement							
	Twenty per cent of Australians identify as having a disability. Digital technology is essential for this group to fully participate in Australian society. Yet there is limited knowledge on what digital citizenship looks like and means, especially in the face of new technology such as AI. The research will provide a holistic evidence base on Australians with disability's use of digital technology – their experiences, requirements, and attitudes towards digital technology systems, arrangements, and future plans. The research will provide new knowledge for federal and state policymakers and agencies (such as NDIA) concerned with inclusive digital technology, communication and information. The research findings will be translated via user-friendly resources (social media, workshops, annual forums, reports and policy briefs). The project outcomes, created with people with disability, will be shared with key disability and consumer organizations to build a robust roadmap to full digital citizenship of people with disability. These findings will ensure Australia can extend access to digital life in line with the Australian Disability Strategy 2021-2031, the recommendations of the disability royal commission and our obligations under the United Nations Convention on the Rights of Persons with Disability.							
DP250103234	**3D Printing of Recycled Thermoplastic Polymer Nanocomposites**	111,540.00	229,426.50	237,109.50	119,223.00	0.00	0.00	697,299.00
Yang, Prof Richard (Chunhui)	This project aims to develop a novel 3D printing technology, Fused Granular Fabrication, to integrate innovative nanotechnology and high-performance 3D printed nanocomposites using recycled plastic reinforced with carbon nanoadditives. It will focus on fabrication, testing, characterisation, modelling, optimal design, and optimal 3D printing for the enhancement of material properties using nanoadditives. This project will deliver sustainable manufacturing solutions for the urgent and critical plastic waste management issue for the nation and the world. The 3D-printed nanocomposites developed with superior mechanical, thermal and electrical properties could be widely used in primary industries such as aerospace, automotive and electronics.							
	National Interest Test Statement							
	This project will develop an innovative 3D printing method, Fused Granular Fabrication, to effectively print high-performance nanocomposites using recycled plastic, polylactic acid (PLA), noting the tonnes of waste created and the associated environmental and economic impacts. It addresses one of Australian Science and Research Priorities – Advanced Manufacturing. The research will generate a sustainable manufacturing solution for plastic waste management and deliver high-performance recycled materials. It will maximise plastic waste recycling and reuse, contributing to the circular economy and Net Zero. In addition, the high performance of the materials will be achieved through the applications of novel carbon nanoadditives and nanotechnology. The completion of this project will significantly contribute to one of the Strategic Research Priorities – Lifting Productivity and Economic Growth for Maximising Australia's Competitive Advantage in Critical Sectors. The expected research findings will enhance our knowledge in the development of innovative additive manufacturing technology for designing and fabricating high-performance and high-quality carbon nanoadditive reinforced composite materials. It will also further reinforce Australia's existing world-recognised strengths in production, innovation and excellence in material and manufacturing industries and benefit Australia's internationally competitive position in the exciting new areas of advanced nanocomposite materials.							
DP250103426	**Synergising plant symbionts and silicon to mitigate heat stress in legumes**	96,649.00	193,654.00	202,628.50	105,623.50	0.00	0.00	598,555.00
Johnson, Prof Scott N	Australia faces accelerated temperature rises which adversely affect many plants. Legumes often become unproductive because their microbial symbionts, which turn nitrogen from air into plant-usable forms, do not tolerate high temperatures. This project aims to mitigate such heat stress by stimulating plant microbial symbionts with silicon supplementation. Recent research shows synergistic silicon-symbiont benefits, but the effects on soil microbial communities and soil nutrients are untested. The project offers a new							

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	mechanistic understanding of these processes, providing a sustainable adaptation to climate change via increased resilience of legumes to heat stress. This could confer significant benefits to soil health and crop productivity.							
	National Interest Test Statement							
	Global warming may adversely affect many agroecosystems in Australia. Key agricultural crops like legumes can become unproductive because their symbiotic microbes cannot tolerate high temperatures. These symbionts turn atmospheric nitrogen into plant-available forms, improving soil nutrients and health. Recent breakthroughs show that supplying legumes with silicon, which is usually deficient in Australian agricultural soils, stimulates such symbiotic plant microbes. This project investigates how application of silicon and plant symbionts may mitigate the adverse impacts of higher temperatures in peas, with cascading benefits to wheat in crop rotations. To achieve this, the project addresses a key knowledge gap of how silicon-symbiont synergies affect soil microbial communities and soil nutrients, offering a new mechanistic understanding of these processes. This would inform safe supplementation strategies to improve the productivity and resilience of Australian legume-cereal systems. This has the potential to generate economic, environmental, and societal benefits to Australia, including reducing synthetic nitrogen fertiliser applications and greenhouse gas emissions, while increasing carbon-capture, soil health and crop productivity. The project will involve key stakeholders, including broadacre farmers and agronomists, to promote research outcomes beyond academia using demonstration plots and farmer events. This provides a clear route to translation, use and adoption.							
DP250104808	**The legacy of coastal infrastructure: reclamations and seawalls**	55,014.50	117,430.50	158,361.00	134,604.50	38,659.50	0.00	504,070.00
Byrne, Prof Denis R	Positioning coastal reclamations and seawalls in Asia-Australia as artefacts of the Anthropocene, the project aims to highlight their historical role in the expansion of human habitat into the sea, provoking debate on the sustainability of human coastal terraforming practices and assisting the heritage field to reassess the significance of historic coastal infrastructure in the context of the current climate crisis. Examining the threat that sea level rise poses to reclaimed land that, over time, has been integrated into the terrain of everyday life in Sydney, Hong Kong, and Japan, the project will better equip the Australian public to understand the background to this threat, thus laying groundwork for enhanced climate resilience.							
	National Interest Test Statement							
	The project tells the story of how in the modern era humans in Asia-Australia have expanded their territory into the sea via the technology of coastal reclamation and seawall construction. Rather than presenting coastal reclamations and seawalls as part of the heritage of human progress, it shows them to be artefacts of the Anthropocene, infrastructural objects that have contributed to today's environmental crisis. The project will generate what we term an 'Anthropocene optic' for heritage practice that encourages society to 'own' the negative ramifications of industrial-era technology and infrastructure, not to instil guilt about the past but rather to aid development of sustainable strategies for coastal living in Australia going forward. This alternative heritage optic will, for example, better equip people to engage in debates on strategies to manage the impact of sea level rise on the sandstone heritage seawalls of Sydney Harbour and the foreshore parks they protect. By meeting and engaging closely with heritage managers and museums and disseminating research results more broadly, including on social media platforms, it will not only build planetary consciousness among Australians but also climate resilience. In so doing, it will enhance Australia's reputation as a global leader in heritage.							
DP250104856	**Transborder Electricity Infrastructures and Geopolitics**	48,151.50	156,703.50	229,739.00	195,346.00	74,159.00	0.00	704,099.00
Neilson, Prof Brett M	The energy map is being redrawn. This project aims to understand how the extension of renewable electricity grids across national borders inflects geopolitics. Designed to sustain the planet, these grids catalyse and respond to changing configurations of world power. The project is significant for specifying how the energy transition spurs the emergence of large infrastructural systems that reorganise the spatial dynamics of globalisation. Intended outcomes include insights into how transborder grids shift regulatory frameworks to meet challenges facing populations, economies and environments. The expected benefit is knowledge relevant to government and industry stakeholders engaged at the interface of energy policy and foreign affairs.							
	National Interest Test Statement							
	Australia has ambitions to be a renewable energy superpower. Transmission of solar-generated electricity to Southeast Asia via undersea cable is part of this vision. The potential for such an initiative to deliver environmental, economic and social benefits for Australia and the region is significant. Yet fraught and fragile global conditions overshadow the realisation of this energy interconnection plan. The project addresses this volatile background by							

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	analysing how transborder renewable electricity infrastructures transform geopolitics. It investigates the Sun Cable proposal for renewable energy export from the Northern Territory to Singapore in relation to similar infrastructural undertakings in the Mediterranean and Northeast Asia. The research will benefit Australia by assuring that policy making to support the energy transition at the regional level is informed by international developments. Rather than treating the energy transition and geopolitics as separate concerns, the project highlights their mutual implication and fosters forward-thinking policy debate to enrich national perspectives on the geopolitics of energy. Findings and insights will be shared through regional stakeholder forums, a national summit on regulatory vulnerabilities and digital methods resulting in non-traditional research outputs accessible to wide audiences. Collaboration with parliamentary librarians will facilitate integrating new knowledge produced by the research into relevant briefings.							
DP250104994	**Scope and ramifications of Indigenous language loss among PNG's youth**	78,039.50	162,330.50	153,203.00	116,208.50	47,296.50	0.00	557,078.00
Sarvasy, Dr Hannah S	Papua New Guinea (PNG) is Australia's closest neighbour, biggest recipient of Australian Aid, and a key strategic partner. Yet some Papua New Guineans think that Australia is falling behind East Asian nations in grasping PNG's current needs. A massive societal change is underway in PNG, through which its youth appear to be rapidly abandoning its 600-800 Indigenous languages. This could have major ramifications for social cohesion in a country where language has traditionally been a major marker of group identity. We will assess the scope of Indigenous language loss among youth in PNG, assess the potential for intervention, and study ramifications for social cohesion, individual and community well-being, and even cognition.							
	National Interest Test Statement This project investigates the effects of ongoing Indigenous language loss in Papua New Guinea (PNG). As Australia's nearest neighbour, primary aid recipient, and strategic partner, PNG's 600-800 Indigenous languages are key to group identity, and a factor in social stability. However, the actual extent of Indigenous language loss in PNG is unknown. Our project aims to determine the extent of PNG Indigenous language loss and whether wellbeing and prosocial behaviour can be positively linked to maintaining and revitalising Indigenous language skills in PNG communities. This research will enable PNG communities to make informed decisions about maintaining, abandoning, or revitalizing their Indigenous languages. This may provide sociocultural and health benefits. It will also enhance our understanding of the cultures of our nearest neighbour, and enable more efficient aid funding—especially in remote parts of PNG. Research outcomes will be promoted through an international linguistics meeting in PNG, as well as through the PNG communities themselves. The project includes the development of Indigenous language revitalisation and strengthening programs which will be implemented in PNG, but can also be adapted to address Indigenous language loss in other countries, including Australia.							
	Western Sydney University	958,431.50	2,118,485.50	2,378,649.00	1,752,077.00	748,791.50	215,309.50	8,171,744.00
	New South Wales	17,151,854.00	36,477,680.50	37,185,722.00	20,178,971.50	2,646,578.00	327,502.00	113,968,308.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Northern Territory								
Batchelor Institute of Indigenous Tertiary Education								
DP250104174 Guenther, A/Prof John C	**Remote Aboriginal students' high school retention and post-school pathways** Improving secondary school completion is critical for remote Aboriginal students' pathways to work and further study. While statistics show small improvements in remote high school retention, Year 12 completion does not guarantee employment or entry to further or higher education, and in remote communities, workforce participation and higher education engagement are extremely low. This project aims to determine what schools can do to retain students to support transition to work and further study. Project outcomes include strategies to improve literacy and numeracy, work readiness, confidence and transition to life beyond school. The research will contribute to social and economic benefits for remote schools, students and their communities.	109,288.00	245,043.00	277,584.00	254,761.00	112,932.00	0.00	999,608.00
	National Interest Test Statement Across Australia, the percentage of First Nations students from remote communities who remain at school until Year 12 is critically low. In the Northern Territory and Western Australia the situation is at its worst. Fewer than 3% of students complete high school, resulting in limited access to employment and further study. Successive attempts at intervention have resulted in ill-equipped one size fits all approaches, missed 'Closing the Gap' targets, and remote Aboriginal school completion and employment rates that continue to fall. This project aims to determine what remote schools and systems can do to retain and support First Nations students to complete school successfully. To do this, our experienced First Nations education research team will work closely with stakeholders connected to schools in remote Northern Territory and Western Australian communities to achieve social, economic, cultural and educational benefits for Elders, community members, educators and students. We will work to explore and address issues from the 'grassroots level' to cater for the unique and diverse needs that exist within these communities. By working closely with schools to help them address their specific needs, the project will identify innovative solutions to support school completion and transition to university, training and employment. In so doing it will develop an implementable model, supported by resources, that can be used across the nation to tackle this ongoing social crisis.							
	Batchelor Institute of Indigenous Tertiary Education	109,288.00	245,043.00	277,584.00	254,761.00	112,932.00	0.00	999,608.00
Charles Darwin University								
DP250103776 Spencer, Dr Michaela S	**Where Waters Meet: Empirical philosophy amidst more than human collectives** This project aims to position water-places, with their attendant people and non-humans, as central actors in Australian collective life. We use a multidisciplinary approach to study how these places are managed, cared for, lived-with, known and changed. The project will generate new knowledge, mapping differences in different contexts (cultural, historical, political), across scales (creek, river, river basin), and attending to epistemic devices (stories, maps, algorithms, images). Expected outcomes include generative, collectively enacted, institutionally stabilised understandings of Australian water-places benefitting those who care for them incl. traditional owners, policy makers, scientists, environmentalists, and recreational users.	83,110.00	170,788.50	171,103.50	83,425.00	0.00	0.00	508,427.00
	National Interest Test Statement The health and wellbeing of Australia's watery places is crucial for all who depend upon them. The management of environmental flows is a significant industry with average water market turnover reaching $6 billion in 2020-1, yet these places are under threat. Guided by elder Indigenous authorities, and engaging government, NGO, industry, and volunteer organisations, we work in 3 project sites inquiring into ways of knowing, being, managing and caring for water bodies and flows. Attending to epistemic devices mobilised by these groups, we map complex institutional ecologies arising in the management of Australian waters across scale (creek, river, river basin). We also work collaboratively to identify new synergies, efficiencies, and competencies that may be more actively engaged within organisations, across sites, and within management policies and procedures. Outcomes of the project will include evidence of new ways of collaborating around, agreeing upon, and caring for watery places and their futures as central actors in Australian collective life. Our involvements in state, territory, and federal government depts – through the delivery of public service treaty education (VIC), the practices and evaluation of Local Decision Making policies (NT) and the work of the Commonwealth Environmental Water Holder (Australian Govt) –							

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	ensures the potential for positive recognition and uptake of project resources and insights beyond the life of the funding.							
DP250104149 Banks, Prof Sam C	**How safe are island havens for biodiversity?** This project will be a partnership between scientists and First Nations rangers to assess the effectiveness of Australian islands as biodiversity havens. Through comprehensive surveys and historical data from the vast island estate in northern Australia, the project will quantify changes in biodiversity and threats in relation to biogeography, climate risk and management. A key outcome will be a classification of islands based on conservation opportunity and risk in the context of cultural and management considerations. Outcomes include increased conservation effectiveness, strengthened collaborations and training opportunities for Indigenous communities, contributing to the preservation of Australia's biodiversity. **National Interest Test Statement** The Australian government has committed to attempting to prevent any further extinctions. A key element of Australia's strategy to achieve this focusses on prioritising species or places where the greatest conservation opportunity exists. Islands play a crucial role in conserving species that are threatened or extinct on the mainland. This is because many of the threats that species face on the mainland are absent on islands. However, species on islands can be very susceptible to extinction if threats like invasive species reach them, and islands are particularly vulnerable to impacts associated with climate change. This project will be a partnership between First Nations ranger groups and scientists. It will comprehensively assess the status and trends in the biodiversity of northern Australia’s islands, which are predominantly First Nations-owned. The project will help us to conserve our unique wildlife by understanding the conservation opportunities and risks on islands and identifying the environmental management strategies that have had the best outcomes. The project will also build networks across island managers, and increase skill levels in environmental monitoring through formal training programs. The project will involve First Nations organisations and communities in research design and implementation, and will collaboratively develop methods and information resources to support environmental monitoring and management by community and government organisations.	135,998.50	361,069.50	457,417.00	408,092.50	175,746.50	0.00	1,538,324.00
	Charles Darwin University	219,108.50	531,858.00	628,520.50	491,517.50	175,746.50	0.00	2,046,751.00
	Northern Territory	328,396.50	776,901.00	906,104.50	746,278.50	288,678.50	0.00	3,046,359.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Queensland								
Central Queensland University								
DP250100937	**Rest and readiness: what is the optimal nap length during night shifts?**	130,545.00	284,247.50	308,160.00	154,457.50	0.00	0.00	877,410.00
Vincent, Dr Grace E	This project aims to investigate the duration of on-shift naps during night shifts for safety and productivity. On-shift naps boost performance and safety at night, but taking a nap removes the worker from the job, and temporary performance impairments upon waking from naps may mean additional downtime. By employing a rigorous sleep laboratory protocol, this project will determine the best nap length for safety and productivity – something we cannot determine from current evidence. The expected outcome is to establish evidence-based guidelines for on-shift napping, aiming to improve workplace productivity and safety with minimal disruption to operational efficiency.							
	National Interest Test Statement							
	Night work is critical for Australia's economic prosperity, supporting essential sectors such as healthcare, emergency response, and transportation. But performance, productivity, and safety are all lower on the night shift because humans have evolved to sleep at night. We know that naps on night shift can enhance performance, but workplaces choose not to use them because they take workers off the job and safety can be impacted by post-nap sleep inertia. But research to date has not asked whether nap length can be optimised so that the costs of downtime are outweighed by the benefits of whole shift productivity. Our project will fill this gap. The potential benefits of this research include a reduction in night work-related productivity losses, estimated at $17.9 billion annually, and a decrease in workplace accidents, costing over $61.8 billion. Outcomes will include new knowledge and evidence-based guidance on the impacts of on-shift napping for productivity and safety. Findings will support the development of tools for strategic nap scheduling, boosting operational productivity in industries that rely on night work. Outcomes will be communicated by direct community outreach including media, industry forums, and public science events, facilitated by a formal communication strategy to influence national policy and operational standards.							
	Central Queensland University	130,545.00	284,247.50	308,160.00	154,457.50	0.00	0.00	877,410.00
Griffith University								
DP250100461	**Proxy advisors and political dynamics in ethical investment campaigns**	83,927.00	225,709.50	246,271.50	104,489.00	0.00	0.00	660,397.00
O'Brien, Dr Erin G	Proxy advisors provide guidance to more than 90% of the market’s large institutional investors, making them powerful allies or obstacles for activist campaigns for ethical investment. This project aims to reveal proxy advisors' role in spreading ethical investment norms, by analysing the power structures of the investment ecosystem through a world-first multi-country study of ethical investment campaigns on climate change, modern slavery, and First Nations’ land rights. Expected outcomes include the development of a novel typology for understanding influence in the realm of investment politics, and an evidence-base to provide benefits of guiding regulatory action and enhancing efforts to leverage market mechanisms to combat global problems.							
	National Interest Test Statement							
	Proxy advisors are highly influential actors that play a central role in the investment ecosystem. This project examines the function of proxy advisors and their ability to direct capital investment to encourage ethical and sustainable business practices. By elucidating the complex relationships among proxy advisors, investors, social movements, and corporations, we aim to create a better understanding of efforts to align investment decisions with broader societal goals and major public issues in Australia. The project specifically focuses on climate change, modern slavery, and First Nation People's land and cultural rights, which are critical issues that carry national, regional, and global significance. Gaining such insights is valuable for the general public as well as for policy making, as better understanding the role of proxy advisors increases transparency and accountability around investment decisions, which can in turn inform public and company policy that considers the social and environmental consequences of investment decisions alongside wealth creation. Project outcomes will not only be disseminated in the academic community, but also presented to non-academic audiences in accessible formats. This dissemination strategy maximises engagement with the insights on the role of proxy advisors in aligning investment decisions with communal							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	interests, bringing the benefits of our research into public discourse.							
DP250100542 Hood, Prof Michelle H	**Breaking the Cycle: Understanding Precarity in Australia's Youth Workforce** The project aims to identify 'necessary' conditions that predispose youth to insecure, poorly paid and regulated, or precarious, work and widening precarity (e.g., eroded development, welfare reliance, low productivity) by taking a life history approach using archival longitudinal data supported by original data triangulated across young workers, their families, and employers. It expects to generate novel evidence on the cycle from preexisting precarity to precarious work to widening precarity. Expected outcomes include workplace change recommendations to break the cycle and better support young workers. This should yield significant benefits by reducing the societal and economic costs (estimated $billions) of a scarred youth precariat.	55,612.00	135,249.00	148,876.50	69,239.50	0.00	0.00	408,977.00
	National Interest Test Statement Precarious employment (insecure with poor conditions, pay and benefits) presents a significant and growing issue for Australia, with youth most at-risk. Yet we know little about what predisposes youth to precarious employment and how that shapes their psychological construction of work and life phenomena, general worldview and a perpetual cycle of precarity. Addressing these knowledge gaps is critical to breaking the cycle. This project aims to identify factors across the life-histories of youths that predispose them to precarious employment trajectories during the adult workforce transition and the effects on their development and adjustment. We will document youth's lived experiences of workplace-based needs, risks, supports and barriers and gather employers' and family's perceptions. Findings will transform the field beyond a focus on individual intervention to address systemic workplace and social risks, barriers and needed change, ensuring outcomes can be translated into actionable recommendations that will be presented to industry, worker organisations, support agencies and government for adoption and will fuel further research. Breaking the precarity cycle is vital to build a psychologically healthy and productive future Australian workforce. This will have important economic and social benefits for young workers directly via recommended workplace-based change (e.g., improved job design) and for organisations via high returns on investment (e.g., productivity gains).							
DP250100860 Ng, Prof Shu-Kay Angus	**Advancing statistical models for clustering data with structured dependence** Modern data present increasingly complexities such as heterogeneity and structured dependence among data. Ignoring these features can result in misleading findings. This project aims to develop novel methods to identify important subgroups in data with various forms of dependence. It will introduce techniques that can capture complex relationships in data and enhance model validity. Main outcomes include advanced methods and algorithms that can accurately identify clusters, patterns, outliers, and model evaluation. This will provide significant benefits in statistics and for crime prevention in Australia when the new methods are applied to Queensland Police Service data to understand co-offending crimes, repeat victimisation, and hot spots.	85,584.00	172,033.00	169,320.50	82,871.50	0.00	0.00	509,809.00
	National Interest Test Statement Identifying disadvantaged subgroups is fundamental in solving many real-world problems. Modern data often show high interdependence. Traditional methods that ignore data dependence can result in misleading findings. This project aims to develop new statistical methods for identifying subgroups from data with various forms of dependence. Research outcomes are advancements in statistical methodology with improved validity for understanding important patterns, outliers, and relationships between subgroups. The research outputs will bring benefits in statistics and across scientific fields that generate data with complex dependence in daily applications. The project will also expand research capacity in Australia by promoting collaborations and by training young researchers and students. The practical application of our methods to the Queensland Police Service data will fill the gaps in understanding patterns of co-offending and repeat victimisation, crime hot spots, risk factors, and vulnerable groups. The findings will be valuable in directing effective crime prevention to achieve safe environment and secure societies for addressing the UN Goal "Sustainable Cities and Communities". These are important foundations for delivering other key services and economic growth to Australia. We will develop a web-based platform and seminars to engage researchers, communities, and stakeholders for promoting knowledge exchange, awareness, and translations into changes in policy or practice.							
DP250100998 Ve, A/Prof Thomas	**Developing chemical probes for effector triggered immunity in plants** Nucleotides play important roles in activation of plant immune responses to prevent pathogen infection and are therefore potential targets for development of crop protecting agents. This project aims to use chemical and structural biology approaches to develop stable and cell-permeable small molecules that can be used	120,194.50	249,513.00	263,427.00	134,108.50	0.00	0.00	767,243.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	as chemical probes to study plant immunity. The expected outcomes include fundamental new knowledge on molecular mechanisms of plant immunity, and a synthetic toolbox that can modulate the plant immune system and be used for developing new strategies to protect crops from disease and invasive plants. This should provide significant benefits to agriculture and global food security. **National Interest Test Statement** Plant diseases, insect pests and invasive plants are responsible for substantial crop losses each year. They are threats to global agricultural sustainability and food security and development of effective strategies to reduce crop losses are of immediate importance. This project aims to develop small molecules that can modulate the plant immune system. These molecules can be used as tools to advance fundamental knowledge in the functioning of the plant immune system, and as starting points for development of new crop protecting strategies with potential significant economic and commercial benefit for Australian agriculture. The project will also build critical capacity and advanced interdisciplinary skills in the rapidly growing fields of chemical and structural biology in Australia by training early career scientists. To maximise understanding, translation, use, and adoption of the research beyond academia, research data will be made publicly available in open-access repositories, research outcomes will be promoted via conferences aimed at a broader community, popular press and social media platforms, and industry stakeholders will be engaged to transform the new knowledge and molecules into impactful outcomes.							
DP250101210 Guan, Prof Hong	**Timber Reimagined: Structurally Efficient Two-Way Flat Plate Construction** This project aims to develop a novel post-tensioned two-way cross-laminated timber flooring system to transform the design of conventional timber buildings, whilst addressing the shortage in timber supply. The project will generate new knowledge in the safe and efficient design of timber buildings and public infrastructure. Expected outcomes include lightweight, thin and more sustainable timber floors and roofs, and leading edge practical guidelines for the engineering community. This will provide significant benefits in response to the Australian Government's commitment to increase timber construction by 2030 to build near-zero and resilient buildings, and the QLD Government's Brisbane 2032 commitment to deliver a carbon-positive Olympics. **National Interest Test Statement** Existing timber structures constructed with conventional cross-laminated timber (CLT) encounter limitations such as one-way bending in floor and roof slabs, as well as the necessity for closely spaced columns, leading to thick slabs with reduced material efficiency. These limitations hinder the industry from using timber as widely as concrete and steel materials in various types of buildings. This project aims to develop a novel two-way CLT slab system enabling engineers to build lightweight, large-span, thin CLT slabs, representing a new generation of cost-effective timber construction. This will address the industry gaps in efficient timber design for strength and serviceability. The manufacturing techniques and design guidelines to be developed have the potential to be adopted by industry and integrated into building and construction policies. The proposed efficient two-way CLT construction solution will overcome the shortage in timber supply, foster advanced manufacturing in timber engineering, and create jobs for the Australian forestry and timber industry. Project outcomes will support the Australian Government's commitment to increase timber construction by 2030 to build near-zero resilient buildings, the QLD Government's Brisbane 2032 commitment to deliver a carbon-positive Olympics, and the UN Sustainability Development Goals. Strategies such as industry seminars, publications and digital platforms will be employed to reach a diverse audience and facilitate adoption.	108,207.00	205,376.00	151,986.50	54,817.50	0.00	0.00	520,387.00
DP250101408 Baker, Prof Sarah L	**Co-creating a sustainable future for the community heritage sector** This project aims to address the sustainability crisis facing the volunteer-managed galleries, libraries, archives, museums and historical societies that comprise Australia's community heritage sector. Securing their long-term futures is imperative, as they serve as custodians of tangible and intangible heritage that record the nation's cultural diversity. This project will identify indicators of organisational sustainability, with the expected outcome being an evidence-based resource which will help volunteers recognise and address threats to operations. This should provide significant benefits to community heritage organisations via a sustainability toolkit that enables them to benchmark their practice and plan for long-term futures. **National Interest Test Statement** Australia's community heritage sector – comprised of volunteer-managed galleries, libraries, archives, museums and historical societies – serves vital functions in shaping public history through the collection, preservation and	87,758.50	181,308.50	168,725.50	75,175.50	0.00	0.00	512,968.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	display of the nation's tangible and intangible heritage. However, the sector faces a sustainability crisis due to mounting pressures (e.g. related to funding, staffing, technology) that pose a challenge to the long-term futures of many of its institutions, putting at risk the diversity and accessibility of the nation's historical record. In collaboration with representatives from 30 community heritage institutions across Australia, this project aims to identify indicators of organisational sustainability in the community heritage sector and co-develop strategies for recognising value, measuring organisational sustainability and creating benchmarks for sustainable practice. The major public output of the project will be the Community Heritage Sector Sustainability Toolkit, which will assist volunteers in the sector to work toward organisational sustainability goals. The project will position Australia at the forefront of research on how to embed organisational sustainability indicators into institutional practice in the community heritage sector. The project contributes to supporting the long-term futures of some of Australia's most vulnerable, yet important, forms of cultural infrastructure.							
DP250101781 Stanford, Dr Bartholomew M	**Settlement agreements between First Peoples and Australian governments** This project aims to examine settlement agreements between Indigenous groups and Australian Governments. New knowledge about this type of agreement-making will be created by investigating cases from Western Australia and Victoria where settlement agreements have been established under two separate legislative instruments; the Native Title Act 1993 (Cth) and the Traditional Owner Settlement Act 2010 (Vic). The findings promise to provide new conceptual and theoretical arguments about settlement agreements in respect to Indigenous sovereignty and self-determination, while providing valuable insights into the factors which underpin their negotiation, implementation and management.	107,150.00	230,222.00	243,016.00	119,944.00	0.00	0.00	700,332.00
	National Interest Test Statement In the aftermath of the Voice to Parliament referendum, the path to achieving reconciliation with Australia's First Peoples and overcoming the disadvantage many of them face is unclear. The Settlement Agreements negotiated by Victoria and Western Australia constitute one possible avenue to reconciliation and Indigenous advancement, given that they address matters related to native title, land management, governance, economic advancement, and protection of culture and Country. This project seeks to generate new knowledge regarding Settlement Agreements, and to assess their potential value in improving relationships between First Peoples and the Australian state and advancing the interests of Indigenous Australians. It will do this by focusing on the negotiation, implementation and outcomes of all seven Settlement Agreements concluded in Victoria and Western Australia since 2010. It will focus on the potential and the realised benefits of Agreements for the First Peoples involved, using an innovative methodology designed to assess outcomes in key areas including self-determination, protection of country, economic opportunity, and cultural and social advancement. Findings will be communicated directly with participant groups during the project, through the Agreements, Treaties and Negotiated Settlements (ATNS) website and at the AIATSIS Summit where we will hold a workshop and disseminate knowledge to policy-makers, researchers, native title groups and First Peoples.							
DP250102162 Wiseman, Prof Howard M	**Advancing Quantum Experiments to Test Reality Beyond Bell's Theorem** This project aims to develop and perform quantum experiments that will impose strong constraints on the nature of reality – even stronger than the constraints imposed by the Bell experiments recognised by the 2022 physics Nobel Prize. Expected outcomes include probing the nature of observation itself, for increasingly sophisticated systems acting as observers, and laying the theoretical groundwork for future tests that can rule out whole classes of theories about the world and our experience of it. Some of the benefits that will likely accrue are: pushing the development of photonic technology in novel directions; and creating knowledge of relevance to humanity's future in a world where artificial intelligences can be accepted as observers.	132,488.00	235,594.00	235,087.50	242,870.50	110,889.00	0.00	956,929.00
	National Interest Test Statement The research project addresses a knowledge gap of the most fundamental kind in physics – what is an "observer"? This may sound like a purely philosophical question. However, the observer is at the heart of standard quantum theory – one of the pillars of modern physics. It is a theory about what observers may observe, not a theory about what exists in the world independent of the observer. The researchers in this project will build on their prominent recent work to perform novel quantum experiments. These will test whether various candidate systems act as observers, given certain common assumptions such as the ability to freely choose experimental settings. The results will either lead to the discovery of completely new physics or, given those assumptions, rule out some classes of observers. Some of the proposed experiments will push the development of photonic technology in Australia in new directions. Others will use quantum computing technology, a growing industry in Australia ripe for future partnerships. The project will train future leaders in the Australian quantum industry or academia. It will advance pure knowledge relating deep themes of free will, reality, and whether an Artificial Intelligence can be an observer. These are topics of broad interest to Australian society. We will disseminate our findings through public talks, interviews, and writing for popular science magazines and books. All of this contributes to the success of the National Quantum Strategy.							
	Dissecting the interplay of metabolism and lysine acetylation in Plasmodium							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250102295 Andrews, Prof Katherine T	This project aims to improve our limited understanding of a key mechanism called lysine acetylation in Plasmodium, which are parasites that infect terrestrial vertebrates causing significant ecological, economic and health impacts. This project will investigate how Plasmodium lysine acetylation is linked to metabolic pathways and discover proteins that are critical to this process. New knowledge generated will improve understanding of Plasmodium biology and in the long term may lead to new ways to monitor, prevent or treat infections with these parasites. This knowledge will benefit researchers globally via access to high quality open science data and benefit Australia by building capability in metabolomics and proteomics core technologies.	105,057.00	213,468.00	218,411.00	110,000.00	0.00	0.00	646,936.00
	National Interest Test Statement Plasmodium parasites can infect over 200 species of mammals, reptiles, birds, and amphibians. For example, certain Plasmodium species cause human malaria (>600,000 deaths annually), while others cause bird malaria in Australia and globally (e.g. decimating native Hawaiian bird populations). One of the challenges of Plasmodium biology is the complexity of the parasite's growth processes, including understanding which are the key genes, proteins and metabolites involved in regulating these processes. This project will address this problem by investigating an important mechanism in Plasmodium that involves the modification of proteins and that influences almost all processes of cell biology including growth and infection. A better understanding of Plasmodium biology offers national benefits, including new insights on the biology of parasitism that may aid in the discovery of ways to monitor and target Plasmodium parasites important to human and animal health and improve understanding of current challenges such as drug resistance and zoonosis (transmission of Plasmodium from animal to human hosts). A further benefit will be mechanistic insights that will aid in the study of related parasites of veterinary importance to Australia, such as Babesia and Theileria that infect cattle and wildlife. The large protein and metabolism datasets arising from this project will be made open access, which will facilitate adoption and translation by other researchers in Australia and globally.							
DP250102625 Zhou, Prof Jun	**Spectral-spatial-temporal object tracking in hyperspectral videos** This project aims to advance video processing systems through the development of hyperspectral object detection and tracking methods. Focused on challenging scenarios faced by conventional camera systems, this research harnesses the capability of hyperspectral video cameras in material identification within and beyond the visible spectrum to capture and model the spectral, spatial, and temporal information for object tracking. Expected outcomes include the formulation of novel methods for material identification, spatial distribution mapping, spectral-structural feature extraction, and their integration into temporal tracking models. This promises to reshape video processing, benefiting agriculture, environment, and transportation sectors.	87,237.50	174,475.00	174,475.00	87,237.50	0.00	0.00	523,425.00
	National Interest Test Statement Video tracking is a fundamental AI technology with more than 100 billion dollars market values. Traditional tracking models based on colour or grayscale videos have inherent limitations in detecting and tracking objects beyond the visible spectrum. This project aims to address this problem by designing cutting-edge hyperspectral video processing technology that can distinguish objects with fine differences from the surrounding environment. By integrating this technology into existing remote sensing platforms, the agricultural industry will be able to detect pests on crops or in soils, improve biosecurity, mitigate yield and revenue loss, control pesticide use, and explore new business opportunities, resulting in substantial economic benefits. Through collaboration with environmental scientists in know-how sharing and academic publication, as well as engaging potential industry partners in translational research, this project is expected to enable government departments and agencies to better detect and track wild animals, understand the distribution and living conditions of endangered species, and provide real-time monitoring of microplastic for improved water quality, generating enormous environmental and health impact.							
DP250102801 Thaichon, Dr Sara Q	**Mitigating the dark side of AI-powered virtual influencers** This project aims to investigate effective strategies to mitigate the impact of AI-generated influencers on young consumers' body image dissatisfaction and self-esteem. This project expects to uncover novel insights about form realism and behavioural realism of virtual influencers by utilising innovative mixed methods including in-depth interviews, a survey, and online simulations. Expected outcomes include identifying inherent risks with generative AI-powered virtual influencers and exploring intervention mechanisms to enhance inclusivity and diversity in online environment. This should provide significant benefits, such as understanding and	56,632.00	105,915.50	126,253.00	76,969.50	0.00	0.00	365,770.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	refining strategies for using AI and influencer marketing and informing relevant policies. **National Interest Test Statement** Influencer marketing, which is increasingly using hyper-realistic AI-generated virtual influencers, raises significant concerns about social comparison, self-esteem, and body image, contributing to growth in eating disorders that cost Australia $67 billion and resulted in 1,273 deaths in 2023. Our research seeks to confront these challenges by uncovering the negative impact of virtual influencers on Gen Z, especially in underrepresented groups such as Indigenous Australians and LGBTQ+ communities. Guided by an advisory committee to ensure alignment with Indigenous community values and needs, we also assess the effectiveness of incorporating inclusion and diversity cues, such as the portrayal of minority groups, in virtual influencers, to promote healthier self-perceptions amongst the 15 to 24 age group. This research will assist firms in developing inclusive marketing strategies that appeal to Gen Z's preference for socially responsible brands and will set new media standards, fostering a positive culture for Gen Z and marginalised groups. The findings will guide the development of advertising regulations preventing influencers from promoting unrealistic body ideals. Our research will be disseminated via various channels in Australia and the US. Development of a Virtual Influencer Directory, Interactive Tool, and guidelines on diversity and inclusion will aid policymakers and businesses in making informed decisions about the ethical use and governance of virtual influencers.							
DP250104387 Simmonds, A/Prof Michael J	**Unlocking the mechanobiological events in oxygen unloading by erythrocytes** This project aims to use state-of-the-art technologies to reveal the process of oxygen release from red blood cells during mechanical force exposure. This project expects to generate new knowledge on a vital biological process originally described using static models of cell-free haemoglobin that do not reflect the diffusive barriers to gas exchange or the mechanical dynamics of the in vivo environment. Expected outcomes include identifying molecular targets responsible for, and equations to accurately describe, the relation between mechanical stress and oxygen transfer. Benefits will include knowledge to improve models of biological dynamics and economic opportunities due to industry applications related to oxygen supply-demand management. **National Interest Test Statement** This project addresses a knowledge gap in the fundamental understanding of the physical processes that regulate oxygen transport and offloading in blood. Classic theory predicts rapid exchange of oxygen between blood and organs, although those approaches relied on measurements in stationary and simplified fluids, which do not translate to the complex and dynamic environment of blood. This project addresses this limitation by developing a cutting-edge method to evaluate how physical forces influence the handling and offloading of oxygen at the single cell resolution and will reveal how the intracellular environment regulates oxygen availability in response to physical forces. The platform technology developed in this project will generate valuable knowledge for future researchers seeking to target specific cellular processes that regulate oxygen transfer from cells, with future applications in health and disease. Further, the developed technology presents commercial opportunities by reducing labour intensive techniques into a single user-friendly platform attractive for blood screening and analytics. The knowledge, technology, and outcomes of this project will thus be shared with, and provide value to, many Australians and is likely to have value in providing tools that may be manufactured locally for export to the world. Knowledge from this project will be shared with community groups via science communication opportunities, and school outreach, to promote science literacy.	112,781.50	218,478.00	209,706.50	104,010.00	0.00	0.00	644,976.00
	Griffith University	1,142,629.00	2,347,341.50	2,355,556.50	1,261,733.00	110,889.00	0.00	7,218,149.00
James Cook University								
DP250100943 Cernusak, Prof Lucas A	**Do tropical conifers differ fundamentally from angiosperms in CO2 response?** This project aims to investigate the physiological basis for a previously observed difference in how tropical conifers and their angiosperm counterparts respond to elevated carbon dioxide. In addition, it aims to determine the relevance of the differential responsiveness under field conditions in north Queensland. This project expects to fundamentally advance understanding of how tropical trees will respond to steadily increasing atmospheric carbon dioxide. The expected outcome is an enhanced capacity to predict which tropical tree species will increase their growth rates and which will not. This should provide significant benefits to the tropical forestry sector, and to conservation and effective management of Australian tropical forests.	119,488.00	243,626.00	240,771.00	116,633.00	0.00	0.00	720,518.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement The atmospheric carbon dioxide concentration has increased by 50% globally since the beginning of the industrial revolution, driven by human activity. While this has caused global warming and climate change, atmospheric carbon dioxide also provides the fuel for plant growth. Its rise has likely resulted in increased growth of tropical forest trees, but a framework for understanding which tree species respond most strongly in species-rich tropical forests does not exist. Preliminary observations suggest that tropical conifer trees native to north Queensland benefit more than their angiosperm counterparts. In this project, we will identify the underlying processes that allow some tropical tree species to increase their growth rates more than others in response to rising atmospheric carbon dioxide, and we will develop a predictive framework that can be applied to tropical forests broadly. Being able to better predict tree responses to the inexorable rise in atmospheric carbon dioxide will benefit the Australian forestry sector by guiding species selections for plantings; natural resource managers through better informed predictions of carbon accumulation in terrestrial biomass; conservation practitioners by providing insight into species interactions, including between trees and the unique Australian fauna that depend upon them; and policy makers by helping to guide Australia's path to net zero emissions including through carbon capture by forested landscapes.							
DP250101690 Strugnell, Prof Jan M	**Does genome rearrangement enable adaptation during environmental change?** This project aims to investigate a hidden but crucially important form of genetic variation involving the rearrangement of genomes. By studying the roles that these rearrangements played during historical climate change the project expects to generate new knowledge regarding their impact on the persistence of threatened species during future environmental change. Expected outcomes of this project include models that will predict the effectiveness of genomic interventions designed to mitigate future climate change impacts. This should provide significant benefits for predicting adaptive capacity, updating conservation genetics frameworks, and designing genetic interventions to protect threatened species.	65,233.50	181,576.00	184,802.50	68,460.00	0.00	0.00	500,072.00
	National Interest Test Statement The future health of Australia's marine ecosystems, from its tropical coral reefs to its Antarctic territorial waters, will depend on the ability of species to adapt as ocean temperatures continue to rise as a result of climate change. Developing marine management strategies that protect and enhance the ability of species to adapt is critical to preserving the immense economic, environmental and cultural value that these ecosystems provide to Australians. Genetic variation must be at the core of any such strategies because it is the fundamental fuel of adaptation and an excellent predictor of adaptive capacity. The goal of this research proposal is to understand an important component of genetic variation that has so far remained hidden in rearrangements of genomes. Human interventions, such as assisted gene flow, are already occurring in an attempt to increase marine species ability to adapt. Such interventions can lead to unintended consequences and may accelerate declines without adequate understanding of these genomic rearrangements. This research will help inform management interventions designed to help species adapt to climate change. This will provide environmental benefits and will also help ensure conservation funds are spent wisely.							
DP250103140 Radke, Dr Helena	**Advancing workplace gender equality through effective allyship** This project aims to conduct a comprehensive investigation of when, why and how allyship can effectively advance gender equality in the workplace. Using a novel theoretical framework and multi methods approach including interviews, surveys, and experiments, this project expects to generate new knowledge on the nature and impact of (in)effective allyship for workplace gender equality. Expected outcomes include an evidence base to inform interventions for workplace gender equality through effective allyship. This project is expected to make a significant contribution to understanding how workplace gender equality can be advanced which has a number of economic and social benefits for women, men, and society more broadly.	73,010.50	163,010.50	177,000.00	87,000.00	0.00	0.00	500,021.00
	National Interest Test Statement Despite decades of research and intervention, gender inequality in Australian workplaces remains a widespread and costly problem. This project proposes that encouraging men and organisations to act as allies for gender equality is a crucial yet overlooked piece of the puzzle required to solve this issue. It therefore aims to conduct a comprehensive investigation of when, why and how men and organisations can effectively advance workplace gender equality. This research has a number of economic and social benefits for Australian women, men, and society more broadly: Gender equality in the workplace is associated with increased gross domestic product, greater productivity, improved well-being, and better access to parental leave and flexible working arrangements for all employees. The research outcomes of this project will be regularly communicated to policy makers, organisations and the broader community through a public-facing website with the findings collated in a freely available toolkit to inform allyship interventions for workplace gender equality. It is anticipated that the research will be adopted by organisations around Australia to inform the development of interventions which effectively advance gender equality in the workplace.							
DP250103482	**Friend or Foe: are common coral symbionts mutualists or parasites?**	91,025.00	184,625.00	201,224.00	107,624.00	0.00	0.00	584,498.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Bourne, Prof David B	The cellular processes underpinning coral health are complex. Bacteria represent a third pillar supporting the symbiosis between coral and their algal partner, but despite being critical for coral resilience, this tripartite partnership is poorly characterized. Applying advanced imaging and sequencing approaches, this work will determine how bacterial interactions in corals are sustained, their function in maintaining coral health and whether they help stabilize the faltering coral symbiosis under environmental stress. Detailing the cellular processes that underpin coral health is critical for implementation of strategies to increase coral resilience and protect the values of the Great Barrier Reef faced with rapidly warming oceans.							
	National Interest Test Statement							
	The Great Barrier Reef (GBR) is an Australian economic, environmental, and cultural icon. The sustainability of the GBR is under threat from ongoing environmental impacts, including repeat mass bleaching events. These impacts can spill into a loss of credibility for Australian environmental stewardship and identity. Microorganisms underpin the health of corals that build the GBR, thus new strategies are being developed to manipulate microbes to buffer against climate impacts. However, these approaches are confounded by limited understanding of how microbes contribute to coral health. Our work is critical to improve strategies that protect corals from a changing climate and maintain reefs for future generations, providing direct value to the Australian community and tangible benefits to management of the world heritage listed GBR. Research outcomes will be adopted in novel strategies (i.e., probiotics) and implemented in expanding coral aquaculture commercial opportunities focused on building healthy resilient reefs. The translative work in this area will support upskilling across academia and industry, critical to the on-going fight to preserve our marine resources. New knowledge will underpin a healthy GBR which is critical to the Australian national interest through its direct economic contribution of $6.4 billion and 64,000 jobs, attracting millions of tourists each year and sustaining important marine industries and ecosystem services.							
DP250104905 Foale, A/Prof Simon J	**Small Pelagic fisheries in the Pacific: the future of nutritional security?** The project aims to improve understanding of the role of terrestrial nutrient delivery in driving productivity of a hitherto neglected fishery sector: small pelagics (sardines, scads and small mackerels) in the Western Pacific. The high productivity, resilience to fishing pressure, and superior nutritional value of these fish warrant greater attention as population and market pressures increase. We will generate data correlating nutrient dynamics and fishery production, together with ethnographic data on local fishery knowledge, to better understand the relationship between small pelagic fisheries and the catchments that deliver the nutrients they depend on.	57,340.50	159,125.00	142,470.00	40,685.50	0.00	0.00	399,621.00
	National Interest Test Statement							
	Small pelagic fish (sardines, scads and small mackerels) are by far the most important species for marine fishery-based nutritional security among Australia's densely populated Southeast Asian neighbours but receive remarkably little scientific attention. Even less is known about these fisheries in two of Australia's most geostrategically important Western Pacific neighbours, Papua New Guinea and Solomon Islands, where their potential nutritional significance is rapidly increasing with burgeoning population pressure and climate stress. Small pelagic fish have vastly higher nutritional value (higher Calcium, Iron, Zinc, Vitamin A and Vitamin B12) than most other exploited fish groups and are much more productive and resilient than most other fish species. Small pelagic fish are part of plankton-based food webs which depend fundamentally on nutrient delivery from either upwellings or terrestrial runoff. Despite their nutritional and economic importance there is surprisingly little scientific literature on small pelagic fisheries, particularly on the significance of terrestrial nutrient delivery for their productivity. Key benefits of our research for Australia are significant nutritional security improvements among our low-income Pacific and Asian neighbours (with multiple human development flow-on benefits including improved maternal and child health, and educational achievement), and enhanced understanding of a scientifically neglected fishery sector at home.							
	James Cook University	406,097.50	931,962.50	946,267.50	420,402.50	0.00	0.00	2,704,730.00
Queensland University of Technology								
DP250100074 Riedlinger, A/Prof Michelle E	**Generative AI and the future of academic writing and publishing** This project examines the impact of Generative AI (GenAI) technologies on scholarly research and publishing. The project investigates how GenAI technologies are shaping the future of academic research from search to publication, including how academic publishers and peak research advisory bodies are responding to the	89,443.00	179,930.00	166,602.50	76,115.50	0.00	0.00	512,091.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	potential of these technologies. The project develops a framework for understanding the sociotechnical drivers shaping the debate and establishes cross-sector principles to promote a more consistent and critical response by key stakeholders. In doing so, it supports ongoing learning within scholarly communities for a more responsive national research system, optimising GenAI for public good. **National Interest Test Statement** Understanding the impacts of GenAI technologies is crucial for maintaining the integrity of scholarly work. GenAI technologies promise to streamline existing processes in higher education, public knowledge production and commercial scholarly publishing, but raise questions about the quality and fairness of academic processes and knowledge outcomes. These technologies are provoking rupture and change - and through this project we have the opportunity to positively influence engagement with GenAI technologies in the academic writing and publishing sector. Our research is timely and vital for Australia because it investigates how academic practices that are supported by GenAI technologies can continue to meet high quality standards, essential for maintaining Australia's reputation for academic excellence and contributing to Australia's socio-economic competitive advancement. The project supports innovation and efficiency in scholarship, keeping Australia's academic institutions at the forefront of technological integration. We will share our findings beyond academic circles through policy reports and briefs to influence the publishing industry and governmental approaches to GenAI in scholarly settings. We will use media channels to raise awareness about this important issue within the broader community and stimulate public discussion for a well-informed community equipped to navigate the complexities of GenAI in academia and ensure research quality that benefits all Australians.							
DP250100117 Hogan, A/Prof Anna R	**Curriculum, resources and teachers' work** This project aims to investigate the capacity of commercial curriculum resources to alleviate teacher workload concerns. This project expects to generate significant new knowledge about how teachers work productively with commercial tools and platforms in delivering the Australian curriculum. Expected outcomes include publicly available policy resources to facilitate the equitable distribution and use of commercial resources in teacher lesson planning and preparation, and the development of best practice guidelines to support the development, sale and use of curriculum resources. This project will have significant benefits in improving teacher outcomes and better use of public funds for teacher workload reduction. **National Interest Test Statement** This project evaluates the efficacy of the shadow curriculum industry in enhancing Australian school teachers' ability to deliver quality lessons and reduce their curriculum planning time. This research addresses the urgent need for an assessment of commercial curriculum resources and their impact on the educational landscape. By developing evaluative materials and best practice guidelines, the project aims to improve transparency and accountability in teacher-platform interactions. The benefits for Australians are significant. Economically, the project will ensure that schools and teachers invest in curriculum resources based on evidence-informed practices, leading to potential workload reductions at a systemic level. Socially, it will enhance the quality and curation of curriculum resources by teachers, leading to more effective and equitable educational practices and an improved educational experience for students. The project will make important contributions to ongoing policy debates over teacher workload reduction strategies and the take-up of curriculum resource platforms in State Education Departments. It will also guide curriculum authorities on curriculum regulation and oversight issues. This project aligns with the National Teacher Workforce Action Plan's goal of retaining teachers to address workforce shortages and will culminate in research engagement and translation activities with industry stakeholders, ensuring impactful outcomes.	48,233.50	103,209.00	123,352.50	68,377.00	0.00	0.00	343,172.00
DP250100366 Yang, Dr Qianqian	**New mathematical models for brain tissue microstructure imaging** Diffusion MRI is a modern workhorse for neuroscientists to non-invasively study the brain. However, the mechanism underlying diffusion MRI signal formation, due to the movement of water molecules in complex brain tissue, is still unclear. This project aims to develop the next generation mathematical framework to interpret and model diffusion-weighted MRI signals, surpassing the capability of conventional mathematical models. Expected outcomes include novel mathematical and computational approaches enabling more sensitive and specific imaging markers for characterising brain tissue microstructure. The mathematical tools developed will advance the state of the art in diffusion MRI data analysis and benefit both researchers and clinicians. **National Interest Test Statement**	97,500.00	201,000.00	198,500.00	95,000.00	0.00	0.00	592,000.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	Since the first images of water diffusion in the human brain were captured in 1985, diffusion-weighted magnetic resonance imaging (DW-MRI) has become a crucial tool for neuroscientists. This project will develop the next-generation mathematical theory and computational tools to interpret and analyse DW-MRI signals, surpassing the capabilities of traditional imaging models like diffusion tensor imaging (DTI) and diffusion kurtosis imaging (DKI). The highly efficient computational models and tools will establish a mapping between the mathematical model parameters and tissue microstructural properties, potentially leading to more sensitive and specific imaging markers for characterizing brain tissue microstructure. The innovative techniques are poised to not only benefit researchers in applied mathematics, biological mathematics, and biomedical imaging, but also neuroscientists and clinicians. Through publications in high-impact journals, this project will position Australia as a world leader in mathematical modelling with fractional calculus theory and tissue microstructure imaging using DW-MRI. Furthermore, it will foster long-term interdisciplinary collaborations with leading brain imaging centres in Australia and Europe. This project will also train the next generation of researchers in the intersection of mathematical sciences and neuroimaging, providing exciting research and collaborative opportunities for the development of their careers.							
DP250100850 Bray, A/Prof Laura J	**Defining cell communication and mechanics in tissue specific vasculature** This project aims to improve our understanding of the mechanical properties that regulate the organ-specificity of blood vessels and their function. The endothelial cells lining blood vessels play a specialised role in the local physiology of their respective organs, however little is known about the fundamental biophysical events which trigger or characterise this function. This project expects to generate new knowledge in the area of developmental biology using collaborative, cutting-edge biomechanical techniques. In studying this process, the project should provide critical insights into how changes in cell and fluid mechanics are interpreted by, and consequently determine the identity and function of organ-specific endothelial cells.	105,224.50	210,319.00	209,364.50	104,270.00	0.00	0.00	629,178.00
	National Interest Test Statement As the connecting pathway to all organs in the human body, blood vessels are an important system underpinning how organs form, how they change and how they regenerate. However, due to the biological complexity of human blood vessels, most of the factors controlling the communication of blood vessel cells within different tissues are yet to be identified. By leveraging and integrating key research strengths in tissue engineering, microvascular biology and biomechanics, this project will deliver new knowledge in how mechanical forces influence organ-specific blood vessel function. By mimicking dynamic interactions within different tissues, this project will allow us to comprehensively characterize how blood vessels transfer signals within tissues, how they function and what may lead to their dysfunction. This project will shape future scientific research and pharmaceutical development across all human organs through a new knowledge framework of specialised organ-specific blood vessel biology and physiology. Future translation of these research outcomes will be of significant value to the medical technologies and pharmaceuticals sector. Our research outputs will be shared with relevant organisations for further validation in mechanistic, diagnostic and therapeutic applications.							
DP250100970 Frisch, A/Prof Hendrik C	**The photochemical tool to probe peptide assembly across water and gas phase** The precise assembly of peptides into defined architectures is paramount for protein functionality, with any errors in this assembly leading to severe diseases. Mass spectrometry, a leading tool for studying protein structures, operates in the gas phase. Tools that close the gap between peptide assemblies in their native state in water and in the gas phase are scarce. This project develops a conceptually unprecedented approach to study the assembly of peptides in both: water and gas phase. The CIs have recently shown that [2+2] photocycloadditions, key reactions of chemical synthesis, can be manipulated by peptide assembly. Exploiting this assembly sensitivity, photoreactions will be turned from a synthetic into a missing analytical tool.	127,900.50	254,376.50	158,832.00	32,356.00	0.00	0.00	573,465.00
	National Interest Test Statement The majority of biological processes and functions are enabled by proteins - including the photosynthesis of plants that feeds us or the muscle movements that allow us to breathe. These specific functions of proteins result from their specific 3D structure. Errors in the structure of a protein lead to a loss of its function, with dire consequences such as alzheimers disease. Techniques to elucidate the structures of proteins including defects are thus of key importance. This project works towards the development of an analytical tool that allows to rapidly analyse the structure of the building blocs of proteins, called peptides.							
DP250101021 Lipp, Prof Ottmar V	**An integrated framework to understand emotional learning** Positive and negative emotional responses enrich or harm the quality of our everyday lives. Although the acquisition of emotional responses is well understood, less is known about how they can be modified – amplified or reduced. The proposed research will address this gap, building on our team's research on both human fear	138,132.00	275,608.00	283,597.00	146,121.00	0.00	0.00	843,458.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	and evaluative conditioning and cutting-edge findings in these areas. The project is innovative in its focus on (a) positive and negative emotional learning; and (b) the processes underlying this learning. The project will provide the foundational knowledge required for the development of an integrated framework of emotional learning and the design of psychological interventions to reduce fear and interpersonal biases.							
	National Interest Test Statement							
	Emotional learning, the acquisition of likes and dislikes, of fears and desires, is an important part of what makes us human. Yet, the processes underlying emotional learning are not well understood and research on the topic is fragmented. The current basic research project will address this gap by generating new knowledge on the topic with the aim to develop a new integrated framework to understand emotional learning across the entire range of emotion, positive and negative. The current work also has potential applied implications. Biases and prejudice negatively affect large sections of society and relapse after successful treatment for an anxiety disorder is common (and not unexpected from a basic science perspective). Emotional learning is a key ingredient in the development of biases and prejudice and in gold-standard exposure-based treatments of anxiety disorders. Our basic research has the potential to inform the design of more effective and longer lasting interventions to reduce biases and prejudice or prevent the return of fear after successful treatment. These developments will benefit the people of Australia and beyond. The involvement of national and international leaders in the field of experimental psychopathology will ensure that research translation will not be overlooked and that the outcomes of the current work are not only disseminated in scholarly journals but to practitioners, and, using Curtin radio and social media, the broader public.							
DP250101051	**UNDERSTANDING TWENTY-FIRST CENTURY MEDIA USES AND PURPOSES**	103,458.50	207,145.50	229,255.50	241,999.00	116,430.50	0.00	898,289.00
Lotz, Prof Amanda D	How we use media technologies and content today are radically changed from when core theories about the role of media in society were established and media content was widely shared at a national level. This project will investigate why Australians choose to use the media available and how they select their media diet to assess the implications of the changed cultural roles media play in our lives and the consequences of a fractured media environment. The program of research will use multiple methods to explore how Australians engage an unprecedented range of content and sources. The project will generate the knowledge needed to address pressing sociocultural issues of our time such as social cohesion, misinformation, and belonging.							
	National Interest Test Statement							
	The media available to and used by Australians is now radically different from when core theories about the role of media in society were established. Though we are awash in data about clicks, views, and likes, we lack systematic person-level data from which to generate understanding about the role of media in the twenty-first century. This project investigates the societal challenges of 21st-century media by gathering detailed evidence about how Australians use media in order to inform analysis of the challenges this environment creates for Australians. Its findings will be made available through scholarly publications, short reports, and public events with industry stakeholders. The project's outcomes will support the Australian government's agenda of policy reform, benefit agencies seeking solutions to the global information crisis, and inform Australian media industries endeavouring to find solutions to the disruption their sector has faced.							
DP250101095	**Complex analysis of nonlinear models in applied mathematics**	70,000.00	145,000.00	152,500.00	77,500.00	0.00	0.00	445,000.00
McCue, Prof Scott W	This project aims to investigate nonlinear mathematical models using applied complex analysis. By employing a variety of applied mathematical tools and repurposing them in the complex plane, the project expects to generate new insight into how properties of complex-valued solutions are manifested in real-valued nonlinear models. The expected outcomes include a powerful new mathematical framework for interpreting classes of nonlinear mathematical models. It is anticipated that significant benefits will be delivered to the applied mathematical community via the development of new mathematical theory and a deeper understanding of nonlinear mathematical models for profoundly important phenomena in the physical and biological sciences.							
	National Interest Test Statement							
	Applied mathematicians use mathematical models to describe nonlinear phenomena in the physical and biological sciences, with the goal of better understanding the underlying processes and making predictions about possible							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	future behaviours. Typically, the independent variables in these models are spatial position and time. This project is concerned with studying important classes of nonlinear mathematical models and re-interpreting them so that the spatial variable is allowed to be a complex number. Here, a complex number means a normal real number plus an imaginary number, where imaginary numbers are multiples of the square root of negative one. There are many fascinating mathematical properties of these complexified models that we shall study with a view to making new mathematical discoveries and, importantly, generating new knowledge about the original real-valued mathematical models and the associated applications. The project will benefit Australia by enriching applied mathematics as a discipline, positioning Australian researchers at the forefront of contemporary research in this far-reaching topic, and providing a unique research training experience for younger mathematicians. We shall promote our research outcomes via our established strong collaborative networks and via extended workshops. We expect our results to be influential across the applied mathematics community, opening up new fronts of research and providing new exciting opportunities for discovery.							
DP250102084 McDonald, Prof Paula	**Help wanted: The Dynamics of AI-Driven Recruitment and Selection** The increasing use of AI in the recruitment and selection of job candidates is widely acknowledged but not well understood. AI-enabled recruitment offers substantial value to employers but has a significant and unchecked influence on job-seekers. This project will explore how AI capability is developed by technology vendors, deployed by recruiters, and utilised by job candidates. Findings from three integrated studies will build new theoretical understandings of the social and technical implications of AI-enabled recruitment. Benefits include the development of governance principles, industry practice standards, and strategies to assist job-seekers, that promote transparency, privacy and equality in the Australian labour market.	78,502.00	157,388.50	186,605.00	217,002.00	109,283.50	0.00	748,781.00
	National Interest Test Statement The use of Artificial Intelligence (AI) in the recruitment and selection of job candidates is widely acknowledged, and appears to offer a cost-effective, automated means to match potential employees with relevant work opportunities. However, AI is currently being utilised in a wide range of recruitment functions without an understanding of precisely how it is used, or how it impacts job-seekers. This project proposes to conduct the first comprehensive investigation of AI in the recruitment and selection of job-seekers in the Australian labour market. Through the involvement of (a) AI developers and vendors, (b) recruiters, (c) organisations (employers), and (d) candidates, the project aims to: • Map how AI capability is used across key recruitment functions • Develop governance principles for AI development in recruitment • Formulate industry best practice standards for AI use • CoDesign mechanisms to maximise the transparency and explainability of AI in recruitment software, and to disclose the relative limits of confidence of AI- enabled recruitment decisions • Identify strategies to assist job-seekers to successfully navigate AI-enabled recruitment processes These outcomes will be shared with industry sectors, peak recruitment bodies, recruitment firms, and employing organisations, in order to maximise the impact of these aims and create social and economic benefits.							
DP250102502 Wang, Prof Hongxia	**Novel transparent electrodes for efficient bifacial perovskite solar cells** This project aims to design transparent electrode composed of dielectric-metal-dielectric (DMD) structure with required optical and electrical properties for bifacial semitransparent perovskite solar cells (ST-PSCs). Expected new knowledge of how properties of the dielectric materials and metal layer control the transmittance, conductivity, work function as well as stability of the transparent electrodes, and subsequently their performance in ST-PSCs will be generated. The important research outcomes will facilitate the development of efficient ST-PSCs in practice such as building-integrated photovoltaics (PVs), placing Australia in the forefront this important emerging photovoltaics.	111,600.00	228,593.50	236,667.00	145,779.50	26,106.00	0.00	748,746.00
	National Interest Test Statement How to make solar electricity more efficient, affordable and reliable is one of the grand challenges in 21st century to address the global issue of climate change and the increasing demand for energy in the society. Bifacial semitransparent perovskite solar cells (ST-PSCs) are a new photovoltaic (PV) technology that can produce electricity when illuminated on both sides (front or rear) of the device by using a material called metal halide perovskite, rendering them suitable for applications in building integrated photovoltaics (BIPVs) and smart windows by fully using not only direct sunlight illumination, but also environmental reflected and diffuse sunlight to achieve higher areal energy yield. This project addresses the critical issues of inefficient transparent electrode, that limits the performance of existing ST-PSCs. The main research outcomes of new transparent electrodes with desirable optoelectronic and chemical properties for efficient bifacial ST-PSCs will advance adoption of perovskite based photovoltaic technology in practical applications such as BIPVs, placing Australia at the forefront of exploitation of this new PV technology for more efficient utilization of solar energy. The outcomes of this research project align with the two priority areas in Australian Government National Reconstruction announced in 2022: “Renewables and Low Emission Technologies”, and “Enabling Capabilities”.							
	Developing Sustainable Hard Carbon for High Performance Sodium-Ion Battery							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
DP250102885 Yan, Prof Cheng	Sodium-ion batteries (SIBs) demonstrate a great potential to replace expensive lithium-ion batteries for energy storage as sodium is low-cost, safe and abundant as compared to lithium. However, the larger radius of sodium ions often leads to a sluggish kinetics process, and they cannot intercalate into commonly used anode materials like graphite. This project aims to investigate the atomic level sodium storage mechanism in hard carbon and develop a novel green hydrothermal carbonisation process to obtain spherical microstructures via combined experiment and atomistic modelling. This project will not only fill the knowledge gaps in developing high performance SIBs but guide the establishment of sustainable hard carbon manufacture industry.	108,080.50	220,980.50	228,126.00	115,226.00	0.00	0.00	672,413.00
	National Interest Test Statement Sodium-ion batteries have emerged as a promising alternative to Li-ion batteries for long term and large scale energy storage, due to high abundance of sodium, low cost, inherent safety and high energy density. Hard carbon has been recognised as viable electrode material as it can be produced from low-cost biomass or polymers. However, the overall battery performance is relatively poor and the sodium storage mechanism in hard carbon has not been well understood. This project will develop innovative, bottom-up strategies to optimise the structure of lignin-based hard carbon from sugarcane bagasse to achieve high battery performance. The sodium storage mechanism will be investigated at atomic scale through combined experimental and modelling approaches. The project will not only fill the existing knowledge gaps in development of carbon-based sodium-ion batteries but provide technical support for utilising Australian biomass and minerals to develop next generation rechargeable batteries for renewable energy storage, contributing to the establishment of multi-billion-dollar biorefinery and battery materials industries, in line with the newly released National Battery Strategy - Leading the charge towards a competitive and diverse Australian battery industry. The project outcomes will be released through industry magazines, university and social media, and broadcast/TV to increase public awareness and attract industry investment towards technology transfer and commercialisation.							
DP250102887 Yan, Prof Cheng	**Chemo-mechanical behavior in all-solid-state lithium metal batteries** Currently available commercial lithium-ion batteries do not satisfy the increasing demands of portable electronic devices and electric vehicles, due to low energy densities, safety issues and high cost. High capacity electrode materials such as Li metal anode, Ni-rich cathode together with solid-state electrolytes have been confirmed as promising alternatives. However, poor interface stability and material failure remain as significant challenges. The project aims to solve these coupled chemo-mechanical problems through in situ characterisation and advanced modelling technologies. The expected outcomes will help develop next generation batteries and fill the key knowledge gaps in broad energy materials.	111,080.50	223,980.50	230,626.00	117,726.00	0.00	0.00	683,413.00
	National Interest Test Statement Lithium-ion batteries have become the main power sources for mobile electronics and large-scale emerging applications, including various types of electric vehicles and energy storage for utility grids. However, in addition to potential safety issues, their energy densities cannot meet the ever-growing demand for high performance energy storage systems to power mobile devices with increased power consumption and to extend the driving range of electric vehicles. To address these issues, this project aims to develop all solid-state lithium metal batteries with superior safety and high energy and power densities. Through collaborating with the Australian mining industry, a top exporter for almost all materials required for manufacturing high performance batteries, this project will identify opportunities for establishing Australia's future battery industry for value added products, in line with the newly released National Battery Strategy - Leading the charge towards a competitive and diverse Australian battery industry. Uniting the Australian research community, government agencies and local industries, it will also contribute to Australia's current efforts in building national battery testing centres and research hubs.							
DP250103634 Fookes, Prof Clinton	**Human-Machine Teaming in a Communications-denied Environment** This project will develop new learning and long-term memory capabilities for Artificial Intelligence (AI) to advance human-machine teaming in challenging and communications-denied environments. It will develop new approaches for AI systems to predict future human behaviour, to improve abilities to rapidly respond to changes in the environment, and to enable stronger decision-making with incomplete and uncertain data. New methods will be developed for complex and adversarial environments to support a range of industry sectors including collaborative and service robotics, manufacturing, and transport. Outcomes will increase Australia's	88,700.50	183,844.50	194,468.00	99,324.00	0.00	0.00	566,337.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	competitive advantage in AI, augmenting human abilities, and will support sovereign defence capabilities. **National Interest Test Statement** AI and robotic systems are rapidly emerging as a tool that Australian's are interacting with daily. Yet working collaboratively with such systems is challenging, if not impossible at present, as systems are unable to effectively coordinate with human co-workers. Our research will enable human-AI teaming by developing approaches that allow human and AI team members to better understand each other's actions. Our research will allow AI agents to understand and anticipate human actions based on a combination of long-term observations and patterns, an awareness of the current situation, and will allow humans to refine AI teammate actions through direct feedback, building trust and enhancing teamwork. Furthermore, our research will explicitly capture uncertainty in decision making, allowing AI agents to make decisions in complex and rapidly varying conditions, including in settings where sensors of communications fail. This research has broad applications across the service, manufacturing, transport, mining, and defence industries, and will become increasingly important as robots and AI agents become more common place. To promote the research, we will create two demonstration systems that showcase the outcomes in transport and drone contexts, and the research team will work with existing industry connections across government, aviation, defence, and mining sectors to realise the full potential of this ground-breaking research.							
DP250104348 Mullen, Dr Kathleen M	**Unlocking the secrets of dynamic supramolecular systems** Smart switchable materials have attracted much attention due to their potential applications in drug delivery, smart coatings, and soft robotics. However, rational design of self-assembled supramolecular systems that undergo controlled switching is inhibited by a lack of understanding as to the fundamental mechanisms controlling these dynamic processes. This project will use cutting-edge ion mobility mass spectrometry technologies to gain new insights into controlling switchable processes in supramolecular materials stimulated by light, heat, or electricity. By monitoring these processes in real-time, we will have a window through which we can develop greater understanding of switching mechanisms for future functional materials. **National Interest Test Statement** Australian scientific innovation is globally renowned. Through the development of novel analytical methods, this research aims to address critical challenges in realising the promise of switchable supramolecular assemblies as valuable catalysts, chemical sensors or functional molecular devices. Leveraging cutting-edge capabilities in ion mobility-mass spectrometry technologies at QUT, the project will enhance our understanding of the processes that underpin smart switchable materials at the molecular scale. This innovative project lies at the cutting-edge of contemporary international research in supramolecular chemistry, and will contribute significantly to maintaining Australia's international leadership in this dynamic field. The development of novel functional materials is aligned with the national interest to foster sovereign knowledge, harness emerging technologies, create future industries, and accelerate productivity to build a more resilient economy. Development of this emerging technology is strongly aligned with the growth of Australia's sovereign capability in advanced manufacturing and, when translated to a commercial scale, will be a part of the economic transition of the manufacturing sector towards value-add materials, with emerging industries providing new opportunities for future Australian jobs. Through strategic investments in research and development, we pave the way for a prosperous future driven by emerging technologies and knowledge-driven industries.	98,974.50	206,947.00	147,578.50	39,606.00	0.00	0.00	493,106.00
DP250104479 Du, Prof Dr Aijun	**Engineering 2D van der Waals Materials for Solar Hydrogen Production** Efficient and low cost photo-catalyst for solar hydrogen production will be vital in the transition to environmentally responsible energy industries. This project aims, through engineering polarization and the binding of photoexcited electron and hole in stacked 2D van der Waals materials, to determine novel theoretical principles on new photocatalyst design, yielding insights for translation into sustainable new photocatalytic processing in water splitting. Expected outcomes include innovative 2D photocatalysts for producing clean hydrogen fuels. The materials and knowledge achieved from this project will dramatically advance the development of renewable energy technology, providing solutions to the global energy and environmental issues. **National Interest Test Statement** Efficient photocatalyst is of central importance in renewable energy industries that involve cost-effective production of hydrogen fuel under solar energy irradiation. This project will deliver innovative designs of finetuned and highly active 2D van der Waals photocatalysts for enhancing hydrogen production efficiency. They will, for example, enable sustainable production under solar light, potentially help to reduce energy cost, and carbon emissions in the currently industrial processes. This cutting-edge research will address national research priorities in Advanced Manufacturing and Powering Australia. A new generation of clean energy technology for splitting water into hydrogen under solar light will bring significant economic and environmental benefit, underpinning new research capability and applied industry-relevant renewable technology for Australia. Additionally, the extensive training of PhD	81,974.50	165,449.00	166,949.00	83,474.50	0.00	0.00	497,847.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	students and early career researchers will be critical for Australian research and the development for commercialising new, internationally competitive clean energy and environmental technologies. Research outcomes from this project will be promoted beyond academia by organising a workshop that brings together academics and policymakers, making media contributions in social media, and publicising research findings on a dedicated website.							
DP250104871 Zhu, Prof Dr Huai-Yong	**Using a Light-induced Field-Gradient to Promote Homogeneous Catalysis** Synthesizing fine chemicals and pharmaceuticals often relies on homogeneous transition metal-complex catalysts for their selectivity and efficiency. However, they are difficult to separate and reuse. This project offers a solution to not only overcome limitations of traditional catalysts but that can enhance metal-complex catalyst performance by leveraging the optical properties of plasmonic metal nanoparticles. Our approach will advance understanding of light-matter interactions and explore parameters of a versatile photocatalyst design to achieve high-turnover chemical synthesis with minimal catalyst waste. It will provide invaluable training opportunities for graduate students, contributing significantly to our knowledge-based economy. **National Interest Test Statement** Transition metal complexes have long been essential in producing fine chemicals, pharmaceuticals, and agricultural compounds due to their proficiency in bond formation and high selectivity under mild reaction conditions. This proposal introduces a novel method to harness the advantages of homogeneous transition metal complex catalysts by temporarily immobilizing them on solid supports without loss of activity, using light. The concept integrates homogeneous catalysts into fine chemical flow synthesis in a manner that overcomes the challenging difficulties of catalyst separation and reuse. By utilizing the unique optical properties of plasmonic nanomaterials, this project will efficiently use light to bind and energize catalysis reaction centres, to trigger important chemical transformations at low temperatures, consuming less energy. To promote the research outcomes beyond academia, we will engage with industry partners through workshops, conferences, and high-profile publications relevant to industry. The research offers significant benefits as it promises substantial cost savings and increased efficiency in chemical manufacture. Environmentally, it promotes a cleaner process and reduces raw material waste. Commercially, the innovation is adaptable to synthesis of valuable chemical products, boosting industrial competitiveness and job creation by developing safer, less hazardous chemical processes, with economic and environmental benefits for Australia.	119,444.50	227,847.00	193,566.50	85,164.00	0.00	0.00	626,022.00
	Queensland University of Technology	1,578,249.00	3,191,618.50	3,106,590.00	1,745,040.50	251,820.00	0.00	9,873,318.00
The University of Queensland								
DP250100162 Rosato, Dr Antonio	**Mistaken Inference in Markets with Incomplete Information** The exponential growth of house prices in Australia may be caused in part by buyers over-paying due to incomplete information and mistaken inferences drawn from the behaviour of other buyers. This project aims to address the issue of mistaken inference, which is present in many markets in addition to real estate, by theoretically and experimentally analysing its implications for an array of negotiation mechanisms, such as auctions, bilateral bargaining and posted prices. Expected outcomes include new knowledge on the impact of mistaken inference on prices, market efficiency and welfare, which will inform policy on how to improve outcomes in markets with incomplete information when traders fall prey to inferential mistakes. **National Interest Test Statement** Australia is in the midst of a housing crisis. With the housing price-to-income ratio increasing by over 45% between 2002 and 2022, housing is becoming less and less affordable. Buyers' decisions in this market rely critically on their beliefs about property values and future prices, often formed under incomplete information. Buyers can form these beliefs by interpreting the behaviour of other buyers and sellers, and this can impact the negotiation process and its outcome (e.g., sale price). The proposed project aims to provide a theoretical and experimental analysis of markets with incomplete information, such as real estate, insurance and financial markets, where privately informed traders and uninformed ones often coexist. It seeks to investigate scenarios where market participants are potentially inexperienced or naive, and thus unable to correctly interpret information contained in others' actions. By improving understanding of markets where participants try to learn from one another, this project aspires to provide guidance on how to regulate these markets and on how to evaluate the implications of different market structures for welfare and efficiency. Through this, the project can benefit Australia economically and socially by informing policies are likely to improve market outcomes. The project could also help the Australian community by improving social equity and supporting sustainable property markets.	44,827.50	77,155.00	82,655.00	50,327.50	0.00	0.00	254,965.00
DP250100166	**Unlocking crop epigenomics to uncover and engineer hidden diversity**	135,000.00	270,000.00	267,614.00	132,614.00	0.00	0.00	805,228.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Crisp, Dr Peter A	Considering the immense pressure to meet global food demand, this project aims to explore new avenues to boost the production of Australia's most important crops. We aim to utilise revolutionary new technology to understand how hidden factors beyond the sequence of genes could be harnessed for crop improvement across generations and environments. Expected outcomes of the project include world-first deep insight into the fundamental biology of epigenomics in sorghum, barley and wheat and development of novel technological approaches to high-throughput DNA methylation profiling and genome engineering. Foreseeable benefits include knowledge and technological capacity to fine-tune underexploited yield components for improved grains production.							
	National Interest Test Statement							
	Australia's agriculture industry generates $80B annually and has the ambitious goal of reaching $100B by 2030. Grains, including sorghum, wheat and barley, are the second most profitable component of the industry, making up approximately 28% of the gross value. Powered by genetics, producers have steadily increased the yields of grain crops over decades; however, gains are stagnating and it is clear that genetics alone cannot explain the differences in yields between our newest varieties. Enabled by a world-first Australian-innovated technology, this project will investigate if the chemical structure of DNA itself can explain yield differences. This is akin to testing if changing the grammar in a sentence can more efficiently convey its meaning. Project outcomes, including understanding the basis of improved yield, combined with our diagnostic tools, have great potential to help producers to develop higher yielding crops more rapidly, potentially increasing yield beyond current limits. Our technology is a breakthrough in cost-effective screening of plants, and through our connections with Australian crop improvement programs we will explore the potential for industry adoption. The approaches developed in this project could have broad applicability to challenges faced by Australian farmers including crop quality, nutrition, disease tolerance and climate resilience, which could increase the future profitability and sustainability of food production.							
DP250100723	**Re-Mapping the Lost Literary Capital: Darwin/Larrakia Nation**	85,851.00	176,079.00	165,670.50	75,442.50	0.00	0.00	503,043.00
Carleton, A/Prof Stephen J	This project yokes together the scores of novels, plays, short stories, poems, and genre fiction titles that have portrayed Darwin from Federation to the present. In so doing, it aims to pull Darwin from the literary void it has sat in for much of the twentieth century and restore it to the national imaginary. We will work with AustLit and AusStage to offer a series of public lectures and exhibitions at the NT Library, guided literary tours of Darwin, and a monograph that organises the literary texts into a series of accessible themed chapters for future educators, students and researchers. Other benefits include increased cultural visibility for north Australian writers and increased capacity for cultural tourism to the regions.							
	National Interest Test Statement							
	This project encourages us to reconsider the way we view Darwin/Larrakia Nation in cultural terms. People who grow up in the major southern capitals do so studying novels and plays about their home cities at school, or having versions of their lived experience and landscapes mirrored back to them in plays, genre fiction novels, popular literature, films and television series. People who have grown up in the northern capital do so in a relative representational void. This project aims to boost cultural, economic and educational activity in the NT and beyond by: offering the NT Tourism industry a series of guided literary tours and digital 'cultural maps' of Darwin; offering the general public a series of themed exhibitions at the NT Library and public lectures at CDU; offering major arts festivals (NT Writers Festival, Festival of Darwin) and book clubs access to forgotten writers and texts of national standing to rediscover and celebrate; offering educators a symposium and monograph to introduce their students to the novels, plays, short stories and screen adaptions about Darwin in a series of easy-to-follow themed chapters; and offering lovers of literature and cultural tourists the nation over fresh ways and means to encounter the northern capital. In future, this research will not only offer a permanent literary record for an overlooked capital city, but add to a wave of post-pandemic cultural and economic activity that is revitalising the nation's regional centres.							
DP250100831	**Discovering how nerve cells resist mechanical forces**	114,869.50	227,040.50	230,465.00	118,294.00	0.00	0.00	690,669.00
Coakley, Dr Sean T	This project aims to discover the molecular mechanisms protecting nerve cells from mechanical force. Using C. elegans as a tractable model system, combined with state-of-the-art microscopy and sophisticated genome engineering approaches, the project aims to advance our knowledge of how these fragile cells resist the forces imparted on them during development and body movement. Outcomes include a mechanistic understanding of how tissues co-operate to withstand physical strain, the molecules involved and how force is buffered by the nervous system. This will provide							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	significant benefits by generating fundamental knowledge, informing technological advances, and increasing research capacity. **National Interest Test Statement** For any animal, its survival depends on an ability to detect and respond to surrounding stimuli, such as food and predators. Once detected, these stimuli are relayed to the brain where a response is formed and sent to muscles to trigger a behaviour. This communication occurs via electrical signals that travel through long cable-like structures protruding from neurons called axons. Axons span large distances, reaching up to 1 metre in humans and 30 metres in some species of whale. How these structures can resist the many forces imparted on them during normal growth and body movement to remain intact and sustain life across decades is not currently known. This project aims to shed light on the biological mechanisms that keep axons intact to discover new knowledge that will be critical for a range of fields, including developmental and cell biology, neuroscience, engineering, and materials science. Understanding the biological consequences of mechanical force also has the long-term potential to impact industries such aerospace and defence, where the impact of force on the human body is a major consideration in the design of new technologies. Also, without knowledge of how a healthy system functions, changes that occur in diseased states can neither be recognised nor corrected. The fundamental cellular mechanisms discovered here will therefore be essential to guide future studies aimed at understanding neurological disorders and diseases that involve axon health.							
DP250100833 Suddendorf, Prof Thomas	**Mapping children's foresight capacities** This project aims to develop a novel test battery to assess young children's emerging foresight capacities. An easily administered battery will enable us to gather large data sets to chart the typical development of these multifaceted abilities and to assess how they relate to one another. The findings from this study will inform the construction of a new integrated framework of the nature of children's developing foresight capacities. It also provides an important foundation for future predictive studies and for the development of measures for other populations. This project should have wide-reaching implications for our understanding of this fundamental aspect of human cognition and for our ability to support teachers and caregivers. **National Interest Test Statement** To prosper in the modern world children must learn to think about and prepare for their future. This project will be the first to develop a comprehensive screen-based assessment of children's foresight abilities, including their capacities to think ahead, to prepare and to plan for the future. The tasks will build upon our own world-leading laboratory research on the development of foresight to create an efficient, reliable, and multifaceted assessment tool that features a diverse array of tasks exploring different aspects of foresight, each with easily adjustable difficulty levels. Subsequently, two large-scale studies will use this tool to chart the development of foresight across early and middle childhood, providing novel insights into how different aspects of foresight emerge, develop, and relate to each other throughout childhood. This project will place Australia centre-stage in advancing our understanding of one of the most elusive and powerful features of the human mind. Findings from this project stand to have wide-reaching implications, including supporting teachers and caregivers in understanding what can be expected at various stages and when children may need extra support. Our assessment tool will be easily adjustable for future use with clinical populations. By providing a foundational resource, the outcomes of this project have the potential to aid future efforts aimed at facilitating the development of more prudent and farsighted citizens.	52,734.50	115,232.50	129,744.50	67,246.50	0.00	0.00	364,958.00
DP250100855 Laycock, Prof Bronwyn G	**Biodegradable and bioderived coatings for controlled release fertilisers** Given the need to feed 9.7 billion people by 2050, it is vital to create a sustainable agricultural system. However, our current, essential fertilizer use has caused significant environmental challenges due to nutrient solubility. Better nutrient use efficiency is urgently required. Yet current coated fertilizers produce nondegradable microplastic residues. This project will deliver the first bioderived and biodegradable thin polymer coatings for high-efficiency fertilizers using innovative polyurethane chemistry, reactive extrusion processes, and in-house coating technologies. Nutrient release and transformations in soil and water will be quantified and modeled, along with plant yields, leading to advanced, sustainable fertiliser products. **National Interest Test Statement** More than half of the 1.9 million tonnes of urea fertiliser currently applied to Australian soils is not used by plants but is lost to the environment through leaching, volatilization, and denitrification. This causes massive environmental issues, such as water pollution, soil degradation, greenhouse gas impacts through potent N2O emissions, and reduced biodiversity in soils and coastal waters, as well as health effects associated with nitrates in groundwater. This is a national and global issue and is of urgent concern for the Great Barrier Reef catchment, with high nutrient loads leading to crown-of-thorns starfish outbreaks and accelerated coral bleaching. Current controlled release alternatives are coated in nondegradable plastics, leaving up to 40 kg/ha/yr of undesirable microplastic pollution after use. This project aims to produce novel, cost-effective, biodegradable, and bioderived coatings for urea that	90,000.00	180,000.00	163,635.50	73,635.50	0.00	0.00	507,271.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	slow fertiliser release to match crop demand, increasing nitrogen use efficiency without leaving harmful residues. Industry appropriate processing approaches will be developed, ready for commercialisation. These environmentally friendly fertilisers could support Australian agricultural industries to achieve more sustainable management of soil and water, and help position Australia as a leader in circular economy innovation. With >100 million t/year of synthetic N fertiliser applied globally, this is also a massive market opportunity for Australian businesses.							
DP250100986 Faulkner, Prof Geoffrey J	**The mobile DNA origins of gene regulation** Genes are the building blocks for complex life. Millions of mobile DNA sequences compose approximately half of the mammalian genome, yet their influence on gene expression remains largely unexplored. The project proposed here will 1) develop a novel system to predict how strongly a given mobile DNA sequence will promote its own expression and that of adjacent genes, 2) test those predictions using long-read functional genomics applied to various cell types generated in vitro and 3) discover new regulatory elements underpinning development in vivo. The expected outcomes are an unprecedented understanding of gene regulation, which will benefit biotechnology applications of genetic engineering, as well as enhanced international collaboration.	120,000.00	252,500.00	252,500.00	120,000.00	0.00	0.00	745,000.00
	National Interest Test Statement Mobile DNA sequences can copy themselves from one genomic location to another and are particularly abundant in animals and plants. For more than 50 years it has been hypothesised that most genes are regulated in eukaryotes by mobile DNA sequences. Until recently we have lacked the tools to systematically test this overarching theory in biology. Exploiting recent technological advances, we will here apply CRISPR gene editing, long-read DNA sequencing and other cutting-edge tools to human cells to finally decide the contribution made by mobile DNA sequences to gene control and development. This work has the potential to enhance the Australian biotechnology sector as, for instance, bioengineering cells for drug production or new yeast strains for commercial brewing requires a full picture of how genes are regulated. As well, because all livestock and crop species contain mobile DNA, and these elements can dramatically impact phenotype via gene regulation, the insights we gain from human cells could in the future be applied to boost agricultural production and overcome environmental challenges. The researchers leading this project will here continue their track record of communicating scientific outcomes to mainstream audiences nationally and internationally, for example via social media and by providing interviews to the popular press. Finally, by involving postgraduate students, the project will contribute to higher education and training in the life sciences in Australia.							
DP250101036 Roosta, A/Prof Fred	**Next Generation Newton-type Methods with Minimum Residual Solver** Optimisation methods play a crucial role in many applications. Among them, Newton-type algorithms hold a special place due to their desirable properties. However, the underlying challenge remains effective solution of their complex subproblems. Leveraging recent advances in numerical linear algebra, this project aims to address this challenge directly and revolutionise Newton-type algorithms for diverse optimisation scenarios. The project is expected to pioneer new theory and open-source implementations that hold the potential to reshape the landscape of optimisation research. Among the benefits are facilitating the development of effective optimisation algorithms for machine learning and enhancing knowledge extraction from modern datasets.	70,000.00	142,500.00	147,500.00	75,000.00	0.00	0.00	435,000.00
	National Interest Test Statement Optimisation methods are the central mathematical tools in training modern machine learning models, often representing a computational bottleneck and a major contributor to the costs and carbon footprints associated with large-scale training processes. In this light, optimisation methods that efficiently utilise computational resources are crucial. Newton-type optimisation methods achieve this by leveraging the problem's geometric structure. However, a critical yet often overlooked aspect in their development is efficiently solving their subproblems, which is essential for their success and adoption. This project aims to innovate mathematical methods that can revolutionise Newton-type optimisation algorithms, with a focus on subproblem solvers. The project's outcomes include methods that efficiently utilise available computational resources, offering tangible economic and environmental benefits, including reduced costs and carbon footprint in large-scale machine learning computations. These methods will be made accessible to Australian businesses and researchers relying on machine learning tools through the development of open-source software compatible with existing industrial machine learning platforms. This will be accompanied by case studies, tutorials and online courses to facilitate the translation of academic research into practical knowledge for practitioners and industry members, as well as to help with the realisation of these economic and environmental benefits.							
DP250101200	**Aphantasia, imagined experiences and the interconnectivity of human brains.** Some people cannot have imagined sensory experiences – Aphantasics. This project	79,433.50	173,167.00	211,868.00	118,134.50	0.00	0.00	582,603.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Arnold, Prof Derek H	aims to reveal pre-requisites for conscious awareness of imagined sensory experiences by measuring and comparing the structural connectivity and power of oscillatory activity in the brains of Aphantasics and Neurotypical people. As an inability to have imagined sensory experiences is a key dimension of the most popular metric of Autistic traits, greater understanding of the benign dysfunction of this psychological dimension in the general population will increase our understanding of Autism. **National Interest Test Statement** Most people can have voluntary imagined experiences, of images and of themselves speaking. But a minority of people - Aphantasics, cannot. This project will determine if this form of neurodiversity is related to the expression of Autistic traits in the general population, test if Aphantasics are resistant to intrusive thoughts, and identify neural correlates of Aphantasia. This project will deliver important new basic knowledge, that will be important for theory and will create important long-term translation opportunities to advantage society. Visualisation is among the world's most popular psychological interventions to benefit mental health and performance, but it is unclear if Aphants can equally benefit from this. So, by validating protocols to detect Aphants, we may create knowledge that can be translated to guide treatment decisions and resource allocation. Moreover, while Aphantasia is not a clinical condition, an inability to have imagined visual experiences is a key dimension of the most popular metric of Autistic traits in the general population. So, by creating greater understanding of visual imagery, and its benign dysfunction, we may increase understanding of ‘fact thinking’ Autistics. Finally, this project will bring together some world leading experts, in Autism research and fMRI data analyses, and they will train promising Australian research students in these skills.							
DP250101269 Ploschner, Dr Martin	**Deep brain neurovascular coupling analysis using multimode fibre endoscopes** This project aims to unravel the hidden rules governing blood flow regulation in the brain, focusing specifically on the intricate interactions between neurons and blood vessels within the thalamus. These interactions are essential for supplying neurons with glucose and oxygen, but their underlying mechanisms remain elusive due to the depth of the thalamus. The project seeks to address this challenge by creating a hair-thin endoscope capable of stimulating activity in neurons and observing the effects on nearby blood vessels using advanced imaging techniques. The anticipated outcome is a suite of tools empowering neuroscientists, with future discoveries facilitated by the technology positioning Australia as a nexus of global brain research. **National Interest Test Statement** The brain's remarkable ability to dynamically adjust blood flow to meet its changing energy needs - a process known as neurovascular coupling - is essential for optimal brain function. It ensures a sufficient supply of oxygen and nutrients to active brain regions, supporting cognitive abilities, sleep patterns, memory formation, and sensory processing in every Australian, every day. However, despite its critical importance, this intricate mechanism remains poorly understood, especially within the deeper structures of the brain. Our project seeks to bridge this knowledge gap by developing a minimally invasive endoscope equipped with advanced imaging modalities, enabling us to directly observe and investigate neurovascular coupling in these previously inaccessible brain regions. The project has the potential to solidify Australia's position at the forefront of neurotechnology, a rapidly growing field attracting significant venture capital investment. Partnerships with DeepEn, a leading German endoscope manufacturer, and Cylite, an established Australian imaging device manufacturer, will drive commercialisation efforts for this technology. In the future and beyond the scope of the project, the enhanced understanding of neurovascular coupling enabled by our technology holds immense potential to transform the diagnosis and treatment of neurodegenerative and cerebrovascular diseases, such as dementia and stroke, ultimately improving the quality of life for millions of Australians.	109,676.00	191,686.00	165,520.00	83,510.00	0.00	0.00	550,392.00
DP250101435 Munro, Dr Jenny	**Experiences and inequalities in Indonesia’s transition to hospital birth** This project aims to explain inequalities in maternal health by investigating the hospital birth experiences of diverse and disadvantaged Indonesian women. Nearly 80% of Indonesian births take place in a health facility but the maternal mortality ratio remains the highest in Southeast Asia. Working with Indonesian researchers, this project expects to produce in-depth knowledge of women’s birth experiences and interactions with maternity care systems. Expected outcomes include new knowledge of why some women avoid health facilities or have negative experiences, and how to improve birth experiences. This benefits Australian and Indonesian agendas to create equitable, inclusive maternal health care and advance equality in our region. **National Interest Test Statement**	15,625.00	45,060.00	54,487.50	43,150.00	18,097.50	0.00	176,420.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Globally and in Australia, rates of maternal mortality and birth trauma are worse for disadvantaged women and cultural minorities. This indicates that current approaches to maternity care are not doing enough to address diversity or improve equity. Indonesia's maternal mortality ratio is the worst in Southeast Asia despite most births occurring in a health facility. This project aims to explain the social and cultural factors that hamper Indonesian women from receiving adequate maternity care and develop new knowledge of what respectful or harmful care means to diverse populations. This will benefit Australia by informing our international development aid programmes. Indonesia is a top recipient of Australian Overseas Development Assistance (about $300 million AUD annually); this research will benefit the 'Partnership Toward Inclusion' initiative and 'Australia's International Development Policy' (2023) by identifying ways to improve the accessibility and quality of services for women and people with disabilities and sharing this with the Department of Foreign Affairs and Trade (DFAT) and others. This research also benefits Australia by sharing knowledge on how to eliminate discrimination and abuse in maternity care, a problem that costs Australia $877 million per year through social, health, and economic impacts of birth trauma.							
DP250101445 Knight, Dr Caroline	**Optimising hybrid work for improved wellbeing and performance** More than a third of workers engage in hybrid work, partially working from home, yet for the first time in decades productivity fell 2.9%, coinciding with rising mental ill health. Realising the positive benefits of hybrid work will require a radical overhaul of how we 'do' hybrid work. This project will develop understanding of the psychological factors underpinning how, when and for whom hybrid work is effective, and establish an evidence-base for effective interventions. Expected outcomes include a suite of practical tools for managers, policymakers, and workers. Significant benefits include increased work engagement, trust and wellbeing, increased national productivity and competitiveness, and reduced national mental health spending.	110,951.50	223,501.00	214,520.00	101,970.50	0.00	0.00	650,943.00
	National Interest Test Statement Urgent action is needed to understand how we can optimise hybrid work (working both from home and the office) to improve wellbeing and performance. Over a third of Australian workers engage in hybrid work yet productivity has fallen and mental ill health of workers increased. This suggests the benefits of hybrid work are not being realised. Currently, organisations are implementing hybrid work policies and practices with no guiding evidence as to how to do so optimally. Our project will examine how, why and for whom hybrid work impacts wellbeing and performance, and evaluate workplace interventions to increase the effectiveness and beneficial outcomes of hybrid work. It will develop evidence-based practical guidelines to enable practitioners, policymakers, and managers to design high quality hybrid work. This will benefit the Australian economy by increasing organisational effectiveness and reducing the economic burden of mental ill health. Social and cultural benefits include facilitating increased participation in the workforce by those typically excluded, such as carers or those with decreased mobility, and increasing workers' sense of belonging and purpose. We will produce freely available guidelines and widely distribute findings through open source repositories, professional bodies and centres, industry events, webinars, media, and executive education.							
DP250101460 Dolnicar, Prof Sara	**Mechanisms of Behaviour Change Theory** Triggering behaviour change can benefit individuals (e.g., healthy eating), communities (e.g., protection via vaccination) and humanity as a whole (e.g., emission reduction via electricity saving). Yet the mechanisms by which behaviour change can be triggered are not yet fully understood because the effect of an intervention on latent theoretical constructs (intervention effect) is not routinely isolated from the effect of the construct change on the behaviour (construct effect). This project aims to develop a new theory of behaviour change that disentangles these two aspects (thus elucidating the mechanism), validate it empirically, and compare its performance with current approaches in the context of climate change mitigation behaviour.	109,931.00	187,900.00	149,954.50	71,985.50	0.00	0.00	519,771.00
	National Interest Test Statement This project aims to develop and validate a new theory to guide the swift design of practical measures that entice people to change their behaviour. Being able to change people's behaviour is critical across many domains, including population health (e.g., mask-wearing) and climate change mitigation (e.g., energy saving). Existing theories are limited in their ability to offer practical guidance for the swift design of behaviour change measures because they do not pinpoint the exact mechanisms that lead to behaviour change. This project aims to develop Mechanisms of Behaviour Change Theory (MeBeC), which simultaneously tests how effective different types of measures are in triggering behaviour change and which mechanisms are responsible for causing this change. In so doing, MeBeC can identify the most promising combinations of practical measures and theoretical constructs to target, thus speeding up the future design of effective behaviour change measures. MeBeC will contribute new knowledge to the behavioural sciences, while also benefitting Australia by enabling policy makers and businesses to swiftly develop effective behaviour change measures to address key environmental and social challenges. MeBeC and all newly developed behaviour change measures targeting two specific climate change mitigation behaviours will be shared with the scientific community, industry, and the public (YouTube videos, social media posts, The Conversation, press releases) to maximise impact.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250101508 Hugenholtz, Prof Philip	**A Genome Taxonomy Database for the Kingdom Fungi** Fungi are important constituents of the global biosphere recognised for their biotechnological applications and infectious potential. They currently lack a systematic genome-based classification compromising scientific communication and comparative analyses. This project aims to apply the successful Genome Taxonomy Database (GTDB) model developed for prokaryotes to the fungal kingdom to address this knowledge gap. Outcomes will include a website for interactive exploration of the resulting genome-based taxonomy and software that allows users to classify their own fungal genomes. **National Interest Test Statement** Fungi are an important part of the biosphere recognised for their value in biotechnology, agriculture and the food industry. Australia is estimated to harbour up to 250,000 fungal species, of which less than two per cent have been described. Genome sequencing of cultured fungi and environmental samples is revealing new fungal species at an exponential rate, but a consistent taxonomic framework to classify this new biodiversity is lacking. This project will address this fundamental knowledge gap by leveraging a unique Australian resource, the Genome Taxonomy Database (GTDB) that systematically classifies bacteria, to develop a complementary genome-based fungal taxonomy. It will also produce associated software that allows users to classify their own genomes against the fungal GTDB. The systematic classification of thousands of new fungal genomes, including many from Australian habitats of economic (e.g. agricultural and forest soils) and cultural (e.g. native plants and animals) importance will enable domestic industries to discover new fungal candidates as starter cultures for beer, wine, bread and other fermented products. A fungal GTDB will also improve environmental management policies and knowledge of local bioresources, benefiting the Australian economy.	161,818.50	355,738.50	383,804.50	189,884.50	0.00	0.00	1,091,246.00
DP250101639 Hilliard, Prof Massimo A	**Understanding neuronal fusion in nervous system development and remodelling** Neuronal self-fusion, that is, the merging of separate sections of an individual neuron, is a poorly understood biological process. Yet, self-fusion is known to occur in multiple animal species during the development, remodelling, and repair of the nervous system. This project aims to define how developmentally regulated self-fusion occurs in the nervous system, the molecules that mediate this process, and its importance for neuronal function. Expected outcomes include new knowledge on the process of neuronal self-fusion. These findings should provide significant benefits by offering novel insights into nervous system function, and thereby positioning Australia at the intellectual forefront of this innovative and fervent area of research. **National Interest Test Statement** Understanding how the nervous system develops, and how individual neurons acquire their specific shapes that are necessary for their function, are major unanswered question in biology. One of the most remarkable events observed during development of specific neurons is fusion between parts of the same cell to achieve peculiar structures, such as toroids (i.e., doughnut shapes), in a process known as self-fusion. This project aims to study how self-fusion occurs in the nervous system, the genes that regulate this fascinating process, and its importance for neuronal function in mediating an animal's behaviour. Importantly, these studies also have the potential to reveal how single-celled tubes and toroids are formed in other, non-neuronal tissues, which remain broad and open questions in biology. These findings will represent a major leap forward and fill a significant gap in scientific knowledge. Our country will directly benefit as the nation where these discoveries are made, and by having the opportunity to initiate applications that might arise from these findings. In addition to the biotech industry, these studies might also indirectly benefit the biomedical field by providing the new knowledge needed to develop strategies to prevent neurodevelopmental disorders and to repair neuronal damage. To advance our research outcomes beyond academia, we will engage with UniQuest, the commercialisation company of The University of Queensland.	147,295.00	300,683.50	310,478.50	157,090.00	0.00	0.00	915,547.00
DP250101726 Wang, Prof Lianzhou	**Lead-free perovskite materials for solar cells and beyond** This project aims to develop new lead-free perovskite materials for next-generation solar cells and explore their application in new optoelectronics. To address the toxicity problem of lead containing perovskites, the key concepts are to design high-quality tin-based perovskite thin film devices through new interfacial engineering and defect passivation strategies. The expected outcomes include low-toxicity stable perovskite solar cells with record efficiencies, and new fundamental understanding of the material-property relationship. The project will significantly contribute to a decarbonised economy in Australia, and position the country at the forefront of	118,040.50	223,581.00	210,581.00	105,040.50	0.00	0.00	657,243.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	renewable energy technologies and application of high-performance semiconductors. **National Interest Test Statement** Australia is taking bold actions towards achieving our target of net-zero greenhouse gas emissions by 2050, propelled by the Government's Net Zero Plan. We are not only aiming to meet this target, but also striving to position Australia as a renewable energy powerhouse. By embracing innovative technologies to harness abundant solar energy, we will not only safeguard our nation against the ravages of climate changes but also pave the way for a wealth of new industries and job opportunities. Our research focuses on innovating low-cost and efficient solar cell technologies, particularly using emerging perovskite-based semiconductors. While these hold immense promise for efficient solar electricity generation, the state-of-the-art perovskite materials contain toxic lead. This project aims to develop high-quality, lead-free perovskite semiconductor materials that not only feature low toxicity but also are expected to achieve world-record efficiency of over 20%. The research is aligned seamlessly with the government's Science and Research Priority of Energy, enriching Australia's knowledge base in functional semiconductor materials and clean energy sectors. The success of this project underpins important technological advances that will lead to significant economic and environmental benefits to Australia and contribute to achieving the Net Zero 2050 through the large-scale uptake of the new solar cell technology.							
DP250101730 Schroder, Prof Kate	**A novel signalling effector of ASC pyroptosomes** The life of an organism relies on the timely birth and death of its cells. Importantly, it is crucial for cells to die not only at the right time, but also in an appropriate manner. This proposal investigates a cell death pathway that triggers potent immune responses. This proposal seeks to validate a new signal effector that induces cell death. Expected outcomes include new insights into how cells die, and how they instruct immune responses from beyond the grave. Project benefits include new fundamental understanding of cell death mechanisms and how this sculpts tissue immune responses, and new knowledge of how to manipulate cell death responses for future basic research and commercial applications beyond this project.	100,500.00	204,500.00	207,000.00	103,000.00	0.00	0.00	615,000.00
	National Interest Test Statement The life of an organism relies on the timely birth and death of its cells. It is also crucial for cells to die in an appropriate manner, so that they prevent or ignite immune responses. However, currently little is understood about precisely how cell death sparks immune responses. Our project will investigate novel processes underpinning a cell's ability to undergo inflammatory cell death. This will reveal previously unknown mechanisms of programmed cell death and how this shapes the body's immune response. Such fundamental knowledge of how cell death occurs, and how cell death instructs immunity, may be harnessed in future assay design and drug development programs to generate new commercial products, such as research tools, diagnostics and immune-modulatory drugs. The project team is skilled at discovering new pathways of immune regulation and using this knowledge to develop new commercial products, and routinely works with Australia's biotechnology sector. Other project benefits include investment in training the next generation of Australian scientists in cutting-edge multidisciplinary techniques across biochemistry, cell biology and immunology.							
DP250101864 Williams, Prof Craig M	**Evolving the nitrogen-nitrogen three electron bond as a technology enabler** Chemical discovery underpins technological advances that benefit society. This project aims to generate a transformational chemical platform of innovative nitrogen atom containing molecules capable of supporting stable and long-lived radicals that can be used in electronic applications. Expected outcomes include an understanding of methods for tuning the unique redox chemistry of these molecules and their conversion into materials with practical applications such as for solar cells and rechargeable batteries. This should provide game changing molecular tools for reducing the cost of energy generation and storage, along with uniquely trained scientists in a range of chemistry sub-disciplines having an entrepreneurial chemical instinct.	104,691.00	211,162.00	215,982.00	126,564.00	17,053.00	0.00	675,452.00
	National Interest Test Statement The objective of this research is to harness and pioneer atypical nitrogen atom bonding to provide high-density electrochemical energy storage molecules. These unique chemical building blocks feature an exciting new dimension in utilising charged species for use in next generation chemical oxidation-reduction (redox) based devices e.g. organic batteries. Their development requires a combination of sophisticated organic synthesis, spectroscopy, AI based computational design, and energy storage analysis methods. Storing Australia's future renewable energy reserves will require improvement in battery performance, which necessitates new chemical based technological advances. Successful translation of the proposed concept has the potential to provide society with highly innovative electronic technologies based on environmentally friendly, non-toxic and abundant organic feedstocks. The technology would be applicable to powering a range of electronic Internet of Things devices aimed at improving quality of life. It is multifaceted translational research programs such as these that open opportunities for future							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Australian researchers to critical disciplinary chemical thinking and training, which is key to cultivating entrepreneurship. Landmark scientific contributions in the rapidly growing area of organic electronics are expected outcomes of this project, attracting local, domestic and international attention and broad collaboration founded on atypical nitrogen bond redox chemistry.							
DP250102035	**The View From Somewhere: embodied agents and the quantum perspective**	46,794.00	111,125.00	178,215.50	113,884.50	0.00	0.00	450,019.00
Evans, Dr Peter W	Motivated by recent results in quantum foundations, this project aims to develop a novel approach to objective reality by taking seriously the agent perspective in our scientific worldview. Our interdisciplinary team of philosophers and physicists will investigate the physics of embodied agents, exploring how agents learn about the world, codify this knowledge, and navigate their environment. We expect our project to significantly advance knowledge in quantum foundations and embodied agent learning. Our foundational research could underpin future breakthroughs in the research and development of the next generation of embedded intelligent machines, with the potential to unlock the enormous wealth creation capacity of Artificial Intelligence.							
	National Interest Test Statement							
	Whilst Australia has become a world leader in quantum computing through heavy investment, Australia's potential to be a world leader in artificial intelligence (AI) is as yet unmet, with the Kingston AI Group concluding that the "development of sovereign AI is of critical importance to Australia's future security and prosperity". Our project establishes a novel metaphysics of AI: a framework for understanding physical learning agents that will revolutionise design principles for machine intelligence. Our research is foundational, and our key innovation is to situate learning agents in physics rather than cognitive science: our team of philosophers and physicists investigate the physics of beings that act in the world, both robot and human, to establish how these agents learn about the world, codify this knowledge, and navigate their environment. We expect our project investigating cutting-edge quantum foundations, the philosophy of how human agents systematise their environment, and how robots learn about the world to underpin future breakthroughs in the next generation of physical intelligent machines, with the potential to unlock the enormous wealth creation capacity of AI and establish Australia as a world leader in this space. As AI systems become increasingly capable and autonomous, our novel metaphysics of AI will be essential for ensuring these transformative technologies responsibly and reliably serve our society, rather than pose existential risks.							
DP250102107	**Novel Metal-Organic Framework Crystal-Glass Proton-Exchange Membranes**	98,264.00	198,829.50	203,431.50	102,866.00	0.00	0.00	603,391.00
Zhu, Prof John	This project aims at new metal-organic framework (MOF) crystal-glass proton exchange membranes (PEMs) for Proton Exchange Membrane Fuel Cells (PEMFCs). The high processability of MOF glasses allows for the fabrication of grain-boundary-free membranes, addressing the key challenge of impeded ion transport. Expected outcomes include new knowledge in ion conductive MOF glasses, techniques for assembling MOFs into practical devices, durable PEMs suitable for various temperature/humidity levels, and PEMFCs with improved efficiency, lifetime, and operational capabilities. This project expects to accelerate the development of a sustainable energy technology viable for diverse applications, including transportation and portable power systems.							
	National Interest Test Statement							
	There is a pressing need for Australia to promote clean energy generation for the transition to net zero. The proton-exchange membrane fuel cells (PEMFCs) are a promising clean energy technology for vehicle applications and portable energy devices, because of their high power density and ultra-low emission features. However, current PEMFCs face limitations in durability and high cost, hindering their practical application. As the core component in PEMFCs, the mainstream polymeric proton-exchange membranes (PEMs) are not only expensive but also suffer from physical degradation under high temperatures, leading to efficiency losses. This project aims to address this critical research gap by developing novel metal-organic framework (MOF) crystal-glass PEMs with high performance, high durability and low cost, contributing to the widespread adoption of PEMFCs. This will benefit Australia economically and environmentally, by stimulating growth in Australia's renewable energy sector and reducing greenhouse gas emissions. We will work with Australian industry partners to commercialise the developed membranes after the successful completion of this project. The fundamental knowledge developed from this project will also contribute to keeping Australia at the frontier position in PEMs, MOFs and fuel cells. The techniques developed in this research will also be readily extended to a variety of membrane applications, including gas separation, sensors and heterogeneous catalysts.							
DP250102112	**Reconfigurable Medium-matched Antenna for Structural Abnormality Detection**	97,114.00	195,679.50	200,281.50	101,716.00	0.00	0.00	594,791.00
Fumeaux, Prof	This project aims to improve the detection capabilities of microwave-based Non-Destructive Testing devices using a multi-element scanning setup. Each element will							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Christophe	address existing challenges such as polarisation mismatch, scanning speed, surface reflection and penetration depth. In this system the phase front of the electromagnetic wave emitted by the antenna is shaped using a lens and the surface of the material being tested is given a specialised anti-reflection coating. This two-stage process ensures the emitted wave has sufficient directed power and is effectively transmitted inside the material to reach deep targets. Outcomes are expected to advance antenna system design and open new application areas for microwave technology. **National Interest Test Statement** Non-destructive testing systems are crucial parts of infrastructure monitoring and maintenance in Australia. The existing non-destructive testing methods use a wide range of probing signals including radio waves, sound waves, electric currents, X-ray or gamma rays, or a combination of methods to wirelessly detect sub-surface anomalies in an object or medium such as ground. The variety of measurement conditions multiplies the cost by requiring maintaining a fleet of different instruments to monitor a wide range of infrastructure objects. This project aims to develop a design methodology that will facilitate the design of a generic modular non-destructive microwave-based testing system for different scanning environments. These challenges will be addressed in the form of interchangeable bespoke components to steer and focus the probing beam, while reducing surface reflections, allowing deeper testing with radar-based analysis instruments. By developing a scanning system that can be adapted to its test environment, the project will improve the convenience and reliability of non-destructive testing. This will enhance public safety by enabling more frequent and accurate inspection of critical infrastructure such as bridges or underground pipes, thus significantly reducing the risk of failures and accidents. This will support informed decision-making on maintenance budget, and timelines for development of new standards by regulatory authorities and commissioning partners.							
DP250102207 Burgener, Dr Sabrina S	**Substrate limits protease activity: Molecular clock for signal inhibition** Proteases act as sharp scissors to modulate molecular processes. Importantly, it is crucial for proteases to be strictly regulated to avoid unwilling proteolysis. This proposal investigates a molecular clock to turn off protease activity. This proposal seeks to reveal how substrate availability acts as a signal inhibition to control the magnitude of proteolysis. Expected outcomes include new insights into regulating protease activity and how their own substrates control the duration and magnitude of proteolysis. Project benefits include a fundamental understanding of how proteolytic processes are strictly regulated and shut down to control the amplification of molecular signals. **National Interest Test Statement** The life of an organism relies on the appropriate death of its cells. We know how cell death programs are activated but understand less about how cell death is silenced to ensure cell functions. Our project investigates processes that silence caspase-1, a protein that induces cell death. Such fundamental knowledge of cell death regulation may be harnessed in future projects to develop new commercial products such as research tools, diagnostics or anti-cancer drugs, and thereby providing economic and commercial benefits to Australians. Other benefits include building capacity in Australia's scientific workforce, including capacity in cutting-edge techniques such as proteomics and enzyme biochemistry to gain structural insights into cell death proteins that will ensure Australia will continue to be at the forefront of international cell death research and its translation into commercial products.	71,000.00	143,000.00	147,500.00	75,500.00	0.00	0.00	437,000.00
DP250102263 Schembri, Prof Mark A	**Molecular control of a bacterial fight or flight response** This research aims to use forefront molecular microbiology and structural biology approaches to advance fundamental knowledge on a group of bacterial transcriptional regulators that control contrasting phenotypes ranging from antibiotic resistance and adaptation, to motility. The major goals of this project are to characterise the mechanisms by which these regulators sense and respond to stress, elucidate the structural basis for their multifaceted function, and define unique features of different regulators in this large family. The outcomes will advance our understanding of a widespread group of transcriptional regulators and decipher how they contribute to bacterial survival and antibiotic resistance. **National Interest Test Statement** Bacteria cope with different environments and stresses by coordinating the transcription of specific sets of genes generally associated with related functions, resulting in a 'fight' or 'flight' response. In the 'fight' response, bacteria activate the transcription of genes that lead to enhanced fitness and survival in a specific condition, while the 'flight' response involves activation of motility genes to escape the condition. These adaptations enable bacteria to	136,715.00	273,430.00	273,430.00	136,715.00	0.00	0.00	820,290.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	survive in industrial, environmental, animal production and clinical settings. Using advanced microbiology, molecular biology, biochemical and structural biology methods, this study will dissect how bacteria sense and respond to environmental stresses such as antibiotics, biocides, salts and metal ions. Enhanced understanding into the mechanisms that control bacterial adaptation to these stresses could lead to the development of new therapeutics to block resistance pathways used by pathogens that cause disease in veterinary and agricultural settings. This new knowledge has the potential for social and economic benefits, such as protecting Australia's food manufacturing and unique environmental ecosystems, as well as improving the well-being of Australians. Beyond its research implications, this project will create a range of high-skills training opportunities and has the potential to bolster multiple Australian industrial sectors, driving scientific and economic advancement.							
DP250102282 Monteiro, Prof Michael J	**Next Generation Engineered Antiviral Coatings** This project aims to engineer an environmentally friendly antiviral nanocoating designed with new and universal mode of viral inactivation for broad-spectrum and long-lasting viral protection. Using a combination of synthesis, computational modelling, and cutting-edge visualisation and quantitative analysis techniques, this project expects to provide new antiviral design principles to guide surface coatings development. Expected outcomes include mechanistic understanding of virus properties and behaviour on coatings, leading to a next generation antiviral nanocoating to optimally bind and rupture viruses. This should provide economic and health benefits through protecting Australians by halting transmission of known and new viral outbreaks.	98,599.00	197,198.00	197,198.00	98,599.00	0.00	0.00	591,594.00
	National Interest Test Statement Viruses pose significant health and economic impacts to the Australian community. While vaccines may be considered the holy grail for preventing viral infection, they come with inherent limitations such as adverse side effects, incomplete protection and need for annual boosters. The most effective antiviral solution is a protective system that prevents viruses from entering the human body in the first place either from contaminated surfaces or through the air. This project aims to meet this need by developing a surface coating that destroys any virus upon contact. Using a water-based formulation, the proposed antiviral coating is environmentally friendly, non-toxic and cost-effective and can be easily applied to surfaces and impregnated in face masks to stop airborne transmission. Beyond the obvious health benefits of protecting society from viral pathogens, the project expects to also deliver economic benefits by reducing annual costs associated with an incapacitated workforce and the burden on public health systems. Additionally, antiviral coatings are considered Mission Critical Technology by space agencies to prevent serious crew illness and interplanetary contamination from opportunistic microbes. If this antiviral coating is successfully developed, two multinational industry partners are ready to translate our research into commercial products through development, manufacturing, and global supply, delivering further economic benefits to Australia in the future.							
DP250102334 Zhu, Prof John	**High performance cathode for protonic ceramic fuel cells** This project aims to develop a novel cathode for protonic ceramic fuel cells operated at economically viable temperatures. The cathode expects to improve the density of active sites and resist degradation due to the cathode reaction environment. The key novelty is to modify the mixed conductive perovskite bulk with surface alkali metal melts that can transport ions and reactivate the surface. Expected outcomes include enhanced efficiency of power generation and new techniques to develop high-performance catalyst materials, which are essential for energy conversion and thermal catalysis. This will benefit Australia’s environment and energy sector in managing carbon emissions and accelerate Australia’s transition to a carbon-neutral economy.	96,916.00	193,832.00	192,232.00	95,316.00	0.00	0.00	578,296.00
	National Interest Test Statement Protonic ceramic fuel cells (PCFCs) are a promising low emission technology that uses the chemical energy stored in the fuels to produce electricity at 400 to 600 degree C, with high energy efficiency, high fuel flexibility and low cost. As electricity generation is Australia’s largest source of carbon emissions, efficient clean power generation is an important step for Australia’s transition to clean energy. However, capitalising on these advantages of PCFCs is challenging because of the lack of cathode materials that can maintain an efficient and stable catalytic activity. This project aims to develop a novel cathode for PCFCs with high activity and high stability, thus greatly promoting the widespread utilization of this promising clean technology and contributing to Australia’s transition to net zero. The knowledge generated through this project will also keep Australia in the frontier areas in novel perovskite materials, ceramic fuel cells and clean energy. The developed high performance perovskite cathode materials will potentially be commercialized through Uniquest at the University of Queensland following the successful completion of this project, benefiting the energy and manufacturing industries in Australia. The fundamental understanding and methodology from this project will also significantly contribute to many new applications of the novel perovskite materials such as membrane reactor for hydrogen production, CO2 electrolysis and solid oxide batteries etc.							
	Controlling the lifetime of biodegradable polymers in natural environments							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250102432 Laycock, Prof Bronwyn G	Plastic waste in the environment is a massive global problem. One key solution is to substitute nondegradable plastics with bioderived and truly biodegradable polymers. Tailoring the rate of biodegradation of these polymers is essential for optimizing their functional performance and environmental impact. Yet the fundamental mechanisms of polymer biodegradation are poorly understood, with little current control over bioplastic lifetimes. This project will create model materials with a variety of surface topologies and chemistries in order to better understand biodegradation mechanisms and develop strategies to manipulate biodegradation rates and predict plastic lifetimes, paving the way for more sustainable solutions to plastic pollution.	109,412.00	225,376.00	239,379.00	123,415.00	0.00	0.00	697,582.00
	National Interest Test Statement More than 420 million tonnes of plastic are produced every year, and this is forecast to triple by 2060. Yet our waste management systems are not able to adequately handle these flows. As a result, plastic pollution is now a global crisis, with 19-23 million tonnes per annum of plastic waste already leaking into aquatic ecosystems, according to conservative UN estimates – 130,000 tonnes per annum in Australia alone. In light of this, the search is on for materials that can replace those that are likely to end up in the environment, with a focus on bioderived plastics that will biodegrade instead of remaining as macro- or micro/nanopollutant hazards for decades. However, the biodegradation lifetimes, rates and mechanisms of these emerging plastics are still poorly understood. If we want to control and manipulate these processes, we need to develop a deeper understanding of the drivers for biodegradation, using model materials that can help us understand the factors that accelerate or slow biodegradation rates. This project expects to lay the necessary scientific foundations for the development of environmentally friendly biodegradable plastic products to support Australia to achieve more sustainable management of plastic materials and to help position Australia as a leader in circular economy innovation. The adoption of this technology also enables Australian manufacturers to produce high-value materials with tailored biodegradability for this massive global market.							
DP250102499 Carah, A/Prof Nicholas	**The Australian experience of automated advertising on digital platforms** This project aims to produce new knowledge about how the advertising practices of global digital platforms have developed and how they impact Australians. Expected outcomes include new digital research approaches to investigate how Australians are tracked and targeted by automated and algorithmic advertising. The project will benefit scholarly and public understanding of how advertising on digital platforms represents and classifies Australians, including whether their models discriminate by race, gender, age or class. The project will produce novel and transferable approaches for studying digital media industries and cultures that envision forms of automated media accountable to shared values through public and policy engagement.	60,200.00	136,516.50	167,329.00	91,012.50	0.00	0.00	455,058.00
	National Interest Test Statement Australians are avid users of digital and social media platforms. Companies like Meta (Facebook) and Alphabet (Google) are at the centre of our daily lives. The project aims to investigate the algorithmic models used for advertising on digital platforms. Government and public sector stakeholders are concerned about their market power, privacy, data use, consumer protections and online safety. The Australian Competition and Consumer Commission's Digital Platform Services Inquiry, along with inquiries in Europe and the US, makes clear these problems stem from the limited public oversight and inadequate regulation of the opaque and data-driven advertising model. To create forms of media and online environments that serve all Australians we must first understand the algorithmic advertising model and its ubiquitous role in our everyday lives. This will benefit Australia socially and economically by developing durable ways of making digital media platforms accountable to shared values. Research translation is undertaken with a series of activities to engage with policy makers, industry partners and the public.							
DP250102530 Holden, Dr Matthew H	**Resolving the value of information paradox for ecological management** Globally, we spend $133 billion per year on environmental management. Half of this money goes towards data collection and research. Clearly, ecologists and managers widely agree that new information is critical for improving decisions. However, surprisingly, the application of mathematics to ecological management regularly suggests we spend too much on research. This wide disagreement between mathematical theory and ecological expertise forms a long-standing paradox in mathematical ecology. The project aims to resolve this paradox by deriving new theory for quantifying the value of information across systems and solving new	106,900.00	216,200.00	219,200.00	127,050.00	17,150.00	0.00	686,500.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	problems that violate traditional mathematical assumptions in fisheries, outbreak management, and conservation. **National Interest Test Statement** Today, Australia spends less on the environment than 20 years ago. With inadequate resources to reverse the environment's downward trajectory, now more than ever, it is essential that we spend what we have effectively. Currently, half of environmental management budgets go towards collecting new information rather than deploying actions that can directly improve environmental outcomes. While new knowledge can improve management indirectly, it is unclear how much time, effort, and money we should spend to acquire it. Furthermore, if we invest heavily in obtaining new information, should most of this information be discovered through analysing existing data, or should we invest more heavily in acquiring new data? This project aims to develop new mathematical methodologies to better allocate resources between mathematical and statistical modelling, data acquisition, and deploying actions to achieve the best environmental outcomes. Expected benefits include (1) more secure food sources by improving Australian fishery assessment prioritisation, (2) increased biodiversity by designing more effective protected areas, and (3) reduced environmental, economic and societal risk through new guidelines for rapid mathematical modelling to inform policy during crises. We will work directly with Fisheries Queensland, discuss the work with other management agencies, and promote the results through social media and news outlets to maximise understanding and adoption of the new findings.							
DP250102550 Sweet, Prof Matthew J	**How immune cells use metabolism to respond to different threats** All animals need to respond to different types of danger, for example injuries and microbes. This project aims to understand how immune cells called macrophages use metabolic pathways to sense and respond to danger. The project expects to advance knowledge of how one metabolic pathway, as well as a molecule produced by macrophages, enable the immune system to focus on environmental threats most likely to cause harm. Expected outcomes include major conceptual advances in cell biology and immunology, new interdisciplinary collaborations, and new tools and methods to study how cells work. Anticipated benefits include a knowledge base that could, in the long term, be indirectly applied to develop strategies to combat infections. **National Interest Test Statement** All animals, including Australian livestock and companion animals, require an immune system to combat harmful bacteria that cause infections. The immune system needs to distinguish between these dangerous bacteria and other environmental factors that do not cause harm. This ensures that the immune system is effective and only activated when it needs to be. However, there are significant knowledge gaps about how animal immune cells detect and destroy dangerous bacteria. A better understanding of this would enable us to switch on specific parts of the immune system to fight bacterial infections. In future, this is expected to lead to the development of vaccines and/or drugs to maintain and/or improve the health of Australian livestock and companion animals. The same knowledge may also help us to reduce antibiotic use and the emergence of antibiotic-resistant bacteria in the agriculture and veterinary sectors. This project also expects to develop a technology to monitor a component of the immune system, for development by the biotechnology industry. Research outcomes are expected to be promoted through industry engagement so that anti-infective agents and immune-monitoring tools can be developed for the Australian livestock, veterinary and/or biotechnology industries to provide economic benefit to Australia, as well as environmental benefit through reduced antibiotic use.	118,500.00	242,500.00	251,500.00	127,500.00	0.00	0.00	740,000.00
DP250102623 Stahl, A/Prof Garth	**Including the voice of boys and young men in their well-being education** Despite significant concerns about the mental health and well-being of boys and young men, we know very little about how to make health-related education more effective for them. We know existing programs often fail to resonate with boys and young men yet they are rarely given a voice in their mental health and well-being education in schools. This research is student voice-driven and aims to include a diverse cohort of boys and young men (e.g. age, sexuality, ethnicity, disability, location) at the secondary level to understand what can be done to enhance their well-being education. The aim of the project is to begin to build a collection of open-access resources to improve the effectiveness of mental health education for boys. **National Interest Test Statement** Using a student voice approach, the proposed research will capture an important gap in knowledge concerning what boys and young men want in their wellbeing education. We know many males will not seek help for issues related to poor well-being due to societal stigmas. The research is of social and economic benefit as it intends to develop resources which may be used to reduce the stigma and foster a productive conversation at the community and national level. Presently, school-based wellbeing programs remain almost exclusively gender-neutral, externally designed and implemented using a top-down approach. For many boys and young men, these programs are	143,367.50	189,406.00	137,196.00	91,157.50	0.00	0.00	561,127.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	ineffective. The information gained will hopefully be useful to the future of wellbeing education for boys and young men. In accordance with the ARC Medical Research Policy, the resources generated from the project are not an intervention and will not diagnose, monitor or manage the treatment of mental illness. The project does not modify a human health condition or behaviour of humans and it is not a clinical trial.							
DP250102648 Redshaw, Dr Jonathan P	**Causes and consequences of cognitive offloading in children** Australian children often use external thinking tools (e.g., calculators, laptops, smartphones) to help themselves solve problems. Among adults, such cognitive offloading behaviours can have detrimental effects on internal cognitive abilities, but nothing is known about the long-term effects on children. This project aims to examine how children and adolescents trade off the benefits and costs of cognitive offloading, and establish the cognitive and neurocognitive causes and consequences of such trade-offs. Expected outcomes include the ability to identify children whose use of cognitive offloading may put their thinking skills at risk. This knowledge may eventually assist in training children to offload only when it benefits them.	78,493.50	162,325.50	169,908.00	86,076.00	0.00	0.00	496,803.00
	National Interest Test Statement Australians are increasingly turning to digital devices and other tools to solve cognitive problems. We use these tools to take notes, set alarms, keep appointments, perform mathematical calculations, and navigate the streets. The current generation of Australian children is the first to grow up with ubiquitous access to such cognitive offloading techniques, and yet nothing is known about how the tendency to offload information impacts children's cognitive development. This project will examine, for the first time, the cognitive and neurocognitive causes and consequences of cognitive offloading decisions in children aged 8 to 15 years. We will determine the different strategies that children use when offloading, the key ages at which these strategies emerge and change, and whether such strategies are associated with long-term positive or negative effects. Findings will be shared with education professionals and policymakers to facilitate downstream social benefits to the community. Examples of these benefits include new assessment tools that can identify children at risk of crystallising maladaptive offloading tendencies. The project will thereby lay the foundation for teaching Australian children to better use cognitive offloading to their advantage without limiting the development of their cognitive capacities.							
DP250102748 Gildfind, Dr David E	**Effect of Magnetic Field Deflection on Magnetohydrodynamic Heat Shield** The magnetohydrodynamic heat shield concept, which uses a magnetic field to control the hot plasma flowing around the spacecraft, will enable vehicles entering Earth's atmosphere to follow trajectories with considerably reduced heating. Minimal research in this field has accounted for how the magnetic field deforms due to the plasma flowing through it, yet this effect is expected to be significant for a full scale spacecraft. This project aims to experimentally reproduce and characterise this phenomemon. Its significance will be providing the first ever measurements of this effect. The expected outcome and benefit will be new understanding and new simulation capabilities, both essential to developing a functional full scale heat shield.	123,021.50	248,543.00	182,333.50	56,812.00	0.00	0.00	610,710.00
	National Interest Test Statement When a spacecraft enters Earth's atmosphere, air flowing around it gets so hot that electrons are ripped off the atoms. Future heat shields may use lightweight magnets to push against this hot, electrically conducting gas, to reduce heating and enhance flight control. When this technology is scaled up to large spacecraft, physics tells us that the magnetic field, like the flow itself, will start to fold back around the spacecraft. The research gap we will address is to conduct the first ever experiments to induce this magnetic field deformation behaviour in an aerodynamic flow. These experiments are necessary to properly understand the phenomenon and to validate our computational models so that we correctly capture this behaviour in future heat shield designs. The project will pave the way for lighter, reusable heat shields, reducing the cost of space-based technologies. Research will be shared with international space agencies to facilitate collaboration and accelerate technology development. It will expand the potential for Australian participation in global supply chains and increase our ability to draw significant international funding to address various unsolved challenges posed by future space transport. The project will train its PhD students into the highly skilled scientists desperately needed by Australia's nascent space industry, and communicating our research through mainstream media will help inspire the brightest young Australians to choose future STEM careers.							
DP250102847 Young, A/Prof Rowan D	**Harvesting fluorine from fluorocarbons: Developing transfer fluorination** Methods to introduce fluorine into organic molecules are highly developed as fluorocarbons are vital to many modern technologies. Such methods rely upon the use of fluorine gas (F2), hydrogen fluoride (HF) or reagents made from F2 or HF. Concurrently, fluorocarbons generated on a megaton scale pose a unique environmental hazard. This project aims to 'harvest' the basic fluorine synthons (F-,	81,158.00	165,867.50	172,969.50	88,260.00	0.00	0.00	508,255.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	F2, F+) from waste fluorocarbons to circumvent the need for hazardous fluorine reagents and recycle the fluorine that has already been incorporated into existing fluorocarbons. The success of this project will result in new methods for transfer fluorination and a new family of carbon-based fluorination reagents that will be readily commercializable. **National Interest Test Statement** Fluorocarbons are essential components of many modern chemicals used by Australians including refrigerants, soaps, cosmetics, plastics, pesticides, herbicides and pharmaceuticals. As potent pollutants, the megatons of fluorocarbon waste generated each year present a significant environmental hazard and Australia has committed to limiting the release of fluorocarbon waste as a signatory of the Montreal and Kyoto Protocols. Most fluorochemicals industry (worth over $100 billion/year) is foreign with limited Australian capability for producing new fluorocarbons or processing fluorocarbon waste. This project aims to invent new methods to harvest fluorine from waste fluorocarbons and then transfer it to other compounds to generate new fluorochemicals (waste-to-asset). Such a technological development would allow Australia to become a major economic benefactor of the global fluorochemicals market and lead to several customised commercial fluorinating reagents. It would also reduce Australia's dependence on foreign fluorochemical imports and provide a new avenue for the recycling of fluorocarbon waste. Discoveries arising from this project will be patented and communicated in open access media to ensure that the benefits of this project remain within Australia and that Australians are able to access and understand these scientific advances.							
DP250102917 Davis, Prof Tamara M	**Cosmic Cartography to Counter Cosmic Conundrums** This project aims to make a comprehensive map of cosmic structure spanning four billion light years around our Milky Way, and analyse it to measure how our galactic neighbourhood warps our view of the Universe beyond. Using innovative machine learning methods to combine galaxy positions with galaxy motions this project should reveal hidden structures and determine their impact on our measurements of the expansion rate of the Universe. Expected outcomes include a 3D cosmic map that can be used by astrophysicists in perpetuity; this awe-inspiring new view of our cosmos is expected to provide social and cultural benefits, in addition to economic benefits arising from applying the new statistical methods to big data in industry and government. **National Interest Test Statement** The field of cosmology is undergoing a revolution, with multiple lines of evidence indicating that our standard cosmological model needs revision. One of the most pressing issues is the "Hubble Tension" in which different techniques of measuring the Universe's expansion rate disagree. Building on two decades of Australian leadership in galaxy surveys, this project aims to use our established access to world-leading data to make the most comprehensive map of our local Universe - and thus reveal whether hidden structure has biased expansion measurements, or whether a step-change in our cosmological model is needed. This project aims to create the most breath-taking map of our Universe to date. By collaborating with software engineers, we plan to release our data as a downloadable resource for all cosmologists in perpetuity and as a public app- and web-based "Cosmic Atlas" (like a "Google Maps" for the Universe). This will provide a real way of achieving the Government's vision of engaging and inspiring the Australian community about science, and cultural benefit will flow from the public's ability to explore the wonders of our nearby Universe. Through leadership in major international surveys the project aims to create long-term collaborations and leave a legacy to enhance Australia's capacity for future astrophysics discoveries. Economic benefits are expected to follow from enabling the next generation of innovators to develop new tools for industry and data science.	80,920.50	164,600.50	176,180.00	92,500.00	0.00	0.00	514,201.00
DP250102923 Davis, Prof Matthew J	**Controlling superfluid transport with spatially engineered dissipation** The goal of the flourishing field of atomtronics is to build useful superfluid circuits in analogy to electronics. However, there is the opportunity to develop innovative devices that go beyond merely imitating their electronic counterparts. The aim of this project is to use spatially shaped current drains to study emergent superfluid transport and design novel superfluid circuit elements. The expected outcomes are (1) a conceptual understanding of how emergent superfluid transport behaviour can be controlled using particle loss, and (2) proposals to demonstrate new circuit elements in the lab. The benefits include formulating design principles for developing sensors based on superfluids for the Australian quantum industry. **National Interest Test Statement**	97,016.50	200,136.50	203,905.00	124,760.00	23,975.00	0.00	649,793.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Scientists can now trap and cool samples of millions of identical atoms down to ultracold temperatures only a few billionths of a degree above absolute zero. Under these extreme conditions new collective quantum behaviour can arise such as the ability to flow without any friction – the atoms become a superfluid. This project will design new methods to force superfluids to flow in a circuit by creating patterns of drains where the atoms are removed. This will cause the superfluid flows to have previously unexplored features that could be utilised for new applications of superfluid circuits. Ultracold atoms are extraordinarily sensitive to inertial forces and are used to measure accelerations and rotations with unprecedented accuracy. They are already used for precision mapping of the Earth's gravitational field to provide information about what is under the surface. The novel features of the superfluid circuits we design could lead to new techniques for quantum sensing, such as gravitational sensors that can perform fast contactless weighing of e.g. large trucks and trains, contributing to transportation efficiency and logistics. In May 2023 the Australian government launched the National Quantum Strategy, forecasting the sector could be worth $6 billion annually and employ 19,400 people by 2045. This project will contribute towards the two Strategy themes of developing a skilled quantum workforce, and building a trusted, ethical, and inclusive quantum ecosystem.							
DP250103141 Bollmann, Dr Steffen R	**Towards Standards and Benchmarks for Reproducible Neuroimaging Research** This project aims to address the reproducibility crisis in neuroimaging by developing methodologies and standards for defining reproducible, benchmarked analysis pipelines. It expects to generate new knowledge about the extent of reproducibility challenges and develop standardised methods for describing analyses from raw data to outputs. Planned outcomes include implementing and integrating these standards with established neuroimaging platforms like Neurodesk and Brainlife for community dissemination. This should provide significant benefits by enabling researchers to reuse, build upon and trust published findings, accelerating scientific discovery and positioning Australia's neuroimaging scientists to lead in reproducible neuroscience.	85,741.50	186,742.00	192,260.50	91,260.00	0.00	0.00	556,004.00
	National Interest Test Statement Neuroimaging research is crucial for understanding brain structure and function, unlocking breakthroughs that impact our daily lives, and influencing everything from health to how we process information and interact with the world. However, a major hurdle in neuroimaging research is its reproducibility—the ability to achieve consistent results using the same data and methods in repeated experiments. This reproducibility is essential for scientists to verify findings, stand on the shoulders of giants, and drive forward with new discoveries. Our project aims to investigate reproducibility practices, develop methodologies that enable analytical reproducibility, and identify how these can be disseminated to and adopted by the neuroimaging community. This understanding will lead to new analysis standards that enable scientists to reliably reproduce, validate, and build upon each other's work, significantly accelerating progress in neuroimaging research. These outcomes will bolster Australia's reputation as a leader in open science and neuroimaging, fostering international collaborations and attracting future investments. Additionally, our project will enhance Australia's neuroimaging infrastructure and standards development capabilities. We will share our findings through academic publications, workshops, and conferences, publish our standards to encourage community involvement, and integrate our solutions into established analysis platforms to directly benefit researchers.							
DP250103149 Martin, Dr Richard J	**Evaluating compensation for harm to Indigenous culture in Queensland** In the wake of the High Court's (HCA's) decision about compensation for 'cultural loss' in Northern Territory v Griffiths [2019] HCA 7, research is urgently needed on the different forms of harm to Indigenous culture suffered as a result of colonisation. This project aims to undertake the first ethnographic investigation of harm outside the context of litigated compensation claims. By investigating the complexities of Indigenous experiences of colonisation, including frontier violence, incarceration on missions and reserves, and contemporary experiences of heritage destruction and interrupted knowledge transmission, this project will establish the knowledge base to resolve the coming wave of compensation claims by First Nations peoples.	63,443.50	170,160.50	156,946.50	50,229.50	0.00	0.00	440,780.00
	National Interest Test Statement Compensation for 'cultural loss' is a major focus of negotiations between governments and First Nations groups across Australia. With over 300 determined native title holding groups eligible to claim compensation, the Commonwealth, states, territories and other respondent parties (e.g., mining companies) face hundreds of future compensations claims worth billions of dollars. Treaty discussions across multiple jurisdictions have also raised the possibility of reparations for colonisation, including for harm suffered prior to the date (1975) after which acts resulting in cultural loss may be subject to compensation under the Native Title Act (1993). Yet there is a lack of independent academic research about Indigenous cultural loss, especially in anthropology, which has avoided the topic for a generation. By investigating the complexities of cultural loss in the Gulf Country of northwest Queensland, focusing on how Indigenous people feel about loss and how the experience of loss changes over time in who it affects and the kinds of feelings associated with it, this project aims to refine research methodologies relating to compensation in both the Gulf Country and the wider nation. As well as benefiting Indigenous peoples by enabling the negotiation of full, just, and fair settlements with claimant groups, this project aims to improve the practice of applied anthropology in this area, saving time and money, and avoiding the trauma associated with unsuccessful litigation.							
	Revealing how cells use protrusions to help form the early nervous system							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
DP250103212 White, Dr Melanie D	This project aims to understand the formation of the neural tube; a fundamental tissue structure that generates the brain and spinal cord. Using interdisciplinary approaches and exploiting recent advances in transgenic and quantitative imaging technologies, the project expects to reveal how cellular protrusions mediate the precise tissue fusion required to form the neural tube. Outcomes include knowledge of previously intractable developmental processes, training of future scientists and development of international collaborations. This should provide enhanced imaging capacity, a higher quality scientific workforce and position Australia at the forefront of cell and developmental biology. **National Interest Test Statement** This project investigates epithelial fusion, where two layers of cells join to form a continuous tissue. This is a critical process during development and wound healing. During epithelial fusion, cells extend finger-like protrusions to make contact and pull each other closer. These protrusions are important for fusion of the neural tube, the precursor to the brain and spinal cord. However, understanding their functions is limited due to challenges in studying the neural tube live in traditional model animals. Using a unique genetically modified quail model, this research offers unprecedented insights into epithelial fusion in a higher vertebrate. The model enables advanced live imaging to study the dynamic behaviours of cellular protrusions in vivo. The findings will enhance understanding of tissue development and repair, potentially leading to future innovations in tissue engineering, regenerative medicine and wound healing, thus improving the quality of life for many Australians. The project will cement Australia's position as a leader in cell biology and improve workforce capacity in cutting-edge imaging technologies. Understanding avian embryo development is also vital to the poultry industry. Increasing uniform hatching would yield substantial savings in costs and animal usage. The work will be shared with current commercial and government partners focused on poultry applications, Petersime and CSIRO, and disseminated through conferences and high-impact journals.	107,000.00	215,012.50	221,957.50	113,945.00	0.00	0.00	657,915.00
DP250103225 Hameiri, Prof Shahar	**Outsourcing Foreign Policy: Consultants and Contractors in Australian Aid** Consultants and contractors are central to achieving Australia's foreign policy goals via international development finance, but little is known about their impacts on the program. This project aims to address this crucial gap by utilising innovative methods for analysing contracts data and conducting interviews across Australia's development constituency. It expects to produce a novel understanding of outsourcing's impact on foreign policy and how to optimise it to meet policy goals. Expected outcomes include recommendations for delivering Australian aid, a publicly accessible database, and enhanced capacity for international collaboration and knowledge transfer. It will contribute to Australian development finance's effectiveness. **National Interest Test Statement** Geopolitical tensions are intensifying globally. In Australia's region, these tensions manifest largely through foreign aid and development financing. To maintain its influence in the region, the Australian government is reshaping its development program to compete with China. Private sector consultants and contractors are central to achieving Australia's foreign policy goals in this domain, implementing many projects, and also often developing and evaluating programs and policy. Little is known systematically, however, about their role within Australia's development program and their impact on its goals and performance. This project aims to investigate consultants and contractors' impact on Australia's international development program and identify how their involvement could be optimised to ensure it best serves Australia's foreign policy goals. Benefits include recommendations on how the government can optimise its use of consultants and contractors to achieve its foreign policy goals in the region, and rebuild the Australian Public Service's capacity. The project aims to contribute to Australian aid's effectiveness and quality, and inform the national debate over outsourcing state functions. Findings will be disseminated to practitioners via stakeholder workshops, a policy report, and seminars to DFAT. Findings will also be made available to the wider public via a policy report, medoa opeds, a website and a searchable database of Australian projects.	47,086.50	139,512.00	166,136.50	73,711.00	0.00	0.00	426,446.00
DP250103242 Meunier, Prof Frederic A	**Deconstructing neurotransmission one molecule at a time: Munc13** Understanding the nanoscale workings of the synapse, the site of neuronal communication, is a holy grail of neuroscience. Munc13-1 prepares synaptic vesicle (SV) for neurotransmitter release. This grant will investigate how Munc13-1 is (1) enriched at the synapse, (2) undergoes translocation and immobilisation at the interface between SVs and the plasma membrane. Using cutting-edge super-resolution techniques, we will test whether Munc13-1 first binds to the membrane, then hooks SVs, thereby contributing to their immobilisation and building a fusogenic	126,359.00	253,815.50	262,315.00	134,858.50	0.00	0.00	777,348.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	interface. The project will harness innovation and EMCR training, propelling Australia to the forefront of neuroscience research, ultimately helping to understand neurological conditions. **National Interest Test Statement** Our project focuses on synapse communication in nerve cells that underpin memory formation in the human brain. Here, we propose an ambitious program of research using novel single molecule methodologies to unravel the inner workings of the synapse at a nanoscale level. Revealing how synaptic vesicles release their neurotransmitters during neuronal communication will be crucial to propel Australia to the forefront of molecular neuroscience research. Outcomes of this research will be disseminated to key stakeholders at national and international conferences and through press releases to media and short videos. Training of early and mid-career researchers, as well as students in state-of-the-art single molecule technologies in our work will contribute to the growth of a new generation of highly skilled molecular neuroscientists in Australia.							
DP250103259 Abbosh, Prof Amin	**Realtime Three-Dimensional Near-Field Microwave Imaging System** The project aims to develop a three-dimensional microwave system that can image and monitor the internal structure of objects in real-time. It will be portable, non-invasive, non-destructive, and non-ionizing, making it ideal for many key applications. It will have a compact antenna array designed to uniformly irradiate the object and collect microwave data that are processed using a combination of compressive sensing and physics-informed deep learning methods for fast and reliable imaging, whereas time-space analysis will enable tracking any changes in the object. The technique will revolutionize microwave imaging and sensing and is a game-changer in many fields such as healthcare and infrastructure, products, and materials inspection. **National Interest Test Statement** This innovative project will place Australia at the forefront of advanced manufacturing by developing cutting-edge microwave technology designed to create three-dimensional images of objects in real time, much like an advanced camera that can see inside things without taking them apart. It's a leap forward in medical technology and non-destructive testing, which are crucial for maintaining high standards in manufacturing and healthcare. The gap this project fills is significant: currently, there's no real-time way to get a 3D view of an object's internal structure without physically dissecting it or using time-consuming methods or ionization radiation. By addressing this, the project aligns with the Australian Government's national innovation agenda, promoting the country's skills in creating new technologies. For Australians, the benefits are manifold. Economically, it means better quality control in manufacturing, leading to less waste, and higher profitability. Socially, it offers educational opportunities for students with skills in a high-demand field. Environmentally, improved efficiency translates to reduced resource use. Commercially, the technology can be licensed, creating new businesses or enhancing existing ones. Culturally, it cements Australia's reputation as a leader in global innovation. In essence, this project will not only enable seeing the unseen but will also secure a brighter, more efficient, and more innovative future for Australia.	41,962.00	160,684.00	232,694.00	230,194.00	116,222.00	0.00	781,756.00
DP250103273 Mattingley, Prof Jason B	**Using real-time neurofeedback to enhance human sustained attention** The ability to sustain attention is crucial for a range of real-world endeavours, from classroom learning to medical diagnostics and air-traffic control. However, even highly experienced individuals exhibit attentional lapses, often with catastrophic consequences. Using a novel behavioural task and concurrent brain imaging, this project aims to use an artificial intelligence (AI) algorithm to identify patterns of brain activity that predict attentional lapses, and to implement a neurofeedback protocol to train individuals to recognise impending lapses before they occur. This project will advance knowledge about the brain processes that regulate sustained attention and put Australia at the forefront of the growing neurotechnology sector. **National Interest Test Statement** The human brain has a finite processing capacity. Mechanisms of attention allow us to focus our limited cognitive resources on sensory inputs and actions that are relevant for guiding behaviour. The ability to sustain attention for prolonged periods is crucial for many real-world activities, from classroom learning and driving to specialist occupations in medicine, defence and aviation. It is well established, however, that people's ability to sustain their attention begins to lapse after just a few minutes. Such lapses are major contributors to a range of catastrophic failures in the real world, including aircraft accidents and errors in medical procedures. The project aims to characterise the brain mechanisms responsible for regulating sustained attention, and to identify patterns of brain activity that herald impending lapses. Previous attempts to train people to improve their attention using behavioural feedback have had limited success. We have developed a novel machine-learning algorithm that decodes brain activity and predicts attention failures before they occur. We will use this real-time neurofeedback protocol to train people's attention in a way that generalises to a range of task scenarios. Our work will provide a foundation for selecting and training individuals whose jobs require prolonged attentional control. The project will also put Australia	146,000.00	306,500.00	326,500.00	166,000.00	0.00	0.00	945,000.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	at the forefront of the growing neurotechnology sector, estimated to be worth more than $50 billion per year.							
DP250103374 Ginges, A/Prof Jacinda S	**Nuclear structure and precision tests of fundamental physics in atoms** This project aims to deduce some of the best information on nuclear structure properties through precision evaluation of their effects in atoms, ions, and exotic muonic atoms. This will be utilised to control problematic nuclear structure uncertainties in precision atomic searches for new physics beyond the Standard Model. We expect that our project will provide important tests of microscopic nuclear models, drive new experimental programs at major international laboratories, and significantly increase the capacity to detect new particles and interactions. It will add to the knowledge base of fundamental nuclear physics, and provide high-level training of scientists at the forefront of atomic, nuclear, and particle physics discovery.	92,014.00	188,829.50	190,931.50	94,116.00	0.00	0.00	565,891.00
	National Interest Test Statement This project aims to provide new information about the structure of nuclei and to increase the discovery potential of precision experiments searching for new fundamental particles and interactions. Through a combination of our state-of-the-art atomic calculations for atoms, hydrogen-like ions, and exotic muonic atoms (where an electron is replaced by a much heavier muon) and high-precision experiments, we will deduce new information about nuclear properties and their distribution. These insights will enable a breakthrough in the modelling of nuclear effects in atomic systems, and allow searches for “fifth” forces, dark matter candidates, and other particles that lie beyond the Standard Model of particle physics to advance to a new level of precision. Improved knowledge about nuclei and implementation in high-precision atomic calculations will have applications in areas such as atomic clocks for precision timing, positioning, and navigation. This project will strengthen ties to scientists at world-leading laboratories and universities, including Max-Planck Institute for Nuclear Physics, Germany, and will elevate Australia’s standing in the international atomic, nuclear, and particle physics communities. Young scientists will be trained in advanced techniques, and the project will provide social and cultural benefits by addressing one of the biggest questions in science -- on the fundamental building blocks of the universe -- that has long fascinated humankind.							
DP250103378 Carroll, Prof Bernard J	**Nanoclay delivered mobile RNA for plant gene editing and crop improvement** The exogenous application of RNA for crop improvement is an emerging and attractive alternative to genetic modification of crops. This project aims to design the most biologically active nanoparticle formulations that deliver RNA into crops for enhanced yield and quality. New knowledge will be generated on the mechanism of exogenous RNA-based crop improvement. The key outcomes from the project will be new nanotechnology platforms to generate new and improved crop varieties in a much shorter timeframe than is currently possible. Exogenous application of RNA has the potential to bring significant economic benefits to Australia and globally through improved crop productivity and food quality.	106,514.00	215,079.50	220,431.50	111,866.00	0.00	0.00	653,891.00
	National Interest Test Statement The increasing global population and climate change are major threats to global food security. This project addresses current and future global food shortages by improving crop productivity and food quality. Currently, crop improvement relies on traditional plant breeding and genetic modification (GM) where foreign DNA is integrated into the crop. Both approaches have introduced many valuable traits into crops but they are extremely time-consuming and expensive. For example, a new GM crop variety is estimated to take 12-15 years and >US$130 million to commercialise. Furthermore, the acceptance of GM crops by the public is faltering, with a transition to non-GM agriculture gaining considerable traction globally, particularly in many of Australia’s important export markets. Gene editing is a new technology with the potential to fine tune important plant genes to increase crop yield and food quality, but currently involves the integration of foreign DNA into outdated crop varieties. In contrast, our novel gene editing approach aims to use RNA to fine tune plant genes in current crop varieties in a non-GM approach, thereby allowing the rapid development and commercialisation of new crop varieties into the future. If successful, this project will bring economic, social and health benefits to Australia through higher crop productivity and global food security, improved food quality, and expanded export markets.							
DP250103477 Labzin, Dr Larisa	**Understanding avian innate immunity to improve avian influenza surveillance** Highly pathogenic avian influenza virus (HPAIV) threatens Australian livestock and wild animal populations. Aberrant innate immune responses cause tissue damage in susceptible, but not tolerant species. This project will reveal the molecular mechanisms underpinning innate immune signalling differences between HPAIV-susceptible (chicken) and tolerant (duck) species. This project will also determine if	144,274.00	295,651.50	305,858.50	154,481.00	0.00	0.00	900,265.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	these differences in innate immune signalling are conserved in predicted HPAIV-susceptible and tolerant wild bird species. Expected outcomes include novel insights into avian immunology and innate immune signalling and new strategies to predict species susceptibility to HPAIV for significant agricultural, conservation and biosecurity benefits. **National Interest Test Statement** Emerging viruses, like highly pathogenic avian influenza (HPAIV), cause severe disease and death in domestic poultry livestock and wild birds. Some species, such as ducks, can carry HPAIV with minimal disease, meaning they can easily spread viruses. The immune response is the best protection against viral infection, yet in HPAIV-susceptible species (such as chickens), immune overactivation may cause collateral tissue damage, driving disease. We have identified an immune pathway that is overactive in chickens compared with ducks. This research project will uncover why this immune pathway is overactive in chickens but not ducks and whether this immune pathway is also overactive in native Australian birds. With this knowledge, we can better predict which native birds may act as HPAIV carriers (like ducks) and which birds are at high risk of death (like chickens). Our findings will improve HPAIV surveillance and Australian biosecurity to protect our poultry and livestock industries and our wild birds. This research proposal will also generate fundamental new knowledge about how this immune pathway functions in infection, which we anticipate may also generate new intellectual property. The project will employ and train Australian scientists in immunology and increasing their employability in academia, industry and government. Project outcomes will be published in open-access journals and will be shared with government (e.g. Biosecurity QLD), wildlife organisations and industry.							
DP250103551 Neely, Dr Tyler W	**Vortex matter simulators of two-dimensional melting** This project aims to address long-standing questions regarding phase transitions in two-dimensional (2D) systems, impacting the development of advanced materials and electronics. It will use the team's recently invented vortex-matter simulator of 2D charge systems to precisely study phase transitions in a configurable, defect free system. The expected outcomes of this project will be to determine the hierarchy of defect-seeded melting of a 2D crystal. Outcomes will provide enhanced understanding of 2D systems and establishment of new international collaborations in experimental quantum physics, benefitting the development of advanced electronics and manufacturing, and enhancing Australia's reputation on the international stage. **National Interest Test Statement** Advances in material science underpin the development of new materials that are relevant to technologies like novel coatings, sensors, and new electronic devices. However, unlocking these advances requires new knowledge about material properties, including how materials change from one physical phase to the other. This project will study the solid to liquid melting transition in a two-dimensional material. Despite the everyday familiarity of the melting phase transition, there is controversy about how certain materials undergo this transition, and whether there is an intermediate phase between the solid and liquid phases. We will use a highly controllable quantum simulator to directly address the existence (or non-existence) of intermediate phases in a model system that consists of long-range interacting particles. This system is closely related to colloidal suspensions and liquid crystals. We anticipate that improved understanding of the phases in our model system will impact the development of novel materials such as self-assembling films and nanostructured materials, among other potential outcomes. This work will also strengthen Australia's world-leading effort in building a quantum industry, which is a key development area in the Australian government's Blueprint and Action Plan for Critical Technologies. This will provide economic, social and commercial benefits for Australia through providing pathways to new jobs, technology exports, and economic diversification.	97,979.00	203,262.50	214,976.00	109,692.50	0.00	0.00	625,910.00
DP250103627 Cunnington, Prof Ross	**Understanding human brain plasticity and sensory perception** This project will examine how sensory areas of the human brain alter during sensory learning and how such changes in brain structure and function lead to improvements in sensory perception performance. We use cutting-edge methods that we have developed for ultra-high resolution functional brain imaging (7 Tesla MRI) and computational modelling to study markers of brain plasticity at a level never previously possible in the living human brain. The project therefore investigates the fundamental basis of human brain plasticity for sensory learning. This will provide critical new understanding of the micro-level function in sensory areas of the human brain that underpin sensory learning and perception. **National Interest Test Statement** This project will answer fundamental questions about how the brain adapts and changes in response to everyday life experiences, known as brain plasticity. The brain's ability to adapt and learn through sensory experience is	166,072.00	319,423.50	288,412.00	135,060.50	0.00	0.00	908,968.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	essential for normal human development throughout life, for learning and acquisition of new skills, and for recovery of abilities following injury. As such, this research provides a crucial knowledge-base for applications in sensory learning and training programs, human-machine robotics developments, and interventions for rehabilitation following stroke or amputation. Our research will also develop MRI technology and computational methods that allow examination of the living human brain with unprecedented detail. We use ultra-high field MRI, using one of only two such MRI scanners in Australia (a major resource under the National Imaging Facility). Through our research program, we provide an advanced training ground for Australian scientists and MRI-technologists in human brain imaging, as well as translation into new medical imaging capabilities and clinical applications. Our research outcomes and computational tools will be promoted and shared through open-source repositories and open-access reports/publications, allowing broad and immediate translation and adoption. MRI advances will also be translated commercially through our existing MRI industry partners.							
DP250103655 Cater, Dr Rosemary J	**How does the nutrient choline regulate blood vessel formation in the brain?** This project aims to understand how blood vessels in the brain are formed. There are more than 600 km of blood vessels in the brain that supply it with critical nutrients, but there is a significant knowledge gap surrounding how these blood vessels grow, and what regulates this growth. This research will use cutting edge experimental methods and an interdisciplinary approach to understand how the essential nutrient choline enters the cells that line blood vessels in the brain and regulates growth of these blood vessels. It is hoped that findings from this study will enhance our understanding of the brain's core infrastructure and reveal how cerebral blood vessels grow and maintain integrity.	121,039.00	255,563.00	272,563.00	138,039.00	0.00	0.00	787,204.00
	National Interest Test Statement The human brain is infiltrated by ~650 km of blood vessels that which supply the brain with oxygen and essential nutrients. The research proposed here will reveal the molecular mechanisms underlying how the essential nutrient choline regulates the formation and growth of blood vessels in the brain – a process that critical for human life and brain health. These fundamental findings have the potential to serve as a foundation for future research on diseases associated with compromised cerebral blood vessel integrity, such as stroke and Alzheimer's disease, and to aid delivery of drugs to the brain – an ongoing bottleneck in neurotherapeutic development. Given that brain disorders account for 20.5% of the total burden of disease in Australia and create a staggering economic burden of over $74 billion per year, this research has the potential to lead to both health and economic benefits.							
DP250103673 Hugenholtz, Prof Philip	**Tracing the emergence of cellular complexity in the phylum Planctomycetota** Some bacteria display structural features that are considered characteristic of eukaryotic cells. This project aims to establish the evolutionary origin of eukaryotic-like features within the bacterial phylum Planctomycetota, a broadly distributed bacterial lineage important to global carbon and nitrogen cycles. The project is designed to generate new understanding of the evolution of cellular complexity using the phylum as a model. In addition, the program aims to provide a comprehensive characterisation of the Planctomycetota, which has recently expanded from three of 28 classes due to recovery of genomes from the environment. Outcomes include broad interest publications, genomic resources and cultured isolates to benefit future research.	216,307.00	336,636.50	260,958.00	272,199.50	131,571.00	0.00	1,217,672.00
	National Interest Test Statement Planctomycetes are distinctive bacteria found globally in soil and aquatic environments that play important roles in carbon and nitrogen cycling including removal of ammonium from wastewater via a unique process. In Australia, they are found in iconic habitats including sponges on the Great Barrier Reef and in koalas and prawns. Planctomycetes have many cellular features that are not found in other bacteria, and instead resemble those found in animal and plant cells. Despite their wide distribution and significance in natural and engineered systems, our current knowledge of the group is restricted because they are difficult to grow in the laboratory, limiting our understanding of their functions and the origin of their unusual cellular features. Through DNA sequencing of Australian habitats, this project aims to address these knowledge gaps by producing new planctomycete genomes, identifying and characterising genes responsible for cell structure in the group, and determining the relationship of these structures to plant and animal cells. This new knowledge will improve our understanding of Australian biodiversity and has the potential to benefit the Australian economy through discovery of novel functions relevant to industries such as agriculture, aquaculture and mining and contribute to the management of our ecosystems.							
DP250104014 Stahl, A/Prof Garth	**Investigating how boys and young men experience their digital lives** Recently, there have been significant concerns regarding what boys and young men are exposed to online and how it may influence their social and emotional development. The rise of the digital has led to new concerns regarding cyberbullying,	72,769.50	150,833.00	136,316.00	58,252.50	0.00	0.00	418,171.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	body image dysmorphia, self-harm, depression, extremism, social anxiety and suicide. There is a need to learn more about what boys and young men are consuming online and how they interpret it. The proposed research aims to discover new knowledge regarding masculinities/boyhood in an era of technology-mediated societal transformations with a diverse cohort of boys and young men. This proposed research is both timely and of national benefit as it will enhance how we safeguard boys and young men. **National Interest Test Statement** Australian boys and young men spend almost five hours per day on a myriad of digital spaces. Increasingly, they are drawing upon online content to define masculine norms and gender dynamics which has issues for the increase in issues with misogyny, extremism, and gendered violence. Yet very little research has attempted to understand how boys and young men consume digital spaces, to understand how they critically analyse their digital lifeworlds and what this means for their identities, relationships and wellbeing. The new knowledge gained from the project will capture how a diverse cohort of boys and young men navigate digital environments allowing educators, parents/caregivers and policymakers to make informed decisions about the e-safety of Australian boys. In discovering new knowledge, the project will raise awareness and foster a national conversation beyond academia. The research is student voice-driven and aims to discover new knowledge around an issue of significant concern we know little about. In accordance with the ARC Medical Research Policy, this is not an intervention and will not diagnose, monitor or manage the treatment of mental illness. The proposed research may contribute to the National Research Priority of 'Health', specifically 'building healthy and resilient communities' as we hope to gain insight into how boys and young men can effectively safeguard themselves in digital spaces.							
DP250104103 Clarkson, Prof Christopher J	**The stone toolkit of the first Homo sapiens from Africa to Australia** This project aims to explore the technological variability of Homo sapiens in their expansion out of Africa to Australia over the last 200,000 years. The project expects to generate new knowledge in the areas of archaeology and human origins by employing groundbreaking 3D computational analysis of stone tools found in sites spanning the period of Homo sapiens expansion. Expected outcomes of this project are to understand the technological underpinning of our forebears' successful expansion out of Africa, their replacement of other hominin species, and the pace and routes of expansion. This should provide significant benefits in understanding human evolution and the resilience of our species in the face of major climate change. **National Interest Test Statement** Australia plays a pivotal role in understanding the human spread of our species out of Africa and into Australia by 65,000 years ago. Australia presents the end point in the great arc of dispersal from Africa, through Eurasia, culminating in ocean voyages to cross island Southeast Asia and reach the Australian mainland. Archaeology, genetics and fossil human remains are beginning to flesh out this story, but a fundamental component of the record remains largely untapped - stone tools. This project employs Australian scientific expertise to map the changes in stone technology used by humans as they migrated out of Africa. Australian science leads the way in characterising and analysing stone tool technology using bespoke sophisticated three-dimensional analytical applications and detailed experimental studies of efficiency, complexity and cognition developed at the University of Queensland. This approach allows characterisation of how tools were made, how the technology was passed down between generations and transformed as people spread out of Africa, helping map cultural ancestor-descendent relations and chart human migration and responses to climate change - an issue of great relevance to society today. This project showcases Australian scientific expertise in documenting the technological underpinning of modern humanity's first epic journey and the peopling of the world.	97,724.50	185,581.50	178,015.00	90,158.00	0.00	0.00	551,479.00
DP250104263 Mueller, Prof Jochen F	**Evaluating Representativeness of Pathology Samples for Human Biomonitoring** For the first time the National Health Measures Survey (NHMS) and the Australian Health Biobank (AHB) are collecting and archiving blood and urine samples from a representative group of the population. The aim of this DP is to systematically compare the cost and time effective human biomonitoring (HBM) program which is built on pooled pathology samples since 2002, with pools produced from the NHMS/AHB samples, establish statistical distribution data and determine reference exposure values for a wide range of legacy and emerging chemical pollutants. This DP will result in a more robust HBM program, adding value to past, current, and future HBM data to result in a world class method that is representative of general population exposure.	66,783.50	170,762.00	214,590.00	110,611.50	0.00	0.00	562,747.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement We have established a unique human biomonitoring (HBM) program using pooled surplus pathology specimens—a cost and time efficient method with minimal ethical challenges due to no participant burden. This program has contributed to the understanding of exposure trends in the Australian population for legacy and emerging environmental pollutants. However, important knowledge gaps associated with this approach include unknown representativeness of pathology samples (for general population exposure) and the distribution of underlying individual data (to determine population reference values and define pooling strategies). In this project we address these knowledge gaps by comparing our HBM program using pooled pathology samples with specimens from a representative sample of the Australian population collected for the National Health Measurement Survey, which will be made available for researchers for the first time in 2024. This project will validate and further inform methodology for HBM using pooled pathology samples to assess exposure to environmental pollutants, improving our understanding of exposure trends and potential risks to humans and the environment, and, thus, providing economic, social and environmental benefits for Australia. Ongoing collaborations with state/territory and federal regulatory organisations will facilitate communication of findings and inform HBM research and methods, environmental policy, and chemical regulation.							
DP250104567 Meakins, Prof Felicity H	**Dingo Lingo: Australia's past through the lens of biology, language & music** This project investigates 'dingo' related words in Indigenous languages to transform our understanding of the linguistic landscape of Australia from a static collection of languages to a complex picture of vibrant language exchange and social dynamics. As the dingo arrived around 4000yrs ago, these words are within the scope of evolutionary models of language. With First Nations rangers, this project will create a large-scale database of dingo words including from different speech styles and song through detailed case studies. This database will be the basis of a model of language change that better reflects dynamic historical relationships between Indigenous groups. The project will also extend ranger programs to cultural conservation.	105,190.00	228,880.00	232,030.00	192,521.00	84,181.00	0.00	842,802.00
	National Interest Test Statement There is now a national consensus that Indigenous languages are vital to cultural and socioeconomic well-being in Australia. This continent has the world’s longest continuous collection of cultures, and Australia’s original languages are key for the survival of these in the aftermath of colonialism. This project aims to shift the understanding of connections between language, people and land. Indigenous language is intrinsically connected to Country, and this work will be undertaken with Indigenous ranger programs to help embed languages through their work and activities. This project aligns with the National Agreement on Closing the Gap which recognises that renewing Indigenous languages is essential for the health and wellbeing of Indigenous people. This project also aligns with Australia’s Strategy for Nature 2019-2030 by strengthening relationships between Indigenous and non-Indigenous people and drawing on traditional ecological knowledge [to improve] outcomes for the environment. In particular, it contributes to the progress measure of “working with Indigenous communities to support the protection, documentation and retention of Indigenous ecological knowledge” and to address Goal 1, Objective 4 to “respect and maintain traditional ecological knowledge and stewardship of nature” as well as Goal 3, Objective 10 to “increase knowledge about nature to make better decisions”.							
DP250104637 Guo, Prof Jianhua	**Anaerobic short-chain gaseous alkane oxidation coupled to nitrate reduction** This project aims to perform a systematic investigation of the novel microbial processes of nitrate-dependent anaerobic oxidation of short-chain gaseous alkanes (SCGAs, including ethane, propane and butane). These processes are suggested to be major sinks for SCGAs, which are potent gases impacting global air quality and tropospheric chemistry. By characterising ecophysiology of discovered microbes, identifying new microbes and deciphering their metabolic pathways, this project expects to provide new knowledge on undiscovered microorganisms and undescribed links between global SCGA and nitrogen cycles. It will also contribute significantly to our capability to more reliably predict the global SCGA emissions in a changing climate.	49,356.00	148,764.00	198,066.00	98,658.00	0.00	0.00	494,844.00
	National Interest Test Statement By establishing a previously overlooked link between global carbon and nitrogen cycles, this project will enhance the international competitiveness of Australian research and advancing Australia’s intellectual position in the field of environmental microbiology. Climate change is one of the most significant challenges of the 21st century. By identifying and understanding novel microbial processes removing short-chain gaseous alkanes (including ethane, propane and butane) that contribute to climate warming, this project will enable climate-modelling communities to leverage metabolite spectra and gas emission profiles to refine models, to predict Australia’s gaseous alkane budgets more accurately, and offer a strong support for developing management strategies to mitigate the emissions of these gases in Australia. This project contributes to the national interest through its significant environmental benefits, directly aligning with the National Science and Research Priority: ‘Environmental Change (the carbon cycling)’.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250105019	**Symmetry making and breaking in neocortical development**	87,288.50	177,487.00	184,106.50	191,246.00	97,338.00	0.00	737,466.00
Suarez, A/Prof Rodrigo	Brain halves become wired during development following molecular and neural activity-dependent rules of symmetry. This project aims to unravel the mechanisms by which spatio-temporal symmetries between cortical hemispheres instruct the precise formation of functional connections. Using advanced methods in high-throughput gene expression analyses, live imaging of neural activity, behaviour, and connectivity mapping in a marsupial model of early brain patterning, this project aims to unravel new generative principles of mammalian brain circuit formation. Expected outcomes include innovative ways to manipulate brain wiring, and to functionally link mechanistic knowledge of complex trait formation across levels of biological organisation.							
	National Interest Test Statement							
	Understanding the fundamental rules that govern brain wiring in health and disease is key to ensure a healthy start in life for young Australians. This project harnesses the extremely early birth of a native marsupial, the fat-tailed dunnart, to provide unique insights about brain formation and function that cannot be obtained using conventional species like rodents. The innovative combination of methods including cellular and molecular neurobiology, stem-cell technologies, genetics and bioinformatics, supercomputer-enabled analyses and mathematical modelling (including machine learning) will benefit many other areas of complex biology research, and create new advanced training opportunities to benefit several critical sectors. These new capabilities may expand the scope and scalability of strategic industries, including biotechnology, brain-machine science, information processing, and artificial intelligence. Furthermore, improving breeding of dunnarts in captivity may benefit conservation of native fauna, which is particularly important as Australia has the highest rate of mammalian extinctions globally. Expanding knowledge about dunnart genetics, development, and behaviour in laboratory conditions will help to refine husbandry of threatened species, such as the Sandhill dunnart, Kangaroo Island dunnart, and many other endangered small marsupials, where habitat preservation alone may not be as feasible, or effective, as selective breeding with genetic monitoring.							
DP250105063	**The brain-immune interface: implications for sleep and mood**	151,434.50	302,869.00	303,685.00	152,250.50	0.00	0.00	910,239.00
Vukovic, A/Prof Jana	The blood brain barrier ensures homeostatic regulation of ions, molecules and immune cells between blood and brain that is necessary for healthy brains. Our recent unpublished work shows that one brain region of interest—the pineal gland— appears to be a master regulator of the brain's immune response. Not only do microglia undergo instantaneous morphological changes and increase in number in this structure following an immune challenge, circulating immune cells use it as a gateway into the brain. The current project will interrogate this interface between blood and brain as it provides a unique insight into diverse brain functions, such as sleep and mood.							
	National Interest Test Statement							
	It is commonly accepted that immune surveillance by blood-derived immune cells is limited in the brain. However, this stands in contrast to emerging evidence (including our own) that shows that immune cells are actively involved in maintaining brain tissue homeostasis and with that are involved in safeguarding healthy aging of the brain. This project will interrogate how the brain senses its own internal state, how such signals are conveyed to the periphery (immune system), and how the brain alters its own functioning in accord to its internal state to modulate behaviours, including sleep and mood. Backed by the UQ's state-of-the-art infrastructure, established experimental pipelines and preliminary data, this project will significantly contribute to basic science across multiple disciplines, including neuroscience, immunology, and biology. Project will provide benefits that extend beyond generating fundamental knowledge to create new advanced training opportunities across these key fields. The intellectual property generated will lay the foundation for future studies aimed at designing new drugs to regulate immune function. Our findings will be communicated via UQ's tech-transfer company to draw the attention of potential biotechnology companies and thus is of benefit to Australia's economy.							
	The University of Queensland	5,607,974.00	11,434,100.50	11,635,918.00	6,315,379.00	505,587.50	0.00	35,498,959.00
University of Southern Queensland								
DP250101273	**Like a wrecking ball: giant planets as the key to finding Earths**	115,368.00	199,638.00	168,540.00	84,270.00	0.00	0.00	567,816.00
Wittenmyer, Prof Robert A	Jupiter-like planets are the key to understanding Earth-like planets. Their presence can disrupt the orbits of inner habitable worlds or deliver life-sustaining water. The							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	project aims to address this gap by utilising major space telescopes, in combination with Australia's unique Minerva-Australis telescope array, to obtain a complete picture of Jupiter-like planets orbiting the nearest stars. Expected outcomes include the detailed properties of Jupiter analogs, their influence on other planets in those systems, and which nearby stars are most likely to host another Earth. This project will benefit the international community by optimising the effort of future space telescopes and generate new knowledge on Earth-like planets.							
	National Interest Test Statement							
	Jupiter-like planets are the key to understanding Earth-like planets. Their strong gravity can disrupt the orbits of inner habitable worlds or deliver life-sustaining water by throwing comets onto rocky planets. This project will engage Australians with major spacecraft missions to fill key gaps in our knowledge of Jupiter-like planets orbiting nearby stars. The results from this project will point the way to the best prospects to discover another "Earth." This work will give Australian researchers a direct role in one of the great missions of our age: the search for a truly Earth-like planet. It will train and inspire future generations of Australians to obtain key skills needed for a high-technology future. The search for alien worlds and life elsewhere fascinates the general public, and by placing Australian researchers at the forefront of that search, our work will inspire the next generation of scientists all across our nation. The work will generate global media interest, allowing us to tell the world our story.							
DP250101568 Huang, Dr Xu	**Unveiling Planet Atmosphere and Formation with James Webb Space Telescope** Leveraging Australia's largest exoplanet science program on NASA's James Webb Space Telescope, this Discovery Project will aim to measure the atmospheric makeup of planets around other stars. It tackles fundamental questions, including how planets form, and how their atmospheres are shaped by their early formation and evolution. The project will harness Webb's unprecedented capabilities to boost Australian expertise in exoplanet atmosphere science. By collaborating with world-experts, this project will train the next generation of Australian astronomers, and will provide a future framework for studying Solar Systems around other stars.	39,606.00	125,712.00	172,212.00	86,106.00	0.00	0.00	423,636.00
	National Interest Test Statement							
	This project places the next generation of Australian astronomers at the forefront of the international efforts to find other Earths and study the places they are born, grow, and interact. A major knowledge gap at the focus of astronomical sciences this decade lies in our ability to apply models of Solar System formation to the wider exoplanet population. This project will utilise Australia’s only exoplanet program on NASA’s flagship James Webb Space Telescope to test key hypotheses in planetary formation and migration that impact the atmospheres of planets. Our research will also leverage capabilities offered by the Twinkle space mission, the only space telescope with Australian partnership. Discoveries with Webb are already having international impact, and our research will generate new knowledge on planet formation, helping to maintain Australia’s position at the forefront of Australian-led exoplanet research.							
DP250103550 Periyannan, A/Prof Sambasivam	**Decoding an ancient, iconic tree species to save it from disease** Bunya pines, iconic conifers that hold special significance to First Nations communities and Australia’s biodiversity, are seriously threatened due to dieback caused by introduced pathogens known as Phytophthora spp. Using cutting-edge DNA sequencing, the project will decode the genomes of the Bunya pines and Phytophthora spp. to investigate genes and molecular pathways associated with disease development and resistance. The expected outcomes are molecular methods to identify dieback-resistant plants for regeneration purposes; rapid disease diagnostics; and pathogen monitoring. The key benefits are to protect Australia’s biodiversity from invasive pathogens and to maintain cultural heritage values.	120,000.00	267,500.00	270,000.00	122,500.00	0.00	0.00	780,000.00
	National Interest Test Statement							
	Bunya pines are part of the Australian landscape and hold special significance for First Nations communities and Australia’s biodiversity. However, these majestic trees and ‘living fossils’ are rapidly declining due to a disease known as dieback or root rot. Most likely, this is a new disease caused by microbial pathogens that were recently introduced to Australia. Currently, chemical treatment of infected trees is the only solution put forward for disease management. This project will provide a new, long-term, and environmentally sound solution using cutting-edge DNA-based technologies that will identify disease resistance in Bunya pines. Subsequently, the project will develop							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	DNA markers to quickly recognise those young trees in nurseries that are resistant to the disease and, therefore, should be used for reforestation. This new approach will be developed to be applicable for commercially important trees that are also attacked by this disease, particularly hoop pines, in follow-up forestry projects. The project will demonstrate the value of advanced DNA technologies in the sustainable management of serious tree diseases. It will deliver a new solution to conserve Australia's unique ecosystem and safeguard the economy and Indigenous cultural values.							
	University of Southern Queensland	274,974.00	592,850.00	610,752.00	292,876.00	0.00	0.00	1,771,452.00
University of the Sunshine Coast								
DP250101477	**Unlocking the proteomics of synaptic glycine receptor complexes**	159,985.50	340,229.00	322,718.50	142,475.00	0.00	0.00	965,408.00
Harvey, Prof Robert J	This project aims to investigate glycine receptors (GlyRs) that are vital for spinal motor output, pain processing and cortical neuronal migration. This project expects to generate new interdisciplinary knowledge by: i) Using GlyR subtype-specific antibodies and knockout mice in high-fidelity proteomics; ii) Examining the location and functional impacts of GlyR interactors using super-resolution microscopy, shRNA knockdown and artificial synapses. Expected outcomes include the first comprehensive proteomic analysis of synaptic GlyR complexes. This project will also provide significant benefits by characterising a new class of GlyR auxiliary subunits and linking Australian researchers to the international Synaptic Gene Ontologies initiative.							
	National Interest Test Statement							
	Neurotransmitter receptors are key components of synaptic communication between nerve cells and bind to accessory proteins that influence membrane trafficking, synaptic localisation, and receptor signalling. The project will address critical gaps in our knowledge of three glycine receptor (GlyR) types, which have fundamental roles in movement (GlyR alpha1), brain development (GlyR alpha2), pain sensing and breathing (GlyR alpha3). The project will leverage unique antibodies and mouse models to uncover the critical components of all three GlyR complexes. Initial work has uncovered >20 new proteins associated with GlyR alpha2beta complexes, including a membrane microprotein that could fundamentally alter our view of GlyR biology. We now need to understand how this protein influences GlyR function, and whether similar proteins associate with GlyR alpha1 and alpha3. Our project will advance fundamental knowledge that will be of wide-ranging interest to scientists and the general public. Our findings will be promoted via the international synaptic gene annotation initiative SynGO, which will maximise translation, use, and adoption of the research findings, as well as enhancing the international reputation of Australian scientific research. The project will also train the next generation of researchers in advanced proteomic methods, electrophysiology and super-resolution microscopy, which will provide economic and commercial benefits to Australian science and biotechnology sectors.							
DP250101662	**Precision receptor-specific miticides for safeguarding Australian bees**	131,800.00	278,433.00	290,583.00	143,950.00	0.00	0.00	844,766.00
Harvey, Prof Robert J	This project aims to investigate neurotransmitter receptors in Varroa destructor mites, a significant threat to bees responsible for honey production and pollination of economically vital agricultural crops. The project expects to generate new interdisciplinary knowledge by: i) Characterising varroa receptors, the key targets of miticides; and ii) Exploiting differences in varroa and bee receptor structure and pharmacology to develop novel varroa-specific miticides (varroacides). Expected outcomes of this project include Varroa receptor screening platforms and novel varroacides that are safe for bees. The project aims to provide environmental and economic benefits by positioning Australia at the forefront of Varroa miticide research.							
	National Interest Test Statement							
	Varroa destructor mites are major threat to honeybees, as they transmit viral pathogens that lead to devastating losses of honeybee colonies. Honeybees are critical to honey and beeswax production, as well as production of over 35 important agricultural crops that rely on honeybees for pollination (e.g., almonds, avocados, apples, blueberries, mangoes). The recent Varroa invasion in Australia poses a significant threat to Australian agricultural and horticultural industries, with billion-dollar impacts. Current methods of Varroa control are inadequate to contain the spread of these mites in Australia, with limited treatments available, and development of resistance likely. We will develop new chemical and double-stranded RNA (dsRNA) treatments for controlling Varroa, using combination of molecular, functional and computational approaches to design compounds that target key receptors in the Varroa nervous system while leaving honeybees unharmed. Our project will contribute to global efforts aimed at reducing the impact of the Varroa mite and is translatable to other parasitic arthropods. Communication will be through traditional academic pathways, as well as to key stakeholders in the honeybee, agriculture and horticulture sectors. Communicating early results will open up potential translation pathways with industry partners, bringing significant benefits to the Australian economy by providing novel lead chemical or dsRNA-based miticides for commercialisation.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250103567	**An eco-friendly approach to mitigate helminth parasite infections**	62,891.00	122,949.00	130,782.00	70,724.00	0.00	0.00	387,346.00
Wang, Dr Tianfang	Helminth diseases have severe impacts on human health and global agriculture. This project focuses on aquatic parasite-host interactions, aiming to unveil novel molecular components governing finding processes. Utilising advanced comparative bioinformatics, proteomics, and animal behaviour analysis, interdisciplinary collaboration among researchers in molecular biology, chemistry, behaviour and parasitology is crucial. Anticipated outcomes will inform eco-friendly approaches to deter parasite-host interactions, including liver fluke parasites causing severe damage to Australian herbivorous livestock. This aligns with sustainability goals, offering practical solutions to pressing agricultural challenges in a concise and comprehensive manner.							
	National Interest Test Statement The helminth parasite Fasciola hepatica is the primary causal agent of liver fluke disease, a disease that is estimated to infect over 600 million animals worldwide. In Australia, major economic losses exist upon livestock infection, yet current control measures, such as anthelmintic drugs, face significant challenges including emerging drug resistance and environmental disruption. A better understanding of the mechanism that enables the parasite to find its host would offer a unique avenue for life-cycle disruption. This project aims to address this gap by decoding waterborne semiochemicals (e.g., pheromones) that drive the parasites' dynamics. This new knowledge will inform the development of natural ‘bait’ traps that negate infection, potentially saving millions of livestock from disease, thus reducing the economic burden of Australia’s agricultural sector. As natural compounds, this would offer an eco-friendly parasite control that aligns with national environmental conservation goals, promoting sustainable agricultural practices and mitigating the ecological impact of conventional chemical treatments. Potential commercial opportunities for Australian biotechnology companies may arise from developing innovative parasite control technologies. To maximise the impact, engagement with industry stakeholders, policymakers, and agricultural organisations will be pursued through workshops, media outreach, and partnerships (e.g., Food and Agribusiness Growth Centre and QLD DAF).							
	University of the Sunshine Coast	354,676.50	741,611.00	744,083.50	357,149.00	0.00	0.00	2,197,520.00
	Queensland	9,495,145.00	19,523,731.50	19,707,327.50	10,547,037.50	868,296.50	0.00	60,141,538.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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South Australia								
Flinders University								
DP250100164	**Pacific Powers: Imperial Competition and Cooperation in Micronesia**	66,096.00	153,165.50	184,508.00	156,118.50	58,680.00	0.00	618,568.00
Fitzpatrick, Prof Matthew P	As geopolitical competition and conflict in the Pacific region grows, this project seeks to uncover the complex historical origins of this situation. It will assess why Micronesia has been the site of competing projects of power projection and how the people of the region have responded to radically different imperial powers. Using hitherto untapped archival materials in six different languages, it investigates how and why Micronesia was targeted and then conquered by the Spanish, the Germans, the Japanese and the United States before winning independence. In doing so, it seeks to offer a deeper understanding of our region, explaining why imperial competition in the Pacific has been the historical norm rather than the exception.							
	National Interest Test Statement							
	Micronesia covers millions of square kilometres in the Pacific region north of Papua New Guinea. It is of immense economic, geostrategic and political importance to Australia. In his speech launching the National Defence Strategy in April 2024, Deputy PM Richard Marles stated “we have put the Pacific at the heart of our strategic policy where it belongs.' Before that, while visiting the Marshall Islands in 2022, Foreign Minister Penny Wong also said Australia had 'ignored the calls of our Pacific family' for too long. The importance of the Pacific was also confirmed in Australia's International Development Policy of 2023. For Australia to engage meaningfully with its Pacific neighbours and be able to promote regional peace, it must understand the region's complicated past. This project aims to deepen our historical understanding by asking why large powers, including Spain, Germany, Japan and the United States, have sought to control Micronesia, how they shaped the region; and what the legacies of this history are for Pasifika peoples. It will do so through an in-depth examination of archival materials by a multilingual team of leading specialists. This project will communicate its findings to different stakeholders in both scholarly outputs, such as books and journal articles, and in public forums such as the media and public lectures in Micronesia itself. It will also train a new cohort of experts who understand the history of international relations in the Pacific region.							
DP250100285	**Unlocking latent reactivity in chemical synthesis via electrochemistry**	137,600.00	279,450.00	286,550.00	144,700.00	0.00	0.00	848,300.00
Coote, Prof Michelle L	This project seeks to establish new methods for the efficient preparation of organic compounds using direct inputs of electricity to unlock fundamental reactivity that is otherwise unattainable under mild conditions. Employing an integrated experimental and computational approach, we will design new chemical reactions in which simple electrochemical triggers transform stable and inexpensive precursors into highly reactive intermediates in a controlled fashion. Ultimately, this research will enable safer and greener manufacturing of high-value molecules, such as pharmaceuticals, that are central to improvements in human health and the quality of life enjoyed by modern society.							
	National Interest Test Statement							
	Environmental sustainability is a major concern in the modern world and developing more sustainable processes represents a continuing challenge for the chemical industry and the global economy. Chemical synthesis underpins the chemical industry, one of Australia’s largest manufacturing sectors that contributes over $38 billion to GDP. This project will establish new reactions for the more efficient and environmentally benign synthesis of organic compounds, promoted simply by direct inputs of electricity. These original and fundamental advances in electrosynthesis will allow for the rapid and selective preparation of important organic molecules that are relevant to the pharmaceutical and agrochemical industries. Long-term practical outcomes for Australia will include the social and economic benefits that arise from making high-value compounds such as pharmaceuticals more readily available and associated production routes cheaper and more sustainable in the future. Our team will leverage our strong track record in promoting our research outcomes to the public via online and traditional media (e.g. Twitter, The Conversation, New Scientist, ABC radio), in addition to presenting our novel findings directly to industry, and in high-impact journals and at major conferences. The project also offers unique opportunities to train and develop emerging research leaders – the next generation of expert chemists who will advance contemporary methods for sustainable chemical synthesis.							
DP250100584	**Unfreedom, Voices, Redress: Plantation Cultures of the Western Pacific**	88,000.00	205,000.00	237,000.00	236,000.00	116,000.00	0.00	882,000.00
Edmonds, Prof Penny	Using fresh scholarly and creative approaches, this project aims to examine the hidden histories of the Western Pacific’s Anglo and German plantations. We will examine							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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C	indenture, blackbirding (kidnapping) and forms of unfreedom, with a focus on gender and mixed-race relationships. Linking archives in English and German, and foregrounding Pacific voices, especially of women, we will generate new knowledge of plantation lives, the labour trade and its legacies. Working with museums and Pacific artists we will also meet urgent demands for public redress and commemoration. Benefits include bringing the Pacific into conversation with global debates on unfreedom and slavery and advancing political change across Australia and the Western Pacific. **National Interest Test Statement** Heightened geopolitical tensions in the Pacific have led to an urgent renewal and reset of Australia's links to the sea of islands surrounding us. Nevertheless, many Australians know little about Pacific history and culture. This is despite significant diasporic communities in our midst, some of whom trace their origins to Australian plantations. This lack of public understanding stems partly from the fact that histories of global slavery and unfree labour have, until recently, been overwhelmingly Atlantic in focus. This project addresses these major, interlinked gaps in history and public engagement. It has two key aims. The first is to create new knowledge about the lives of Western Pacific plantation workers through multilingual archives and three important ethnographic collections of Australia, Germany, and Fiji. We will also answer recent calls to deepen Australia's social and cultural connections to our Pacific neighbours by collaboratively and respectfully giving voice to their perspectives on the world. This will be aided by engaging with contemporary Pacific and Australian South Sea Islander writers and artists to reimagine legacies of the Western Pacific's plantation system, thus enabling our project to pioneer new and creative practices of memorialisation and truth telling. Translation and dissemination of findings to wider audiences will be through compelling stories (including an online Story Repository), educational content for schools, and public exhibitions.							
DP250100615 Chew, Dr Yee Lian	**What makes a memory? Identifying learning molecules in a simple brain.** This proposal aims to dissect the minimal chemical requirements for learning and memory formation in the compact, experimentally-accessible nematode brain. It seeks to advance molecular neuroscience and psychology using an innovative proximity labelling approach, to identify proteins present specifically during learning within the brain of a living animal. In expected outcomes and benefits, the project will revealing the entire network of molecules required as memories are being formed, and will generate breakthrough knowledge of the key molecular pathways driving specific forms of memory in different parts of the nervous system. These findings are essential to understand more complex forms of learning and memory formation in bigger brains. **National Interest Test Statement** The ability to form memories is critical for survival. Memory is regulated by many genes working together in a network, with specific parts of the brain playing distinct roles. While current research focuses on individual genes and broad brain sections, we are missing crucial details on the network of molecular processes that occur during memory formation and the distinct contributions of key brain cells. This project will bridge these gaps – doing so by studying the compact, well-characterised brain of the 'worm' C. elegans. We will identify drivers of positive and negative memories, study wider protein networks in critical neurons of the worm brain, and explore how different senses influence memory formation, all while advancing novel experimental techniques for cell-specific protein network labelling that are broadly applicable for detailed neuroscience studies. Through this, we will identify the essential molecular and cellular requirements of robust memory. Our work will drive a fundamental understanding of the biology of stable memories; discoveries which, in the long term, may help support quality of life for ageing Australians vulnerable to memory loss. Keeping memories intact for longer is not only better for health, but also enables older Australians to remain active in society and the economy. To keep the public apprised of our findings, our team will extend our strong track record and commitment to community engagement, science outreach, and media activities.	141,000.00	271,500.00	268,500.00	138,000.00	0.00	0.00	819,000.00
DP250100648 Spencer, Prof Nick J	**Recording gut activity in freely moving animals using wireless technology** This proposal aims to identify for the first time, the different patterns of activity along the length of the gut in freely moving animals in their natural environment. This will be accomplished using miniature fully implantable wireless devices developed and tested by the investigators. The project expects to generate – without the constraints of current recording methods – crucial new knowledge about gut function in the body including which patterns of gut activity are controlled by the peripheral nervous system and how gut activity is modified during environmental changes. This will provide major benefits by delivering breakthrough technology and new knowledge to global science; placing Australia at the forefront of gut research. **National Interest Test Statement**	89,534.50	185,425.50	200,363.50	206,900.50	102,428.00	0.00	784,652.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	Currently, our fundamental understanding of how the gastrointestinal (GI) tract functions in the body is limited; primarily because there has been no technology available to record GI-tract activity in living animals that are awake and free to move in their environment (versus being restrained or anesthetized: a key problem since both strongly affect the GI-tract). This project will demonstrate a breakthrough technology which will allow long-term recordings from all regions of the GI-tract in laboratory animals that are awake and free to move around. To do this, we will use a new miniature device developed by the applicant team. The device is implanted in the body and uses wireless Bluetooth technology to record gut activity. This means we can, for the first time, understand what patterns of activity occur in the GI-tract during normal behaviours like feeding, drinking, sleeping and socialising with other animals, and shed light on dysfunctional patterns of GI activity when disorders occur. This project will also reveal how the GI-tract is affected by changes to day-night cycles and identify mechanisms that cause the patterns of activity. The research findings, to be disseminated via scholarly fora and wide-ranging public media, would pave the way for future economic, commercial and social benefits for Australia by providing innovative basic knowledge of gut function and a major new (potentially commercialisable) bioelectronic recording technology for biomedical science.							
DP250100698 Nordstrom, Prof Karin	**Closing the loop on target detection: Neural and behavioural mechanisms** This project aims to study motion vision in closed loop, by quantifying how small moving targets are first seen, then processed by the nervous system to control behavioural action, which in turn affects what is seen. Using an innovative approach combining virtual reality with neural recordings in the hoverfly (a species with a highly compressed and optimized visual system), the research expects to redefine our understanding of neural control in a biologically meaningful context. Major outcomes include advanced knowledge in sensorimotor processing, closed-loop control learnings with implications for robotics, novel technique development, and, as hoverflies are important pollinators, potential future gains for Australian agriculture.	82,168.00	211,169.50	260,979.50	131,978.00	0.00	0.00	686,295.00
	National Interest Test Statement Understanding how the nervous system controls behaviour is a long-standing quest in neuroscience. This project will examine motion vision in the hoverfly, particularly insect target detection, as an innovative model for revealing how sensory input is transformed into behaviour. Indeed, insects with crude optics, small nervous systems and low power requirements manoeuvre with great precision, successfully performing goal-directed behaviour in places they have never encountered. In contrast, autonomous machines struggle with competing inputs and new environments. This project will therefore provide novel understanding of living systems, but it could also provide game-changing upskilling, insights and development for our own technology and robotics. In addition, the project could contribute to agriculture, as hoverflies are important alternative pollinators. This is important as the estimated total value of the pollination service from insects is ~$12Bpa in Australia. As such, this project may benefit Australia in a range of ways including economically, environmentally and socially. The project will include global expertise in robotics, modelling and control theory, and provide Australian-based students and early-career researchers with high-value skills. We will capitalise on our existing experience and networks to pursue public, school student and peer communication avenues for our findings, as well as pathways for potential technology translation.							
DP250101028 Vasilev, Prof Krasimir A	**Advanced Glucated End Products in Immune Responses to Biomaterials** The overarching aim of this project is to discover the inflammatory role of Advanced Glycation End Products (AGEs) when adsorbed on biomaterial surfaces and how rational surface engineering strategies can be used to modulate AGEs adsorption and improve inflammatory outcomes. Despite the well documented high complication rates of biomaterials used with sections of the population that have high blood levels of AGEs, at present, there is no knowledge of how AGEs may adsorb to biomaterial surfaces and promote inflammation. The outcomes of the project will create new fundamental knowledge that in the future can instruct the development of the next generation of biomaterials capable of controlling and directing the body’s inflammatory responses.	110,245.50	233,201.50	251,016.00	128,060.00	0.00	0.00	722,523.00
	National Interest Test Statement ‘AGEs’ are a group of compounds that form when excess sugars in the bloodstream react with proteins and lipids. We know that people with increased AGEs face much higher complication rates from biomaterial implant surgeries (e.g. hip replacements, pinning of fractures), which reveals a key gap in knowledge about the interaction of AGEs and the biomaterials interface. At present, there is no understanding of the ‘mechanics’ of AGE deposition on biomaterial surfaces, the implications of this accumulation on the inflammatory environment, or how this ultimately affects the biomaterial being accepted or rejected by the body. Our project will address these gaps, generating advanced knowledge for the design of next-generation high added-value products, such as novel implants and tissue engineering constructs that have manageable and predictable inflammatory outcomes. This would, ultimately, enhance the wellbeing of Australians. Although focused on fundamental science, the project has potential to develop new IP that can be exploited by Australian companies and lead to new high added-value manufacturing sectors and skilled employment. Technologies that could emerge from this project are exactly the advanced industries of the future that Australia needs, and align seamlessly with Government manufacturing priorities. We have strong track records in outcomes dissemination and translating research findings to commercial products and will continue to work actively with industry.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
DP250101476 Breed, A/Prof Martin F	**Advancing soil health assessments with ecoacoustics** This project aims to create and test the effectiveness of a tool for soil health by undertaking comprehensive field and controlled lab studies of how soil biota can be measured with soil ecoacoustics. The project expects to generate new knowledge (and tools) in soil biodiversity monitoring using innovative technology to detect and analyse the sounds of soil biota. Expected outcomes of this project include an enhanced capacity to measure soil biodiversity by advancing techniques and tools, including ecoacoustics hardware and analytics. This should provide significant benefits, such as enhancing ecosystem restoration monitoring and precision agriculture practices, contributing to reducing the economic costs associated with soil degradation.	97,703.50	167,693.50	132,501.50	62,511.50	0.00	0.00	460,410.00
	National Interest Test Statement Australia’s soils are valuable assets, supporting most of the nation’s biodiversity and food production. However, vast areas of Australia's soils have been degraded by human activities such as land clearing, overgrazing and urbanisation. Detecting, measuring and monitoring soil health is a major challenge, currently too costly, inefficient and intrusive to do at scale. Therefore, it is imperative to develop cost-effective and non-destructive ways to measure soil health to better guide soil management in natural ecosystem and agricultural contexts. This project will address major hurdles in measuring soil health through the novel use of ecoacoustics – the detection of acoustic waves emitted by sound-producing organisms. Our project will achieve a step-change in biodiversity monitoring knowledge, resulting in soil ecoacoustics tools which are effective at measuring soil health in common land use and soil types, as well as a mechanistic understanding of soil biota sound production. Our research will benefit Australians through an improved understanding of soil health, focusing primarily on improving how the sounds of the underground can be used to measure it. This has basic and applied science aspects and provides on-ground solutions to the economic, environmental, cultural and social threats associated with soil degradation. We will promote educational activities in schools and engage with the soil science sector to ensure rapid translation and adoption of research findings.							
DP250103648 Antonello, Dr Alessandro	**Our Blue Backyard: A History of Australian Cities and Marine Environments** This project aims to investigate past environmental and cultural relationships between Australia’s coastal cities and their nearshore marine and coastal environments from the late nineteenth century to the present. Through diverse archival and material sources, it expects to reveal how urban communities and institutions in Adelaide, Brisbane and Melbourne have developed knowledge, policies, and practices around their dynamic ‘blue backyards’. Expected outcomes include innovative frameworks for integrating environmental and urban history in Australia and internationally. New systematic knowledge will benefit continuing policymaking and environmental management for sustainable and resilient coasts and oceans at all government levels.	41,598.00	81,894.00	85,411.00	45,115.00	0.00	0.00	254,018.00
	National Interest Test Statement Around two-thirds of Australians live in one of its coastal capital cities. City life in Australia has historically benefited from its access to nearshore marine environments, but it has also degraded and harmed those environments. Yet we know little about the history of the relationship of cities, urban processes, and marine environments. This project aims to understand how urban residents, governments, and institutions have developed, managed, and thought about relationships between cities and marine environments since settlement. Through its analysis of social and political developments this project promises significant new knowledge to benefit both human and environmental needs within cities. It will benefit current and emerging government initiatives to promote marine and coastal sustainability, particularly in urban zones. The project promises cultural benefits for Australians by recovering forgotten stories and recording community memories and practices as a basis for ongoing place attachment, environmental knowledge, and community building and resilience. Research findings will emerge not only from archives and other visual and material records but also from engagement with individuals, community groups and policy makers, who will benefit from telling their stories and generating policy relevant research questions.							
DP250103825 Edwards, Prof Robert A	**Discovering new ways to generate targeted mutations** Life evolves by acquiring DNA from other organisms or mutating existing DNA sequences. Most mutations are neutral or deleterious. However, some organisms have developed site-directed mutagenesis that allows them to evolve small sections of their genomes. Phages, viruses that infect bacteria, are particularly adept at targeted mutagenesis as it allows them to infect many different bacteria. We have identified phages that reproducibly mutate their genomes but have yet to discover how they alter their sequences. We will combine genetic and genomic experiments with bioinformatics to identify new mechanisms phages use to create targeted mutations. These enzymes	106,559.50	228,113.00	236,331.00	114,777.50	0.00	0.00	685,781.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	can be used for biotechnology and genome engineering. **National Interest Test Statement** Like all viruses, phages, viruses that infect bacteria, change their DNA to adapt and survive. Understanding how viruses change is essential to both exploiting and combatting them. While phages can mutate their DNA in specific ways, we only currently understand a few of these methods. In our lab, we have developed new tools to identify these targeted mutations, and this project will uncover the new mechanisms that phages use to create them. We will conduct experiments to identify these new mechanisms while developing innovative computer tools to compare thousands of phage genomes to uncover hidden mutation patterns. New insights into phage biology will lead to breakthrough biotechnological applications, benefiting Australian agriculture, biomedicine, and environmental management. Understanding phages will also help develop antibiotic alternatives, like phage therapy, to benefit Australians in the future by improving health and combating antibiotic resistance. We will promote our outcomes by collaborating with large and small biotech companies, creating engaging public content, and publishing our groundbreaking research in top-tier scientific journals. In addition, all of our software will be made open source and publicly available to drive future impacts.							
	Flinders University	960,505.00	2,016,612.50	2,143,160.50	1,364,161.00	277,108.00	0.00	6,761,547.00
The University of Adelaide								
DP250100172 Francke, Dr Alexander	**Tracking 600,000 years of flooding and aridification in Australia's deserts** This project aims to provide unprecedented understanding of how tropical rainfall promotes excessive wet pulses and floods in Australia's iconic dry, desert interior. This is achieved by developing a 600,000 year record of tropical rainfall and river runoff to the desert, becoming the longest and most continuous sedimentary climate record from the Kati Thanda–Lake Eyre Basin. Outcomes will unravel the global climate conditions that fostered extensive wet pulses in the past, providing unprecedented reference for the period of human migration and extinction of megafauna during the last 65,000 years. Outcomes will also inform how the desert responds to flooding, relevant to constrain risk to agriculture, infrastructure, and ecologic habitats.	95,970.00	194,647.00	147,390.00	78,265.50	29,552.50	0.00	545,825.00
	National Interest Test Statement Will tropical flooding and droughts that have shaped desert Australia in the past become more frequent and intense in the future? By analysing lake filling patterns of the last 600,000 years, the project will provide unprecedented insights into tropical rainfall in Australia, and connections with its northern hemisphere counterpart, the East-Asian monsoon. Together, these two climate systems affect over 2.2 billion people internationally and impact major economic activities across regions of high social and cultural significance. This project will provide foundational environmental data covering periods of dramatic transformation during the first peopling of Australia and extinction of megafauna over the last 65,000 years. By examining past periods of flooding and drought, the project evaluates if current and future conditions have occurred before, to provide indispensable reference data to future-proof landscape management efforts such as agricultural development, climate change mitigation and government adaptation strategies in desert Australia. This will provide economic and social benefit to desert communities and the farming and energy sectors operating in dryland regions, and will guide environmental management for ecosystems threatened by climate change. Outcomes will be shared via two workshops and regular updates with Traditional Owners, and with the government and industry for dissemination of results to end-users and policy makers.							
DP250100308 Cook, Prof Nigel J	**Modelling critical mineral potential in copper-(iron)-sulphides** The behaviour of foreign atoms trapped-in and released-from mineral lattices relative to solubility limits and crystal structure changes is an uncharted topic for sulphide minerals. We will develop machine learning algorithms capable of addressing the thermodynamic properties of large atomic systems comprising copper-iron-sulphides hosting precious and critical metals. Results will be tested against ores from world-class deposits. This computational toolkit can predict trace element behaviour, solubility limits, and copper-iron-sulphide speciation, adaptable to other sulphide systems. Outcomes are beneficial for Australia's $10 bill. p.a. copper industry as this information can provide new revenue sources from recovery of critical minerals.	156,093.50	298,770.50	290,928.00	148,251.00	0.00	0.00	894,043.00
	National Interest Test Statement This project uses a combination of cutting-edge computational modelling techniques, machine learning, molecular dynamics, and imaging to shed light on the atomic-scale distributions of critical and precious metals within copper							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	ores. While the current focus on critical minerals centres mainly on the exploitation of stand-alone resources, several precious and critical metals also occur as minor and/or trace elements in common copper sulphides within Australia's existing mining-processing operations. To capitalise on the opportunities presented by recovery of all commodities of value within a processing chain, new predictive tools are required to understand trace element solubility, distribution, and release from copper sulphides. Our project will deliver breakthrough approaches to applied mineralogy, improved knowledge of local resource endowment, and insights to drive leaner processing and less waste. The project thus contributes to Australia's critical mineral strategy and provides competitive advantage and long-term economic and environmental benefit to the wider community. Outcomes will be promoted to the broader public in popular and social media showing how Australia can optimise utilisation of its huge resources. This research will assist the nation in achieving its ambition to be a global leader in critical and precious minerals production and innovation and demonstrate how knowledge-based responsible and sustainable mining contributes to the green energy transition.							
DP250100936	**Discovering natural hydrogen in continental interiors**	137,157.00	216,159.00	140,389.00	61,387.00	0.00	0.00	555,092.00
Holford, Prof Simon P	Hydrogen (H2) is a crucial clean energy source with applications in industry and transportation. Currently, H2 production relies on high-emission steam-methane reforming, while 'green' H2 production through electrolysis is expensive and energy-intensive. The project focuses on the scientific and commercial potential of 'gold' or 'white' natural H2 generated by geological processes. Despite recent discoveries of subsurface H2 accumulations, large-scale commercial production remains unrealised. This project addresses this gap by developing a systematic, process-oriented approach to define geological controls on the origin and transport of natural H2 and provide a framework for identifying drilling targets and quantifying exploration risks.							
	National Interest Test Statement							
	Hydrogen (H2) is emerging as a vital clean energy solution, though most current production technologies are expensive or associated with high levels of greenhouse gas emissions. However, H2 can also originate from a range of geological processes, and 'natural' H2 is attracting wide interest because of its potential to provide a clean energy source that can be produced from geological formations at low cost. Exploration for commercial-scale natural H2 is at an early stage, and whilst promising discoveries have been made recently in South Australia's Yorke Peninsula, the geological mechanisms behind the formation and accumulation of natural H2 are poorly understood. This project will combine innovative underground image processing with state-of-the-art laboratory techniques, to identify the key factors that drive the generation, movement and preservation of natural H2 in Earth's crust. Our work will result in a world-first exploration framework that is needed to determine the technical and commercial viability of large-scale production of natural H2. The research will position Australia as a global leader in the strategic technological shift to net-zero emissions, providing economic and environmental benefits to Australians. Our findings will be promoted to the Australian energy industry for adoption through a program of workshops and training, and to the Australian public through a dedicated website where research outcomes will be summarised in plain language briefs.							
DP250101115	**Leveraging mouse t-haplotype transmission bias for mammalian pest control**	159,299.50	262,046.50	242,592.50	139,845.50	0.00	0.00	803,784.00
Thomas, Prof Paul Q	The aim of this project is to develop new genetic biocontrol technology to address the negative impact of invasive mammals on Australian agriculture and the environment. This project expects to generate new insight into the evolution and genetic mechanism of naturally-occurring selfish genes through application of cutting-edge DNA sequencing and gene editing tools. Expected outcomes of this project include generation of a new technology platform that could potentially be used to supress invasive mammals such as mice, rats and rabbits. This could provide significant benefits to the Australian environment and agricultural producers.							
	National Interest Test Statement							
	Invasive mammalian pests, such as mice, cause widespread damage in Australia but available control methods are labour-intensive, ethically challenging, and don't target pests alone. A genetic process where certain traits are more likely to be passed on, called gene drives, can be used to prevent animals from producing offspring, and has enormous potential for non-lethal, large-scale suppression of invasive populations. Gene drives have so far been challenging to develop in mammals. This project investigates naturally occurring mouse gene drives and uses them to generate a man-made gene drive. Importantly, the gene drive developed in this project could be used in other mammalian pest species. The technology developed in this project could transform Australia's environment and biodiversity, especially for island conservation, where mammalian pests are most destructive. Australia's agricultural industry is also heavily impacted by invasive pests, including widespread mouse plagues, and will benefit from cost-effective and humane solutions to pest management. The knowledge and tools generated in this project will be shared through the research team's active involvement in international invasive rodent associations, including with leading experts, not-for-profits, and Australian and overseas government agencies. Gene drive developments will also be shared with various stakeholders and the public by media communications and the South Australian Genetic Biocontrol program.							
DP250101672	**Synchronised brain oscillations and motor function in older adults**	91,905.50	185,994.00	195,538.50	101,450.00	0.00	0.00	574,888.00
	The ability to learn new motor skills declines with advancing age, but the cause of this							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Semmler, A/Prof John G	decline, or how to alleviate it, remains elusive. This project will use a novel form of non-invasive brain stimulation combined with multimodal techniques to investigate how synchronising brain oscillations at specific frequencies can improve motor learning in older adults. This cutting-edge approach will provide new information on the neurophysiological basis of synchronised brain oscillations and how they can be optimised to improve motor function. The outcomes may have wide-ranging implications for the design of training protocols aimed at improving motor and cognitive function, providing potential benefits in ageing and in rehabilitation. **National Interest Test Statement** The deterioration of motor function with advancing age is a major cause of loss of independence and reduced ability to work. This results in a substantial personal, social and economic impact for Australia's older population, as motor function not only underpins skilled movements, but the basic tasks we take for granted in our everyday lives. While we know that changes in the brain contribute to age-related declines in motor skills, the specific brain processes that contribute to this decline are not well understood. This project will take a unique approach to this problem by using a novel brain stimulation technique to manipulate specific brain rhythms that are known to change with age and are thought to be important for motor function. These studies will identify how specific brain rhythms contribute to the age-related decline in voluntary movement, and how these brain rhythms can be manipulated to rejuvenate motor function in the elderly. These findings will be provided to government organisations and community groups focusing on healthy ageing, where they may inspire new ways to maintain optimal brain and motor function throughout the lifespan to improve quality of life for older Australians. This may ultimately lead to the development of strategies to delay the functional declines that often lead to frailty, promoting better outcomes for ageing and reducing aged-care costs for the Australian government in the face of a changing age demographic in our country.							
DP250101794 Hill, Prof Lisa	**Epicureanism in the Western Political and Economic Tradition** The influence of classical Epicureanism on Western thought has been obscured by the fact that Epicurean ideas were often imported covertly due to the threat they posed to the established church. Further, many have laboured under the mistaken belief that the Epicureans had little to offer by way of political or economic thought. This project aims to explore how Epicureanism impacted the British contribution to early modern political liberalism, classical political economy, and utilitarianism by assessing how it affected the works of 7 key thinkers (Hobbes, Locke, Mandeville, Hume, Smith, Bentham, and Mill). Expected outcomes will deepen our understanding of the Western political and economic traditions, including their tacit assumptions. **National Interest Test Statement** Epicureanism, the ancient philosophy of the pursuit of pleasure and avoidance of pain, has had a profound impact on Western culture; yet it is little understood. In excavating this key intellectual current that helped transform Western culture from a rigid, religious, tradition to a dynamic one based on rationalistic and individualistic principles, the project will enhance understanding of the Western moral, political, economic, and legal way of life. In short, it will illuminate the story of how and why we live now and provide knowledge that helps Western liberal culture reflect on, challenge, and reinvent itself. Social benefit accrues, not only from sharing Epicurean teachings for the good life, but from placing Australian scholarship at the forefront of a field dominated by European and North American scholars, enhancing Australia's image as a knowledge economy that exports ideas to the world. Such work, culminating in a Year 3 workshop with national and international experts, will enhance the prestige of our tertiary education sector, of considerable value to a country where higher education is a major export industry. The project will also train a PhD student and ECR, mentoring them to develop their research and supervision track records. Findings will be accessible to the public through an Open Access monograph, a website, as well as a podcast series, The Everyday Epicurean, which will share the teachings of Epicureanism on living a happy and contented life.	63,271.50	124,064.00	138,364.50	77,572.00	0.00	0.00	403,272.00
DP250101888 Nettelbeck, Prof Amanda E	**Derailing Empire? A transcultural and gendered history of Australian rail** This project investigates what the history and memory of rail (1870s-1960s) can tell us about some of Australia's most neglected social histories. Focusing on transcultural and gendered histories of railway, it aims to 'derail' a more familiar progressivist or technological story of nation-building to highlight histories of non-European and gendered labour and community-building. These aspects of railway networks' social histories remain little understood within either a national or an international comparative frame. Supported by collaboration with the museum and library sector, and generating an outward-facing digital Story Map, this project will help make our transcultural and gendered railway heritage accessible to new public audiences.	66,434.00	153,732.50	164,099.50	76,801.00	0.00	0.00	461,067.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement Rail is often understood as a technology that linked up nations, drove economic development, and symbolised modernity. Today, public heritage of railway is still largely filtered through this lens. Less understood are the social histories of the ordinary men and women who engaged with rail as a site of work, domestic life and cultural exchange. This project aims to uncover the diverse social histories and cultural legacies relating to the development of Australian transcontinental rail over a century, and to place them within an international frame. It investigates the labour of non-European and women workers who helped construct and maintain Australia's largest inland railways; the evolution of cross-cultural communities and systems of colonial governance that emerged along railway lines; and the domestic and gendered aspects of railway work and life. This project will bring to light neglected transcultural and gendered histories of rail that have been obscured by a more nostalgic history of technological progress, and it will locate those histories within a larger global history of 'railway imperialism'. Supported by the National Railway Museum and two state libraries, the project will benefit Australia by generating a more inclusive social history of Australian rail. Among its public-facing outcomes are a GIS-enabled, interactive digital map that will help make Australia's diverse transcultural and gendered railway heritage accessible to new public audiences.							
DP250102252 Guo, Prof Zaiping	**Interfacial Design for Durable Solid-state Lithium Batteries** This project aims to develop safe and long-life solid-state lithium batteries (SSLBs) for next generation energy storage. Existing interfacial issues in SSLBs will be addressed by synergistic approaches, integrating cathode-solid electrolyte (SE) interface engineering, optimal interface design within composite SE, and anode surface engineering. This project will also develop scientific design principles for high-performance SSLBs via extensive theoretical modelling and cutting-edge characterisation techniques. Success will generate new fundamental knowledges and facilitate commercialisation of SSLBs for renewable energy storage and electric vehicles, benefiting Australia's research and manufacturing capability, economy and sustainability.	115,527.50	235,228.00	248,022.50	128,322.00	0.00	0.00	727,100.00
	National Interest Test Statement Lithium-ion batteries are widely employed in electric vehicles, but they are approaching energy density limits and raising safety concerns. This project aims to develop more efficient and safer solid-state lithium battery (SSLB) alternatives, which represent the optimal solution for next-generation energy storage. However, incongruity between various components within SSLBs lead to large battery resistance and rapid capacity decay, challenging their practical application. This project will tackle these issues at various levels via synergistic approaches ranging from atomic structure engineering to surface regulation, materials design and manufacturing. The research will generate new interdisciplinary knowledge, advance the frontiers of energy storage, and revolutionise current battery technologies. The expected outcomes will enable more powerful and safer energy storage systems for electric vehicles and sustainable smart grids, which could help combat climate change and position Australia as a global leader in the critical transition to a decarbonised economy. Project breakthroughs will lead to patents, open new business opportunities for industries, and contribute to Australia's leading position in energy storage field. Our broader outreach strategy will encompass professional seminars for researchers and stakeholders, high school STEM studies promotion, and an active media presence to expand the influence of this exciting research beyond academia.							
DP250102307 Liffner, Dr Benjamin	**Understanding cell polarity & organelle biogenesis in parasites of mammals** Single-celled parasites cause economically significant diseases in both humans and livestock. These parasites undergo a complex process to build the organelles that control their entry into host cells at their apical end, making the parasites hyper-polarised. Despite their importance, the proteins that control polarity establishment and apical organelle biogenesis are not known. This project will investigate two evolutionarily divergent parasites: Plasmodium, a mosquito-transmitted parasite that causes malaria, and Cryptosporidium, a gastrointestinal parasite. We will determine when, where and how these parasites establish their polarity and build their apical organelles, and whether these pathways are evolutionarily conserved.	79,940.50	176,320.50	184,975.50	88,595.50	0.00	0.00	529,832.00
	National Interest Test Statement Apicomplexans, such as malaria and Cryptosporidium (Crypto), are parasites that infect livestock and humans. Collectively, apicomplexans cost the global economy >$25B each year in control measures and production loss, with Crypto being the leading cause of calf loss in Australia's livestock industry. To cause infection, these parasites need to form a uniquely shaped and organised lifecycle stage that enters host cells. It is not known how these parasites orchestrate this cellular organisation or what proteins control it. In this project, we will apply world-leading imaging approaches to determine if key proteins-of-interest enable malaria parasites or Crypto to form their unique cellular organisations. Further, we will establish the 2nd facility in Australia for the genetic manipulation of Crypto; a significant new resource given the parasite's major burden on our livestock industry. Discoveries arising from this project may underpin development of new control measures for parasite-specific 'Achilles heels', able to target apicomplexans of economic and health importance to Australia and its major trading partners. Our work will advance imaging technology and applications, initiate multiple avenues of biological discovery, and train emerging leaders to build national research capability. Project findings will be shared with the public via media releases,							

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	social media and presentations to the community and Industry (e.g. School outreach, SA Museum, Livestock Producer Forums).							
DP250102518 Ng, Prof Ching Tai	**Revolutionising Non-destructive Inspection with Nonlinear Laser Ultrasonics** This project aims to develop a new inspection technology for structures with hard-to-inspect conditions using fully non-contact nonlinear laser ultrasonics. This will overcome the limitations of existing non-destructive evaluation (NDE) and structural health monitoring (SHM) techniques. The project will create a new concept and generate new knowledge on NDE and SHM. The expected outcomes are significant improvements in the capability and applicability of NDE and SHM to cutting-edge technologies, such as real-time monitoring of constructing objects in additive manufacturing, and structures with extreme conditions in the Space, Energy, Oli and Gas industry. This provides significant cost savings in the integrity inspection of structures.	90,930.50	184,448.00	181,108.50	87,591.00	0.00	0.00	544,078.00
	National Interest Test Statement In engineering structures, early-stage defects accumulate progressively under in-service conditions, leading to significant damage and eventual structural failure. Detection of defects is critical to ensure integrity and safety of a wide range of structures spanning the oil and gas, space, energy and power industries. Existing non-destructive inspection techniques are insensitive to early-stage defects and have very limited functionality for any structures with hard-to-inspect conditions, since these conditions pose challenges for ‘contact-based’ sensing. Our project will develop a breakthrough technology for non-contact and reliable non-destructive inspection of early-stage defects to overcome these key limitations. Harnessing laser ultrasonics, this technology will significantly improve capability, sophistication and practicability over current inspection techniques for high-value structures. The project outcomes will contribute to Australian priority areas in Transport and Energy by transforming integrity assessment and optimising maintenance of high-value assets, as well as increasing the competitiveness of Australian manufacturing. Alongside public dissemination, our findings will be communicated to a range of government agencies and research organisations through high-impact journals, conferences and workshops. This will expand Australia’s knowledge base and capabilities in non-destructive safety inspection and enhance our leadership in this strategic area of research.							
DP250102570 Collins, Prof Alan S	**Oceanic Oxygen in Deep Time: Have We Been Looking in the Wrong Places?** Dissolved marine oxygen supports animal life and controls the distribution of redox-sensitive critical metals. Yet the evolution of oceanic dissolved oxygen, when complex cells evolved and links to major critical metal deposits are poorly known—largely because existing studies are from rocks formed in the same Baltic-like sea 1.5 billion years ago (as revealed by new plate-tectonic reconstructions). We will address this by studying ancient rocks that formed in different oceans (rocks now in WA & India). Geochemistry, geochronology and biogeochemical modelling are used to build paleogeographic maps of ocean redox to benefit Australia by understanding the conditions that led to the proliferation of complex cells and critical metal deposits.	98,821.50	225,346.00	232,095.50	105,571.00	0.00	0.00	661,834.00
	National Interest Test Statement Oxygen is a fuel for life and a primary influence on evolution. Oxygen also controls the solubility and mobility of many critical metals needed for a sustainable energy transition. Despite this, the history of how Earth’s oceans and atmosphere became so rich in oxygen is poorly known, hindering our understanding of the evolution of life and the controls on where to find critical metals. This project uses new billion-year scale models of deep-time plate-tectonic geography of the planet coupled with new ways to date ancient sedimentary rocks and track dissolved oxygen levels, pioneered by the investigators, to map the evolution of oxygen in our atmosphere and hydrosphere. This project will place Australian research in the forefront of global efforts to understand how earth systems evolved in deep-time leading to cultural benefit (greater understanding of how the Earth works), training of researchers, and economic benefits through understanding the controls on ancient ocean chemistry that can help target prospective rocks for critical metal discovery. This new knowledge will also provide advanced solutions to benefit industry by mapping times and places in Australia to target critical metal discovery and exploration. For industry and government stakeholders, results will be translated and widely dispersed through industry networks, trade and popular publications, and freely available software.							
DP250102939 Soares da Costa, Dr Tatiana P	**Learning lessons from drug resistance to tackle herbicide resistance** Herbicide-resistant weeds pose a major threat to the profitability and sustainability of Australia’s $78B agricultural industry. Learning how resistance arises and spreads is key for developing strategies to preserve and restore herbicide efficacy. This project aims to draw on parallels with drug resistance to investigate how plant communication via extracellular vesicles may mediate herbicide resistance. Expected outcomes include	117,748.50	226,441.50	215,578.00	106,885.00	0.00	0.00	666,653.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	new strategies for monitoring of resistance, targets for resistance circumvention, and restoration of herbicide susceptibility in resistant weeds; with long-term economic and environmental benefits arising from substantially reduced herbicide requirements, and improved crop yields safeguarding food security. **National Interest Test Statement** Weeds are a major threat to Australia's $78B agricultural industry that drastically reduce crop yield and quality. The emergence of herbicide-resistant weeds is placing an ever-increasing strain on agricultural outputs, outpacing the development of new herbicide options. Concerningly, Australia has the second largest number of resistant weeds globally. Rather than developing new herbicides, this project aims to investigate the other side of the problem: how does herbicide resistance emerge and spread? Leveraging lessons from combatting drug resistance, our work proposes to explore a new mechanism of resistance transfer—extracellular vesicles. Our findings have the potential to revolutionise strategies to preserve and restore the efficacy of current and future herbicides, with long-term social, economic, and environmental benefits. Bolstering weed management will boost food production, reduce input costs for farmers, and minimise damage to ecosystems, via a project that pioneers new directions and leadership for globally relevant agricultural research. Results will be communicated through industry-oriented meetings, publications, and press releases to keep relevant industry groups and the public informed; at the same time, potential commercial opportunities to develop effective new herbicide adjuvants and monitoring tools will be shared with long-term industry partners to fast-track delivery of these benefits to Australian farmers, communities, and land.							
DP250103235 Shearer, Dr Cameron J	**Advanced catalytic reduction to breakdown fluorinated pollutants** This project aims to address the accumulation of man-made chemical pollutants in our environment by optimising colloidal particles that use light energy to breakdown these persistent fluorinated chemicals. By taking advantage of 2 concurrent degradation pathways and studying toxicity of the degradation products, this project will generate new knowledge in the field of both physical chemistry and toxicology. The anticipated outcomes of this project include the development of a patentable new technology that will transform environmental remediation methods. The outcomes are expected to provide significant benefits to human health, wildlife and the environment through preventing adverse impacts of pollutant exposure. **National Interest Test Statement** Perfluoroalkyl substances (PFAS) are human-made chemicals that are widespread in the environment at levels considered toxic, including in Australia. PFAS will not degrade naturally so remediation is necessary. Current strategies to degrade these chemicals are either ineffective or produce pollutant by-products. Our research will provide vital information to increase the activity of materials that use energy from light to breakdown PFAS. The project will: 1) produce new materials which absorb light and use the energy to breakdown PFAS, 2) optimise the process, and 3) ensure PFAS is broken down into non-toxic by-products. The researchers will communicate outcomes to their peers via conference presentations, to the public through social-media, web-posts and outreach events, and to industry through conferences, workshops and direct communication. Findings could be translated by environmental remediation industries to treat soil and water contaminated by PFAS both within Australia and worldwide. Knowledge in the interaction of PFAS with materials can be applied to other remediation strategies. Widespread implementation of this technology would reduce exposure to PFAS in the environment, leading to a decrease in the associated adverse effects on human and ecological health.	118,050.50	231,339.50	228,894.00	115,605.00	0.00	0.00	693,889.00
DP250103319 Tyerman, Em/Prof Stephen D	**Improving wheat nutrient use via the plant nitrogen–potassium–water nexus** To optimise growth and yield, plants must maintain careful balances of water and ions in their cells. While individual nitrogen, potassium, and water transporters that uptake nutrients from soil are mostly known, how these systems are co-ordinated is not, especially in important cereal crops such as wheat. This project aims to uncover new molecular mechanisms that co-regulate water and ion uptake in wheat. Results are expected to provide significant benefits to farmers by creating new options for improved nutrient use efficiency in economically relevant plants; reducing the need for, and impact of, costly fertilisers; and improving the long-term environmental sustainability of Australian agriculture. **National Interest Test Statement** Modern agriculture heavily relies on the use of fertilisers to enhance crop yields. The efficiency of fertiliser use is closely tied to water, which transports essential nutrients to the roots, leaves, and grains of plants. However, less than one-third of applied fertilisers are absorbed by crops, with the remainder contributing to air and water pollution and the release of greenhouse gases. Focusing on the widely used nutrients nitrogen and potassium, our research aims to enhance nutrient use efficiency in wheat—a crop projected to contribute $10.4 billion to the Australian economy in 2024/25. We will investigate the coordination of water and nutrient uptake from soil into wheat	92,190.00	208,518.00	236,844.50	120,516.50	0.00	0.00	658,069.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	roots using an innovative approach involving light-activated proteins. Our discoveries are expected to optimise fertiliser and water use, providing critical insights for developing wheat varieties with superior nutrient and water absorption capabilities. These advancements will offer significant benefits to farmers by reducing the need for costly fertilisers and mitigating their environmental impact. The findings will be disseminated to the industry through the Australian Plant Breeding Academy, which will aid in developing new wheat varieties and training the next generation of plant scientists to ensure the industry's continued success. Additionally, the Waite Research Institute's established connections with the wheat industry will be leveraged to maximise the impact of our results.							
DP250103420 Tyler, A/Prof Jonathan J	**Climate, fire and Kangaroo Island: resolving the past to manage the future** Bushfire impact depends on interacting factors (e.g., people, vegetation, and climate) that complicate development of fire mitigation and conservation strategies. Our project aims to explore the unique Australian case of Kangaroo Island, where traditional land management putatively ceased ~4,100 years ago, to unravel the effects of climate, vegetation and people on changing fire regimes. By combining a suite of novel analytical techniques, including sedimentary ancient DNA and organic biomarkers for fire and people, we seek to develop complimentary records of climate and environment. Our aim is to develop new knowledge to inform sustainable fire management and biodiversity conservation both on the island and across south-eastern Australia.	119,572.50	270,140.00	256,065.50	105,498.00	0.00	0.00	751,276.00
	National Interest Test Statement Fire has been integral to the evolution of Australian ecosystems, so managing contemporary fire risk while preserving biodiversity requires a deep understanding of how past fire and climate have shaped our unique vegetation. Using the case study of Kangaroo Island (KI, South Australia), this project aims to develop actionable landscape management recommendations to mitigate fire risk while conserving rare taxa. Our research will reconstruct accurate, island-scale histories of vegetation cover, climate, and fire incidence to provide new knowledge on the natural recurrence, cause and impact of regional-scale fire events. We will also develop and validate next-generation genetic and geochemical proxies for past vegetation and fire regimes, benefitting global research efforts to develop an improved understanding of climate, fire and ecosystem dynamics. Through consultation with the SA Government, the research will benefit regional and national agencies by developing risk management strategies and guiding landscape management and conservation of threatened ecosystems. In doing so, the research will benefit tourism, agriculture and economic activity in the region. Our findings will be promoted through SeaLink, a new KI Visitor Centre, and 2 public fora on the island; and more broadly through traditional and social media.							
DP250104259 Jiao, Prof Yan	**CO2 to Propylene through Electrocatalyst and Electrolyte Engineering** This project aims to address the critical knowledge gap in sustainable chemistry regarding converting CO2 into propylene (CH2=CH-CH3; a valuable platform chemical) powered by renewable energy. Leveraging a combination of advanced molecular modelling for electrocatalyst/electrolyte prediction and experimental synthesis for performance testing, the project proposes a novel approach to enhance the C-C-C coupling, paving the way for the electrocatalytic conversion of CO2 to propylene. The outcome of this project is optimised electrocatalyst and electrolyte towards propylene production, thereby contributing significantly to the reduction of greenhouse gas emissions and advancing the field of green chemistry through electrocatalysis approaches.	105,791.00	207,433.50	203,358.50	101,716.00	0.00	0.00	618,299.00
	National Interest Test Statement This project is at the forefront of addressing the critical challenge of converting carbon dioxide (CO2), a major contributor to global warming, into propylene. Propylene is a valuable commodity widely used in the plastics and manufacturing industries, both recognised as intensive CO2 emitters. Our project aims to advance electrosynthesis – a sustainable chemical synthesis approach – to convert a problematic greenhouse gas into a commercially valuable resource. Electrosynthesis utilises renewable electricity to drive chemical reactions, enabling sustainable and energy-efficient processes. Our research will bridge crucial knowledge gaps in electrosynthesising propylene, provide significant insights into the main challenge of achieving C-C-C coupling, and potentially revolutionise our understanding of key molecular pathways, catalyst materials, and reaction-environment designs needed for success. The economic and commercial benefits for Australia include fostering new sectors in green technology, creating jobs, reducing dependency on chemical imports, and exploiting Australia's rich renewable energy resources. Environmentally, the project supports Australia's commitments to reducing emissions and protecting ecosystems. To ensure the broad societal benefits of this research, findings will be disseminated through scientific publications and public engagements, leveraging the research leadership of the team to promote widespread adoption of the expected innovative technologies.							
DP250104642 Clair, Dr Amy	**Forging the new Australian Dream in a Post-homeownership nation** As we navigate the 21st Century as a 'post-homeownership nation, this Project will chart the pathways, actions and actors required to transition to a new and 'fit for	89,268.50	210,367.00	257,679.50	136,581.00	0.00	0.00	693,896.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	purpose' Australian Housing Dream. It will use international comparative, quantitative and qualitative analyses to provide new insights, and provide a roadmap that will support Australia to provide current and future generations with good housing outcomes – with or without the home ownership.							
	National Interest Test Statement This project addresses one of the most pressing challenges facing Australia today – the 'housing crisis'. Housing impacts our lives in a multitude of ways, including our health, social and family lives, education and employment, and financial wellbeing. Traditional home ownership pathways are disappearing, being replaced with new household and occupancy models. However, these new options are not well understood or captured in current housing, economic, and other relevant policies, amplifying existing difficulties in accessing affordable and healthy housing. Our research will combine comprehensive analyses of national and international datasets over time to explore emerging trends, new housing pathways, and their links with health and wellbeing outcomes; with innovative application of change theory in evaluating decision drivers and predictions from key actors in the housing market (renters, landlords, owners, and policy makers) to understand how to best shape the future housing market. Research impact will be maximised through communication with policy makers, housing organisations, and the public, i.e., by producing policy briefs, short reports, and accessible summaries to optimise delivery of actionable outcomes to improve housing experiences and equity for all Australians. The research will also be of global importance, as many other countries face similar housing challenges, with this project placing Australia at the forefront of tackling this global problem.							
	The University of Adelaide	1,797,972.00	3,610,995.50	3,563,924.00	1,780,453.00	29,552.50	0.00	10,782,897.00
Torrens University Australia								
DP250104494	**From Oppression to Hope: Reducing Heavy-Drinking with Midlife Women**	140,134.50	282,241.00	243,815.00	101,708.50	0.00	0.00	767,899.00
Ward, Prof Paul R	This project aims to reduce alcohol consumption in 4 heavy drinking groups of midlife women by developing/testing co-designed interventions aimed at changing social practices around alcohol. This project expects to generate new knowledge on the personal, social and cultural drivers of heavy drinking using novel interdisciplinary approaches combining social practice theory, critical consciousness and pedagogies of oppression and hope. Expected outcomes include: community-level actions and policy/practice levers for alcohol reduction; and enhanced capacity for the research team to address the societal impacts of alcohol on the global stage. This should provide significant benefits in terms of reducing alcohol consumption for midlife women.							
	National Interest Test Statement Alcohol consumption remains a major societal problem, contributing to myriad health conditions and costing Australia $6.8 billion a year. Australian midlife women (45-64 years) consume more alcohol than ever – more than previous generations of midlife women and more than other age groups of women currently. Alcohol poses health risks unique to midlife women, including increased risk of breast cancer - 10% of breast cancers result from alcohol consumption and there is no 'safe' limit (every drink over the lifecourse further increases risk for breast cancer). There is a global gap in knowledge about socially and culturally appropriate interventions for reducing alcohol consumption in these heavy-drinking groups of midlife women. Our study will work out ways to support the following groups of midlife women to reduce their alcohol consumption (and their breast cancer risk): 1) women living in regional areas of Australia; 2) LGBTQ+ women; 3) women living in poverty; and 4) women working in the corporate sector. All these groups of midlife women are known to drink at levels deemed risky and heavy. Our multi-disciplinary, international research team will use innovative methods and theory to co-design and test interventions with community and policy relevance. We will provide solutions to the intersecting community, socio-political and commercial factors that shape alcohol consumption for different groups of midlife women.							
	Torrens University Australia	140,134.50	282,241.00	243,815.00	101,708.50	0.00	0.00	767,899.00
University of South Australia								
DP250100643	**A new mechanism regulating cell death**	117,768.00	241,096.00	248,821.50	125,493.50	0.00	0.00	733,179.00
Kumar, Prof Sharad	Cell death in multicellular organisms is vital for disposing of damaged and unwanted cells to maintain homeostasis. The project aims to understand how specific protein modification via the process of ubiquitination regulates Gasdermins, the executioners of pyroptosis, a distinct type of cell death. We will use state-of-the-art molecular and							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	cellular approaches to discover mechanisms that control Gasdermins to manage cell death response. Given the essential nature of cell death the outcomes will generate high value conceptual knowledge in a topical field of broad biological significance. This is expected to enhance Australia's research reputation and capability, foster international collaborations and provide training for PhD students. **National Interest Test Statement** Multicellular organisms have evolved highly sophisticated cell death machinery to remove damaged, infected, or unwanted cells from the body to maintain homeostasis, the state of balance amongst all body systems that enables survival. Each day, billions of cells die off as a part of normal cell turnover. One form of cell death is pyroptosis, which acts as a front-line host defence mechanism. This project focuses on understanding the regulation of Gasdermin proteins (Gsdms) that are essential to execute pyroptosis. However the cell specific function of Gsdms, their stability and how they shift pyroptosis to other types of cell death remain unknown. This project aims to fill the current gap in knowledge and elucidate the machinery that controls Gsdm levels and activity to manage different modes of cell death. Understanding these mechanisms will generate new knowledge and contribute significantly to this highly topical research field. Research outcomes will help build Australia's research capability with the potential to generate high-impact knowledge across various fields, such as cell biology, biochemistry, and molecular biology. Pyroptosis is associated with many inflammatory conditions that pose a huge economic burden on the nation. The fundamental knowledge gained from the project can be applied in the biotechnology industry in the future to develop tools for animal and public health, thus bringing significant economic and social benefits to Australia.							
DP250102398 Zhuge, Prof Yan	**3D printed strain-graded green concrete with co-extruded FRP reinforcement** 3D concrete printing (3DCP) offers many advantages over traditional construction methods, but its practical application is hindered by the reinforcement implementation. This project aims to develop a novel co-extrusion technique for 3DCP, integrating flexural fibre-reinforced polymer grid reinforcement. The project seeks to leverage alkali-activated slag binder as a sustainable alternative to Portland cement, with significantly lower CO2 emissions and excellent early age strength required for high-quality 3DCP. Expected outcomes include innovative techniques for reinforced 3DCP and optimized models for strain-graded concrete. The findings will shape the next generation of digital construction for safety, durability and sustainability. **National Interest Test Statement** The Australian construction sector faces a significant challenge with high labour expenses, which 3D printed concrete (3DPC) aims to address by reducing costs and speeding up construction. However, the widespread adoption of 3DPC encounters obstacles, particularly in effectively implementing reinforcement. Additionally, the environmental impact of cement production, emitting a staggering two billion tons of CO2 annually, highlights the need for sustainable alternatives. This project pioneers a novel co-extrusion technique for 3DPC, integrating flexural fibre-reinforced polymer (FRP) grid reinforcement and utilising alkaline-activated concrete (AAC) from industrial waste to replace ordinary Portland cement (OPC). By promoting FRP reinforcement with its corrosion resistance, high strength-to-weight ratio, and superior electromagnetic properties, the project introduces innovation to 3DPC. This approach explores new ground in FRP-reinforced 3DPC. The environmental impact is twofold: creating a new market by utilising slag waste while reducing the environmental impact of increasing waste production. Furthermore, substituting OPC with AAC promises to cut CO2 emissions, contributing to a more environmentally friendly construction sector. To promote the research beyond academia, pilot projects, field trials and workshops demonstrating the practical applications of the developed technologies will be carried out through collaboration with construction firms to reach a broader audience.	87,976.00	170,987.50	113,134.50	30,123.00	0.00	0.00	402,221.00
DP250103613 Gregory, A/Prof Philip A	**Illuminating the functions of alternative splicing** Almost all human genes produce several species of messenger RNA by a process called alternative splicing. These alternative RNAs make different proteins (isoforms) that are presumed to have different functions within a cell. However, the functions of most of these protein isoforms remain a mystery. This project aims to capitalise on advances in gene editing technology to determine the functional consequences of alternative splicing. It is expected to reveal functions of protein isoforms that are essential for cell growth, movement, and cell state transitions. We anticipate use of this technology could facilitate better understanding of human development, future treatments, and improvements in agricultural applications. **National Interest Test Statement** Cells are the building blocks of life. In humans, the complex functions of cells require many different proteins (isoforms) to be made from a limited number of genes by a process called alternative RNA splicing. While alternative	116,479.00	251,752.50	258,667.00	123,393.50	0.00	0.00	750,292.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	splicing is critical for normal cell behaviour, the functions of most protein isoforms arising from alternative splicing remain a mystery. This project will leverage new technology to assess the functions of hundreds of protein isoforms and identify how they operate to promote cell growth, movement, and transitions between cell states. It will contribute fundamental knowledge to our understanding of the functional complexity of the human genome. These findings could be directly applied and benefit many cell engineering applications in the areas of development and disease. These benefits could extend to future improvements in agricultural applications in Australia and beyond through splicing manipulation of crops, livestock and microorganisms. Collaboration with Australia's new RNA manufacturing sector will enable translation and benefit to these agricultural, health and biotechnology industries.							
DP250103993 Elliott AM, Prof Anthony M	**Enacting ChatGPT in Fintech: Identities, Institutions, Iterations** The project investigates practices of user engagement with generative artificial intelligence (GenAI) in organizational and workplace contexts, and will propose solutions to counter growing social and political concerns about human-machine interaction. The research aims to advance understandings about the formation of GenAI knowledge communities in the financial services sector, and how these communities of practice are reshaping the social and cultural consequences of emergent technologies. Expected outcomes include benchmark publications, enhanced international research capacity and an improved ability to address socio-technological problems in an area of vital importance to Australian society.	117,609.50	240,204.50	244,861.50	122,266.50	0.00	0.00	724,942.00
	National Interest Test Statement In 2022, ChatGPT captured the world's attention and demonstrated the extraordinary power of generative artificial intelligence (GenAI). While some claim that GenAI will increase productivity, employee creativity, and on-the-job learning, others warn of complex policy risks, like misinformation and fraud, copyright concerns, inherent bias, and trust issues. There is a significant gap in understanding how GenAI is used in particular social contexts, especially people's creative involvement in producing, maintaining and repurposing it. Using the financial technology sector as a case study, the project addresses these gaps and generates novel insights into the emergence and role of knowledge communities in continuously shaping GenAI as a creative and commercial resource. It will benefit Australia economically, socially, commercially, and culturally by improving the knowledge and skills of citizens and organisations to engage with GenAI productively and safely. Research outcomes will be promoted beyond academia via the national and global media, including press releases and op-ed pieces (e.g., The Conversation), plus ongoing engagement and outreach activities to translate outcomes into impact like podcasts and workshops. Outcomes will be communicated to Australian policymakers, government agencies and corporate stakeholders including finance professionals and peak bodies for translation into discourse and policy.							
DP250104314 Rahman, Prof Md Mizanur	**Stabilising tailings dam capping with plant-based enzymes** We propose to extract cheaper plant-based urease enzymes from an Australian weed, Paddy melon seeds, and develop their kinetics framework for calcium carbonate precipitation for binding and stabilising tailings, by-products of the mining operation. It significantly reduces the cost of cementation and will be a sustainable alternative to cement and other chemical additives with a very high carbon footprint. This novel approach will stabilise tailings storage facilities (TSFs) surface/capping upon ceasing mining operations. A constitutive and user-defined model for numerical software will be developed to ensure faster and greener technology transfer in mining closer activities, which currently is the largest industry for the national GDP.	65,000.00	153,000.00	135,750.00	47,750.00	0.00	0.00	401,500.00
	National Interest Test Statement Mining contributes nearly one-tenth of Australia's gross domestic product. However, mining creates by-products called tailings, typically stored in large dams called tailings storage facilities (TSFs). When mining operations end, TSFs are decommissioned to prevent tailings from contaminating the environment. There are 759 inactive TSFs in Australia and approximately 30,000 worldwide. Due to the legacy of tailings operations and poor quality of closure materials, many TSF surface tailings require stabilisation to ensure their integrity and reduce costs. While calcium-based stabilisers like lime and cement are sometimes used to mix and compact with soils to bind soil particles for stability, they are unsuitable for tailings. To address this gap, the project will repurpose one of Australia's most invasive common weeds, prickly paddy melons, to engineer weed-based enzyme extracts to bind and stabilise soil and tailing particles. This innovative approach is more effective and sustainable than traditional binders, and cheaper, with the added benefit that removing these weeds positively impacts farming systems, biodiversity, and grazing livestock. The project will also develop models and engineering tools for stabilised tailings. To ensure faster and greener technology transfer in mining activities, outcomes will be disseminated to industry and government via meetings, workshops, articles, conferences, media releases, a project website, and seminars aimed at the general public.							
DP250104625	**A Gamified 3D Cultural Heritage Platform for Archaeology and Architecture** Few research infrastructures support engaging and useful 3D heritage content for both	81,274.50	167,745.00	179,068.50	92,598.00	0.00	0.00	520,686.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Champion, A/Prof Erik M	archaeology and architecture. A user-focused, experiential immersive environment with AI content creation will be developed and evaluated. Audience and international expert feedback will create a flexible feature list. Workshops with museums and galleries will test the prototype's usefulness for communication and preservation. The system will allow groups to explore 3D models in conjectural and imaginative contexts and pose counterfactual arguments. The project will also consider how to convey levels of authenticity and uncertainty. Outputs will be a website with open-source tools and data, publications, a conference and a demonstration as an exhibition. **National Interest Test Statement** Examples of 3D heritage content showcasing archaeology and architecture are rare, limiting opportunities for the Australian public to engage with culture and history. To address this gap, the project will develop a gamified 3D cultural heritage platform to make archaeological and architectural heritage accessible and interactive. Technologies including artificial intelligence and 3D interactive modelling will create immersive, educational experiences that engage the public with historical narratives. This platform will deliver multiple benefits. Economically, the cultural tourism sector will be enhanced by enriching visitor engagement with innovative storytelling and exhibition tools. Socially, Australia's national identity and civic pride will be strengthened by making cultural heritage more accessible and engaging. Environmentally, the digitalisation approach will protect archaeological sites and built heritage, preserving these critical and non-renewable assets for future generations. The project will collaborate with cultural and educational institutions to maximise outcomes beyond academia, promoting the platform's use in public education programs and exhibitions. Targeted workshops and a website with open-source tools will facilitate its adoption, contributing significantly to national and cultural discourse. Aligning with broader national interests, this project positions the platform as a pioneer in digital cultural preservation and educational innovation.							
	University of South Australia	586,107.00	1,224,785.50	1,180,303.00	541,624.50	0.00	0.00	3,532,820.00
	South Australia	3,484,718.50	7,134,634.50	7,131,202.50	3,787,947.00	306,660.50	0.00	21,845,163.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Tasmania								
University of Tasmania								
DP250100886	**The invisible past: Antarctic ecosystem evolution unlocked by ancient DNA**	102,360.00	247,662.50	281,355.00	136,052.50	0.00	0.00	767,430.00
Armbrecht, Dr Linda	This project aims to investigate marine organism responses to ecosystem change around Antarctica by using an innovative approach of sedimentary ancient DNA, evolutionary and population genetics. New knowledge will be generated on rates at which keystone marine organisms (e.g., phytoplankton, Antarctic krill) adapt to environmental change. Expected outcomes include the most comprehensive, circum-Antarctic sedimentary ancient DNA dataset to date providing marine ecosystem evolution information spanning, at least, 1 million years. Integrating this with population genetics surveys on modern organisms will allow improved predictions of ecosystem responses to climate change, ultimately benefitting targeted conservation efforts in Antarctica.							
	National Interest Test Statement							
	Climate change is causing marine ecosystem shifts around the globe. Identifying the capacity of marine organisms to adapt to such changes is a matter of urgency. One of the most vulnerable regions to climate change is Antarctica, where ice cap melting and warming ocean temperatures are starting to have catastrophic impacts both locally on marine ecosystems and globally through sea-level rise. Palaeo-records offer a powerful means to learn important lessons about past ecosystem evolution. This research will use a novel combination of ancient DNA from marine sediments and evolutionary genomics to infer how and how fast species around Antarctica, including commercially fished Antarctic krill, evolve and adapt to climate change. Such knowledge will help to manage marine resources in Antarctica effectively. The project aligns with the Australian Government's Science and Research Priority of monitoring 'Environmental Change' and represents a state-of-the-art genetics tool to address the National Marine Science 2015-2025 Research Plan Grand Challenge 'Climate Change Adaptation'. We will train five early career scientists, thereby contributing to building Australia's future research workforce. This project leverages nine previous Antarctic expeditions that already had high publicity, which we will build on by bringing this research to the public via talks, blogs, videos, and social media.							
DP250101122	**Evolution of Antarctic glaciers from icequake seismology: a new capability**	147,919.00	313,444.50	333,953.00	283,428.50	115,001.00	0.00	1,193,746.00
Reading, Prof Anya M	This project will establish a new capability to reveal change in the outlet glacier systems of the vast Australian Antarctic Territory, East Antarctica. Machine learning will be applied to the 'seismic symphony' of icequakes caused by the sudden vibrations of moving and cracking ice, tumbling melt water and ocean wave action. Highly significant, fast-changing outlets of the largest ice sheet on Earth will be analysed. Outcomes include a step-change in the knowledge of how influences, such as reduced sea ice, are instigating new mechanisms for ice loss. Benefits include advanced training for the scientific and geotechnical workforce, and informing Australia's response to the timing of accelerated sea level rise and climate tipping points.							
	National Interest Test Statement							
	This project addresses how, and when, ice will be lost from the East Antarctic Ice Sheet. Many East Antarctic glacier systems that are vulnerable to ice loss lie within the expanse of Australian Antarctic Territory. A critical gap exists in our current knowledge, because until now it was not possible to conduct the needed observations across such vast and remote areas. This project will establish an innovative and world-leading capability to understand and monitor change in the outlet glacier systems of East Antarctica. The team will use seismic recordings of icequakes and apply machine learning to interrogate these sudden vibrations due to moving ice, melt water, and ocean wave action. Environmental benefits include better predictions of accelerated sea level rise. Social and commercial benefits include informing actions to mitigate the impact of sea level rise on Australia's coastal communities and infrastructure. New knowledge outcomes, presented in summary form as time-evolving animations, will communicate how each glacier system is responding to influences such as the warming ocean. The new monitoring capability outcome, promoted through the global network of national Antarctic programs, will demonstrate Australia's stewardship of the extensive East Antarctic region. Further promotion of the many transferable workflows to geotechnical industry networks will enable future workforce development in skills areas that are needed in a rapidly changing world.							
DP250101878	**A Novel Model to Understand Ice Shelf Stability and Collapse**	104,064.00	208,019.00	207,910.00	103,955.00	0.00	0.00	623,948.00
Christoffersen, Prof	Climate change is undermining the stability of the Antarctic Ice Sheet, which is losing ice mass at a growing pace. However, deep uncertainty in sea level projections is							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Poul	compromising effective adaptation and mitigation, not only in Australia but globally. The largest source of uncertainty in ice sheet models is a crude or missing representation of fractures that produce icebergs and may lead to instability. This project addresses this problem using observations together with a novel hybrid model to develop an innovative method for the prediction ice shelf stability. The project will improve sea level projection, increasing confidence in climate models and accuracy of future liveability along our coastlines amid rising global sea levels.							
	National Interest Test Statement							
	Protection of nature, infrastructure, and communities across coastal Australia relies on well-designed coastal adaptation strategies and protection measures that take sea level rise into account. These mitigation efforts require accurate and reliable climate information, however projection of sea level rise is very uncertain. This lack of clarity comes notably from Antarctica where future ice losses are extremely uncertain because models disagree. One of the largest sources of uncertainty in ice sheet models is a crude or missing representation of icebergs delivered into the ocean from floating ice shelves. Current ice sheet models rarely capture icebergs, nor the vertical ice cliff at the end of the ice shelves that produce them. This project is an interdisciplinary programme of research designed to address iceberg calving and ice shelf stability as a critical knowledge gap causing high uncertainty in sea level projections. The national and global benefits are highlighted by the latest assessment report by the Intergovernmental Panel on Climate Change (IPCC AR6), which states that global mean sea level rise of 2 m by 2100 or 5 m by 2150 cannot be ruled out due poorly understood feedbacks associated with iceberg calving and stability of calving ice cliffs. Accurate understanding of such high-impact events is needed for Australian policymakers, coastal adaptation practitioners and stakeholders concerned about climate risk.							
DP250102421	**Enhancing the performance of electric vehicles via energy management**	25,856.00	118,893.50	184,575.00	91,537.50	0.00	0.00	420,862.00
Wang, Prof Xiaolin	The electrification of transport is the future direction in Australia and the world; however, the low driving range and short lifespan are currently hindering the wide application of electric vehicles. This project aims to establish a way of enhancing the operating performance and thermal comfort of electric vehicles by managing energy distribution and increasing energy utilization efficiency. Expected outcomes include an automated approach to energy management and efficient heat recovery, a new air conditioning technology without global warming potential, and efficient cooling techniques for the battery power chain. The project provides significant societal and economic benefits and supports Australia in achieving a zero-emission goal.							
	National Interest Test Statement							
	The transportation sector contributes 27% of global CO2 emissions. Electric vehicles (EVs) represent a green revolution in transportation electrification to address these emission issues. However, challenges such as low driving range, operational safety and reliability, and passenger thermal comfort make EVs less appealing to users. This project aims to optimize EV operational performance by developing an energy management platform that effectively coordinates energy distribution, utilization, and recovery using Artificial Intelligence technology. The proposed energy platform will incorporate a novel CO2 heat pump air conditioning system to provide efficient heating and cooling for the EV cabin, and innovative battery cooling techniques to ensure battery safety and longevity. These advancements will enhance energy efficiency, extend driving range, and improve the reliability of EVs. Successful implementation of this project will enable manufacturers to design more efficient EVs capable of adapting to diverse driving conditions. This will significantly lower users' operational and maintenance costs, and enhance user thermal comfort, thereby fostering widespread market acceptance of EVs and delivering additional commercialization opportunities in Australia. The research outcomes will support Australia's transition from fuel-based to renewable energy-based vehicles, aligning well with the national long-term emission reduction plan aimed at achieving net-zero emissions by 2050.							
DP250102853	**Rapid response of Antarctic ice streams to decadal climate perturbations**	99,226.00	191,636.00	192,010.00	99,600.00	0.00	0.00	582,472.00
King, Prof Matt	The rate of sea-level rise in coming decades depends heavily on how fast the West Antarctic Ice Sheet changes. This project aims to tightly define the uncertain ice-bed physics that will govern that rate of change. The project is based on recent observations of rapid, climatologically forced changes in the glacier elevation, and focuses on near-instant responses to climate-varying melt of downstream ice shelves. Existing models of ice-shelf/ice-stream dynamics will be perturbed by climatological changes in ice-shelf melt and the modelled perturbations in upstream strain and elevation compared with observations. This will allow us to better predict the speed at which the ice sheet will change due to changes in ocean driven-melting.							
	National Interest Test Statement							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Understanding how coastal sea levels will change is important for Australia as we have so much invested in our coastal regions - $230 billion of assets, tens of thousands of homes, and much cultural heritage. Future coastal sea levels will depend to a large extent on how quickly Antarctic glaciers will flow into the ocean. The project will develop a new method to calibrate Antarctic glacier models which are used to project future sea levels. This calibration will be based on newly observed changes in glacier thickness and speed that show fluctuations over decades. The project will enable improved sea-level projections, with the results fed into the Australian ice-sheet modelling groups that inform the Intergovernmental Panel on Climate Change (IPCC) sea-level projections. The new knowledge will be translated to Australia's ACCESS climate model which is currently being developed to add ice-sheet model capability. The project will bring new knowledge to Australia through collaboration with two leading US and UK-based scientists and, by training three early career researchers, develop much-needed increased capacity and capability in Australian glaciology and sea-level science.							
DP250102864 McDonald, Prof Jan	**Charting the Legal Seascape for Marine Carbon Dioxide Removal in Australia** This project develops the legal framework needed to harness the ocean’s potential to combat climate change. Removal of atmospheric carbon dioxide is essential to advance Australia's net zero climate policy and achieve Paris Agreement climate goals. Marine carbon removal technologies could greatly enhance the ocean’s sequestration role. Our vast ocean estate positions us for leadership, but only if the gaps, complexity and fragmentation of our legal framework are addressed. This project will devise reform recommendations for adaptive, anticipatory laws, spanning local to international scales, multiple sectors, public and private actors, to create an enabling environment for marine carbon removal that also protects marine and coastal values.	61,945.50	126,631.00	153,755.50	89,070.00	0.00	0.00	431,402.00
	National Interest Test Statement This project will deliver Australia’s first legal blueprint for marine carbon removal. Australia cannot achieve its goal of net-zero emissions by 2050 or fulfil its Paris Agreement obligations without significant drawdown of atmospheric carbon dioxide. Our vast ocean estate positions us as a potential global leader in marine-based carbon removal, given the limits of large-scale terrestrial drawdown. This potential cannot be realised without an effective legal framework that facilitates marine carbon removal, protects unique marine environments, and safeguards Indigenous rights and other marine uses. Through policy briefs and events for government and industry, social media and podcasts, this project will provide evidence-based advice on law reform, based on principles of adaptive, integrated marine management. A robust legal regime can unlock the economic potential of Australia’s marine carbon removal markets, estimated at AUD30+ billion per year. It will promote sustainable private investment, innovation and employment in marine science, engineering and secondary industries, while respecting other marine uses and priorities, restoring marine ecosystems, mitigating ocean acidification and preserving biodiversity. A model law disseminated to international stakeholders through online workshops and international conferences will enhance Australia’s contribution to and reputation in climate diplomacy, and promote global governance of marine carbon removal.							
	University of Tasmania	541,370.50	1,206,286.50	1,353,558.50	803,643.50	115,001.00	0.00	4,019,860.00
	Tasmania	541,370.50	1,206,286.50	1,353,558.50	803,643.50	115,001.00	0.00	4,019,860.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Victoria								
Deakin University								
DP250100019	**Models of adolescent brain development to predict socioemotional function**	77,770.50	152,291.00	151,041.00	76,520.50	0.00	0.00	457,623.00
Silk, A/Prof Tim J	This project aims to understand what drives brain development leading to variability in socioemotional functioning in adolescence. Adolescence is a dynamic developmental window for brain development, and current models of adolescent development fail to predict why, when and to whom, changes lead to socioemotional difficulties and poorer outcomes. Timing and progression of puberty is emerging as a better marker of where an adolescents' brain is up to in development. Having established the largest internationally collaborative dataset, this project will reveal the role of pubertal maturation and hormones in adolescent brain development, with significant beneficial consequences for age-based benchmarking decisions in policy and society.							
	National Interest Test Statement							
	Adolescence is one of the riskiest times to be human. Changes in developing brains of young people can lead to socioemotional difficulties and poor outcomes, like reckless driving, assaults, unsafe sex, substance use and self-harm. Current models of adolescent development fail to predict why, when and to whom, changes lead to socioemotional difficulties and poor outcomes. However, the timing and progression of puberty is emerging as a better marker of where an adolescents' brain is up to in development. This project focuses on understanding the drivers and timings of brain development, and the role of pubertal maturation and hormones. This will have implications for how we benchmark brain development across adolescence at population levels, and provides opportunities to have a positive impact on developmental trajectories relating to health, education, and social success across the lifespan. This project will strengthen Australia as the hub of an international, collaborative, open-access dataset on adolescent brain development, available for researchers to access worldwide with ongoing capacity to help answer key questions about adolescence brains. To enable the translation of evidence-based knowledge, results will be promoted to parents, health and education professionals, and policy makers across Australia and internationally. The implications span science, education, policy- and law-making and may influence how legal competency and educational levels are measured.							
DP250100725	**Embedding Net Zero Carbon Emissions in Northern Australia**	21,933.00	103,012.00	181,216.00	100,137.00	0.00	0.00	406,298.00
Neale, A/Prof Timothy D	This project aims to examine how people in northern Australia view the local, national, and global value of large net zero carbon emissions projects. This project expects to generate new knowledge on how local social factors shape the embedding of the net zero paradigm in place through industrial infrastructures. Expected outcomes of this project include insights into how climate change policy agendas are normatively evaluated at a local scale and therefore the potential challenges and opportunities faced by governments, industry, and others as they seek to realise net zero goals. This should provide significant benefits, such as improved success, improved planning capacity, and reduced negative effects in future net zero implementation.							
	National Interest Test Statement							
	Net zero is being actively pursued as a solution to Australia's linked challenges of climate change mitigation, industrial development, and regional employment. Building large industrial infrastructures has become a key government strategy for implementing net zero policy, however political polarisation and limited understanding of local priorities could hinder their realisation. Through interviews, fieldwork and other activities, this research project will engage residents and professionals involved in a large net zero infrastructure in northern Australia to uncover their priorities and insights. The project will reveal new knowledge about the causes of local support and opposition to net zero policies and infrastructures and therefore opportunities for more effective net zero implementation with greater social and economic benefits for local communities and others. Findings will be shared with participants, industry bodies, and policymakers through a range of outputs including a short film and project website to directly improve the design and implementation of future Australian climate and energy policies.							
DP250100932	**Understanding the role of sex in ageing muscle**	90,000.00	182,500.00	182,500.00	182,500.00	92,500.00	0.00	730,000.00
Lamon, A/Prof Severine	This project aims to explore cause-and-effect relationships between molecular regulators and age- and sex-specific traits in skeletal muscle loss. Females live							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	longer and are more susceptible to the functional and metabolic consequences of muscle ageing. Yet, our knowledge is overwhelmingly inferred from findings from male cohorts. Our results will establish the role of sex hormones and sex chromosomes on the origins, progression and consequences of age-related muscle loss, identifying transition points when risks to well-being and windows of opportunity are greatest. The project will produce essential knowledge allowing appropriate mitigation of the sex-specific consequences of muscle loss in males and females to promote healthy ageing.							
	National Interest Test Statement							
	Why do females live longer than males but are paradoxically more susceptible to age-related muscle loss? By 2053, 10 million Australians will be aged over 65 years and the majority will be female. We hypothesize that sex hormones and sex chromosomes can independently affect the progression and consequences of age-related muscle loss, yet the origins of these differences are unknown as our current knowledge overwhelmingly comes from findings from male cohorts. This project will start to address this knowledge gap by examining the cause-and-effect relationships between molecular regulators and age- and sex-specific traits in skeletal muscle loss. The novel fundamental knowledge generated will not only be valuable for all pre-clinical research into age-related muscle loss, but also inform the development of future interventions to promote healthy ageing in Australian males and females. Our team is ideally placed to build research capacity in this space, in Australia and internationally, and to communicate our results to industry groups, policymakers and health professionals interacting with ageing Australians, ensuring rapid and effective translation. Improving healthy ageing is an Australian research priority. By paving the way to sex-specific anti-ageing interventions, this project will deliver economic and social benefit for Australians and ensure that future research accounts for the largest segment of our ageing population.							
DP250101240 Potter, Prof Emily C	**Understanding place-based repair in climate-affected communities** Community-based repair work is a vital but often overlooked aspect of responding to the impacts of climate change and to mitigating the increasing costs of disasters. Through storytelling and creative methodologies, this project will document, map and analyse how people are responding to environmental change through diverse, locally attentive practices of repair. Generating understandings of the nature of repair work for researchers, governments and communities, as well as practical tools, guides and resources, the project will contribute to improved strategies and actions for more inclusive and equitable community-led responses to climate change.	101,562.00	210,419.50	192,577.00	83,719.50	0.00	0.00	588,278.00
	National Interest Test Statement							
	Climate change, biodiversity loss and disasters pose serious environmental and socio-economic challenges to Australia. This project aims to generate knowledge of how people living in three Australian regions (the Wimmera-Mallee in Victoria, the Northern Rivers region of NSW and the Perth-Peel metropolitan region) are responding to long-term, place-based environmental change. It considers this in relation to two international regions facing similar challenges (Gotland, Sweden and Northeast England) to understand what community-led repair looks like on the ground, and what formal disaster response can learn from this. Previous research has focused on documenting the causes of environmental change, and how to prevent and manage this change, whereas less research has considered how to repair the harm and loss associated with altering environments. This research is particularly significant in light of the enormity of the reparative task and the need to prioritise limited resources for environmental repair work. This project will benefit the future adaptation efforts of Australia, leading to improved understandings of what supports the success of localised repair work. In addition to academic outcomes, including PhD and early career pathways, the project will produce creative and publicly available outputs, including an atlas, story maps and field guides, and engage with community and policy stakeholders to inform responses to ongoing environmental change.							
DP250101423 Harris, Prof Anita L	**Youth Futures After Mobility: a longitudinal study of mobile transitions** This project aims to investigate what helps and hinders the social and economic integration of young people after living abroad. Through surveys & interviews conducted over 10 years, it will track the integration of 800 mobile youth as they age, face decisions about remaining or returning, and seek to settle. The unique longitudinal mobile youth dataset will be used to generate important new theories linking mobility, integration and ageing. Outcomes will be enhanced knowledge of mobility and settlement and training of youth migration scholars. This will assist governments and businesses design programs and policies to help Australian society benefit from youth mobility including resettling young expats and retaining talented migrant youth.	74,124.50	161,410.00	165,860.50	165,611.50	171,110.50	84,074.00	822,191.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement Australians increasingly venture overseas for work or study during their youth. This international movement of young Australians is part of a global trend for young people. Indeed, Australia is also a destination for similarly mobile youth from abroad – many of whom pay to study at Australian universities or come for a working holiday. Although quite a lot is known about what drives youth to be mobile, we know little of what happens in the longer term as they enter a new life stage and face decisions about returning and settling down. This study will address this gap in knowledge by tracking the experiences and intentions of a group of 800 mobile youth through surveys, network maps and interviews conducted over a decade as they travel and transition into adulthood. By understanding the longer term drivers of mobility and enablers of settlement, governments and businesses will be better able to design programs and policies to help Australian society benefit from youth mobility. These include Australians reintegrating with knowledge, skills, entrepreneurial capacities, industry networks and new cultural experiences and ideas, but also retaining migrant youth, many trained with desired skills in our university system. Research outcomes will be disseminated to the project advisory board, government and industry stakeholders through workshops, a data dashboard and policy papers. This engagement will promote translation of the research into programs and policies.							
DP250102634 Xiang, Prof Yong	**Copyright Protection of Deep Neural Network Models Based on Watermarking** This project aims to develop robust watermarking techniques for copyright protection of deep neural network models. Existing techniques to protect this copyright are preliminary, difficult to apply and susceptible to abuse. This project employs novel approaches, methods and techniques to solve these shortfalls. Expected outcomes include a set of innovative mechanisms and algorithms that provide solutions to the key challenges in deep neural network watermarking. Expected benefits include significant advance in deep neural network watermarking research, greater commercial opportunities, expansion of deep learning for real-world applications and economic gain through greater protection of intellectual investment.	82,606.00	167,712.00	172,712.00	87,606.00	0.00	0.00	510,636.00
	National Interest Test Statement As a driving force of artificial intelligence, multi-layered artificial neural networks, called deep neural networks, have been widely used in many fields of society. Deep neural networks enable computer systems to learn from data in a manner similar to the functioning of the human brain. Consequently, they can build the capability of performing complex operations on massive amounts of data and making decisions. The training of such powerful network models is challenging and costly. Such models are also vulnerable to copyright infringements, causing major losses for model owners. This project examines the vulnerabilities of deep neural network models to various attacks and develops innovative watermarking mechanisms and algorithms for the copyright protection of deep neural network models, which will deter illegal and nefarious players from exploiting those vulnerabilities. Benefits will include curbing cybercrime and other illegal activities caused by copyright infringements, greater commercial opportunities for Australian companies, expansion of deep learning for real-world applications such as autonomous driving, and economic gain through greater protection of intellectual investment. The research outcomes and their use in practice will be promoted through workshops, industry meetings, and industry networks such as the Australian Industry Group and Australian Information Industry Association.							
DP250103036 Symonds, Prof Matthew R	**Evolving escape: anti-predator adaptations in threatened bird species** This project will examine how escape responses to predators evolve through natural selection, a critical question in the conservation and management of threatened species. We will examine whether protection measures select for increased tolerance to threats, thereby making populations more vulnerable to predation. Using field studies of two threatened Australian birds, we will generate behavioural, genetic and demographic data to identify how management regimes influence escape responses, whether these responses are heritable, and how these responses affect survival. The project will be beneficial by enabling conservation groups to make evidence-based choices about management of protected threatened species.	114,000.00	226,500.00	227,500.00	115,000.00	0.00	0.00	683,000.00
	National Interest Test Statement Australia is facing a biodiversity crisis with more than 1900 species currently listed as threatened and at risk of extinction. To prevent future extinctions of our native animals, we need to understand how human and other threats affect their behaviour and survival, and assess their ability to adapt to those threats. This project will examine the evolution of predator escape behaviour, a vital element of survival in the wild, in two iconic threatened bird species: the hooded plover and the helmeted honeyeater. The project will assess how escape behaviour varies in response to environmental threats, and how conservation measures affect this behaviour and ultimately the survival of the birds. The findings will fill a knowledge gap about the potential long-term evolutionary consequences of environmental disturbance and management on Australian fauna. The research will generate important							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	information on behaviours that affect the survival of threatened species, and thus provide environmental and social benefits associated with preventing future extinctions. By working with government and non-government organisations, such as Zoos Victoria and BirdLife Australia, the project results will be communicated to land managers to inform future conservation measures.							
DP250103542	**Artificial Intelligence Designed 3D-printed Solid-state Li Metal Batteries**	91,400.50	185,301.00	187,801.00	93,900.50	0.00	0.00	558,403.00
Chen, Prof Ying Ian	This project targets challenges in solid-state Li metal batteries (SSLMBs), lithium dendrite growth and poor interfacial contact, with cutting-edge 3D printing and Artificial Intelligence (AI) techniques. Leveraging AI's predictive capabilities on extensive databases, optimal materials and structures for SSLMBs will be identified. The designed SSLMBs will be precisely fabricated with 3D printing techniques. Expected outcomes include novel solid-state electrolyte formulations, smart battery structures, and high-performance SSLMBs. The project will benefit Australia's energy storage innovation and economic growth, bolstering Australia's global leadership in advanced energy technologies.							
	National Interest Test Statement							
	This research proposal aims to address the research gap in safer and more efficient solid-state battery technologies by integrating additive manufacturing (3D printing) and artificial intelligence (AI). By utilizing AI to design battery structures, we aim to enhance performance, while leveraging 3D printing to produce smaller and more efficient battery cells to meet the increasing demand from Australian society and industry. This convergence of 3D printing and AI in battery design represents an emerging area of research that has yet to be extensively explored within the Australian research community. The potential outcomes of this research extend beyond technological advancement; they have the capacity to significantly bolster Australia's research capabilities in energy storage, advanced manufacturing, and AI. Furthermore, the benefits extend to facilitating the transition towards a smarter society and contributing to environmental protection efforts. Successfully achieving these objectives will not only create new opportunities for commercialization but also stimulate job growth, as demonstrated by the track record of our research team.							
	Deakin University	653,396.50	1,389,145.50	1,461,207.50	904,995.00	263,610.50	84,074.00	4,756,429.00
La Trobe University								
DP250100183	**Addressing the opportunities and risks of HIV elimination in Australia**	97,316.00	209,305.50	203,335.50	91,346.00	0.00	0.00	601,303.00
Murphy, Dr Dean A	This project aims to provide the first critical analysis of public policy related to HIV 'elimination', including the emerging notion of 'micro-elimination'. Using a novel 'policy ecology' approach involving an analysis of media coverage, policies, health promotion materials, and qualitative interviews with stakeholders and people affected by HIV, it seeks to identify the benefits and risks of implementing this policy in Australian settings. It also seeks to identify the role of this policy in perceptions of HIV prevalence and transmissibility, and its potential role in relation to HIV stigma. Expected outcomes of the project include urgently needed new knowledge on the adoption and implementation of a powerful global public health policy.							
	National Interest Test Statement							
	With the annual number of new HIV cases having halved in the past decade, Australia is on track to become the first country in the world to achieve the UN target of eliminating HIV transmission. However, given there are still approximately 500 new cases per year and 30,000 people currently living with HIV in Australia, questions remain about the risks to HIV prevention from messaging that suggests elimination is imminent. Using an innovative and interdisciplinary approach that combines policy, biomedical and social aspects, this project will generate urgently needed new knowledge about the effects of global public health's focus on elimination on understandings of HIV risk and experiences of stigma. In doing so, it will identify factors likely to support the success of this ambitious goal and provide an understanding of the potential dangers of virtual elimination in specific areas in the context of global mobility and the interconnectedness of communities. This new knowledge will inform HIV policy in Australia and internationally, supporting prevention and reducing costs of HIV care, and provide social benefits by identifying the dynamics of HIV-related stigma in the contemporary era. It will also offer lessons for other areas of infectious disease public policy. To support translation of the findings, outcomes will be communicated via knowledge-translation workshops with policy makers and health-promotion practitioners, and by direct communication with affected communities.							
DP250100393	**Sustainable working conditions: Requirements to enable long working**	75,243.50	155,070.00	164,961.00	85,134.50	0.00	0.00	480,409.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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Oakman, Prof Jodi	**lives?** This project aims to build a contemporary post-covid model of sustainable work, through examining the necessary workplace conditions required to address current age and gender inequities. This project expects to generate new knowledge of changes to the work environment following the unprecedented large scale labour market disruption caused by the COVID-19. A model of the key requirements for supporting sustainable work will enhance our capacity to create more equitable conditions to address current age and gender inequities. This should provide significant benefits to the Australian economy through improved work participation rates of older workers and women and the associated productivity gains. **National Interest Test Statement** Optimisation of working conditions is critical to address current workforce shortages that are exacerbated by an ageing population and well-established gender inequities in the labour market. Increasing workforce participation of older workers could deliver significant benefits to Australian society, estimated at $48 billion per annum. This project will generate a comprehensive new body of rigorous evidence on 'new ways' of working emerging after the COVID-19 disruption. We will identify the key requirements to design and support sustainable work with a focus on age and gender. Key benefits will be resultant improvements in productivity and quality of work and in workforce participation, enhancing Australia's leadership in this area. Good quality and safe work are central to assisting Australia in meeting four UN Sustainable Development Goals: 'gender equality', 'good work and well-being', 'decent work and economic growth' and 'reduced inequalities'. Results will be disseminated to policy makers, workplace health practitioners and employers who can use project outputs to design, deploy and then evaluate the impact of sustainable working conditions on ageing worker retention and subsequent economic benefits.							
DP250101011 Dutton, Prof Jason L	**Finding the limits of oxidative capacity in hypervalent iodine chemistry** This project aims to develop new ways to convert simple hydrocarbon feedstocks into value added fine chemicals, through the development of the strongest known organoiodine oxidizing agents. This project expects to result in the discovery of new high oxidation state iodine compounds that will be the most reactive in their class to date, which will provide a widely sought capability to directly convert simple C-H bonds into more valuable C-X bonds, where X can be virtually any other element. The new capabilities that this project aims to develop may benefit Australian SME chemical manufacturers to better use Australia's abundant simple hydrocarbon resources and enhance the value of these molecules by 10- to more than 100-fold. **National Interest Test Statement** Converting chemicals from one type to another type is crucial for the further development of the multi-billion dollar worldwide chemical industry. For this industry to progress forward to developing more renewable products with less reliance on fossil fuels, invention of new techniques is needed. Natural gas and wood, both of which Australia has an abundance, are renewable materials that can act to fuel machines and industrial processes. However, at the moment, these materials are not used frequently in the Australian chemical industry. This project will develop new chemical agents and methods to convert these simple and cheap natural materials, worth cents per kilogram, into high-value fine chemicals worth more than $10 per kilogram, a value addition of multiple orders of magnitude. The results of this project will be of particular interest to many small-medium enterprises within the chemical industry in Australia and will be highly economical to produce and sell to an internal market thus benefiting the Australian economy. To maximise future translation, results from the project will be communicated through the project teams established networks in the Australian fine chemical production sector and CSIRO, as well as through social media channels and mainstream media to extend sector reach.	100,763.50	203,925.00	167,054.00	63,892.50	0.00	0.00	535,635.00
DP250101215 Reynolds, Dr Nicholas P	**Unravelling the role of amyloids in viruses** This project aims to investigate the commonality and nanoscale structures of aggregated proteins (amyloids) in viruses, generating new knowledge in the areas of virology and nanobiotechnology. Amyloids are found in every part of biology yet their roles in viruses are largely unexplored. Expected outcomes include elucidating the roles of viral amyloids, and how they affect the cellular responses of their hosts (livestock and human). Fundamental knowledge from this project should provide significant benefits to the agriculture industry by guiding the design	80,552.50	239,314.50	247,251.00	88,489.00	0.00	0.00	655,607.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	of amyloid targeting therapies to treat viral outbreaks in livestock. Beyond this project the fundamental knowledge gained may also aid our preparedness for future viral pandemics. **National Interest Test Statement** Large clumps of proteins, also known as amyloid fibres, have been associated with the disruption of many healthy functions within the body. Recent work from us and others suggests that they may also have important roles in how viruses can cause disease. However, how they contribute to viral function is unclear. In this project we will identify the function of proteins in viruses that cause significant problems for Australia's agriculture and healthcare systems. These viruses affect poultry and cattle, resulting in $5.5 billion costs due to animal losses, resulting in enormous socioeconomic and healthcare costs. As well as generating understanding of the role of these proteins in viruses, the project outcomes will pave the way for the future development of better treatment options for these viruses and assist to reduce the socioeconomically burden. We will also develop new materials for the simple, low-cost detection of these proteins, solving a long-standing challenge. We will use our extensive experience and connections in the biotechnology sector to maximise future opportunities to convert these materials into commercial diagnostic products. Our preliminary work has generated significant media attention and relationships with journalists at major Australian institutions (e.g. The Age, SBS, ABC) will be maintained to maximise public dissemination of project outcomes.							
DP250101228 Herries, Prof Andrew I	**The origins of our direct ancestor Homo erectus and its contemporaries** The project aims to investigate the origins of the early human species Homo erectus, our direct ancestor, and other contemporary early human species around 2 million years ago. The project expects to do this by expanding on our discovery of fossils of the oldest evidence of Homo erectus and Paranthropus from Drimolen Cave in South Africa. The project will generate new knowledge by the excavation and analysis of a newly discovered partial skeleton, thought to be Homo erectus, from Drimolen, and the dating of a newly discovered, unique skull from Kromdraai Cave. Expected outcomes and benefits of the project include a better understanding of the shared ancestry of the multi-cultural society that is Australia and all modern humans alive today. **National Interest Test Statement** Understanding how past species adapted to increasingly dry landscapes is critical to understand the future of adaptation to climate change in similar landscapes such as Australia. This project will address a major knowledge gap by helping us determine how the earliest representatives of our direct ancestor, Homo erectus, managed to survive a changing, more dry world compared to other relatives of contemporary humans and animal species that went extinct. We will take advantage of our teams unique set of recent discoveries; a partial Homo erectus skeleton, our discovered 2-million-year-old skull (the oldest example of this species), and fossils we recovered and believe represent other early human relatives. As well as increasing our understanding of climate adaptation, we aim to highlight the shared ancestry of the multi-cultural society that is Australia and all humans alive today, vital in an increasingly culturally divided world. The project findings will be used to engage the public in science by 3D printing the fossils and using them in outreach programs with Australian schools, as well as making them available to museums throughout the world for educational purposes. Australian students will be able to excavate these fossils on a field school and we will promote the research through media, podcasts and live streams so that people can watch the excavations and learn about the research on their direct ancestor as it progresses.	105,567.50	196,819.50	185,033.50	160,989.00	67,207.50	0.00	715,617.00
DP250101513 Forsdike, A/Prof Kirsty	**Creating Safer Sport Communities from Rural to Urban Australia** Sport is intrinsic to Australian culture, particularly in rural and regional communities. However, sport cultures can also perpetuate gender inequalities and violence. This project aims to examine and address gender-based violence across Australian sports communities. The project expects to develop an in-depth understanding of the gendered nature of violence in this context and how communities can address such violence. Using an interdisciplinary approach, mixed methods and collaborative co-design, the project's expected outcomes include a new evidence base, enhanced international interdisciplinary collaborations, and practice guides to improve the capacity and response of sport communities across Australia to address gender-based violence. **National Interest Test Statement** Gender-based violence results in significant harms for individuals and communities at great social and economic cost to Australia. As specifically identified in the Commonwealth of Australia 2022 National Plan, sport is	118,957.00	219,683.00	183,129.00	82,403.00	0.00	0.00	604,172.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	considered a key setting for prevention work, given its importance in Australian culture. Yet, international research shows high rates of violence in sport, up to 76% across psychological, physical, and sexual violence. Little is known about the prevalence or experience of gender-based violence in Australian community sport nor how to address it. This project aims to address this knowledge gap and in so doing to reduce gender-based violence through creating safer sports spaces in Australia. To do this we will work closely with those who have experienced violence in community sport to develop practical tools and guides for identification and response and the means to apply them across diverse sports spaces. These will be shared through an online information hub and community of practice, as well as within our existing extensive networks, to build the capacity of sports organisations and their communities to reduce gender-based violence. In the current epidemic of violence against women, addressing sport's gendered culture and practices will reduce the risk of gender-based violence for the benefit of all Australians.							
DP250103284 Tabain, Prof Marija	**The sounds of Papua** This study investigates speech in the Papuan languages spoken to the immediate north of Australia, which have very simple consonant and vowel systems, but which have been consistently reported as showing a very high level of language-internal variability. The New Guinea area is recognised as having the highest language diversity in the world, yet the sound systems of its languages are greatly under-studied. This project aims to produce the first ever large-scale phonetic studies of these superficially simple sound systems of Papuan languages. This is expected to provide a better understanding of human speech production in general. In addition, online dictionaries are planned based on the sound recordings from this project.	97,184.00	203,791.00	215,487.00	108,880.00	0.00	0.00	625,342.00
	National Interest Test Statement Papua New Guinea is Australia's closest geographical neighbour, and a country that has been recognized as having the greatest linguistic diversity in the world. However, the sound systems of its languages are greatly under-studied. This project aims to produce the first-ever large-scale study of speech sounds of Papuan languages. Compared to major European languages (from which most knowledge of speech production has been generated), Papuan languages tend to have very simple sound systems but show a tremendous amount more variability. Studying the potentials and limitations of this extreme variability will generate a much deeper understanding of the human capacity for speech. A highly significant outcome of this research will be a series of digital dictionaries, including audio recordings, produced in consultation with native language speakers and freely available online. This co-creation approach will ensure effective communication of the research outcomes to stakeholders. Other benefits of this project will be to help preserve these languages and reverse the language loss that is a legacy of colonization, and to help strengthen cross-cultural communication and foster understanding with one of our most important neighbours. Further, a better understanding of speech production has potential clinical implications for the treatment of speech disorders and for improving language technologies, which are currently mostly trained on major world languages.							
DP250104110 Herold, Prof Marco	**Unravelling the molecular basis of CD8+ T cell development and behaviour** The immune system is essential in disease resistance and resilience across diverse species and ecosystems. CD8+ T cells are a critical component of effective immunity. However, the molecular mechanisms governing their development and behaviour are poorly understood. This project aims to explore these mechanisms in unprecedented depth using an innovative in vivo CRISPR/Cas gene editing platform. Expected outcomes from this project include transformative insights into the genetic networks regulating CD8+ T cell immunity, and the establishment of an advanced novel platform for studying immune cell biology. This research promises significant benefits in advancing fundamental immunology and facilitating future studies in this field.	157,756.00	360,158.00	395,275.00	192,873.00	0.00	0.00	1,106,062.00
	National Interest Test Statement The immune system is made up of a complex network of specialised cell types. Despite a comprehensive understanding of the roles different cell types play within the immune system, the mechanisms controlling their development and how they move through the body to target infection are poorly understood. This is largely due to the complexity of studying these cells within their natural environment inside the body. Using advanced animal modelling and molecular techniques, this project will pioneer a new platform to track immune cells throughout their lifecycle, from early-stage cell growth to end-stage immune function. The dramatically enhanced insights into immune cell networks made possible by this new platform could pave the way for future development of treatments for both animal and human disease. This will benefit wildlife conservation efforts and public health, crucial for preserving both Australia's unique ecosystems and the well-being of its population. Further, the platform technology established in this project has the potential to be widely adopted across Australia and internationally. To ensure effective dissemination and translation of our findings beyond academic networks, we will collaborate with industry and policymakers to facilitate expanded investigation of all facets of immune cell biology, and position Australia globally at the forefront of science and technology.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250104587	**A Human Rights Implementation Assessment for Mental Health Law and Policy**	57,591.50	167,649.00	147,422.50	37,365.00	0.00	0.00	410,028.00
Gooding, A/Prof Piers M	This project aims to develop an implementation assessment framework to assess Australia's compliance, in mental health law, policy and practice, with international human rights law. This framework would be a world-first, created using participatory research methods that involve mental health service users as experts by experience, and therefore in accordance with norms of mental health policy and human rights. The framework would be tested in two jurisdictions at a critical moment of change in Australian mental health law and policy. The anticipated goal is to develop clear and measurable standards to help advance human rights compliance, which will benefit mental health service users, as well as their families, communities and governments.							
	National Interest Test Statement							
	Human rights violations are on ongoing issue in Australian mental health settings. Recent Royal Commissions highlight how service gaps and experiences of involuntary psychiatric intervention can undermine a range of rights, including people's right to the highest attainable standard of mental health. A major barrier to change is the absence of a human rights implementation assessment tool for mental health-related policy, practice, and law. This project will develop such a tool that offers a way to measure Australia's compliance with the Convention on the Rights of Persons with Disabilities ('CRPD'), creating a 'CRPD indicator'. The research team will use co-design methods so that people affected by rights violations can co-develop the indicator as experts by experience. A CRPD indicator will help analyse the commitment of governments to enact international human rights law in the mental health context. The indicator will be designed for governments and a range of civil society organisations, including associations for mental health service users, practitioners, families, and carers. Engagement activities will be held with these stakeholders throughout the project to ensure the indicator can be readily integrated into law, policy, and practice. Social, economic, and cultural gains will result from mental health services that better meet people's needs, improving health and safety for all Australians.							
	La Trobe University	890,931.50	1,955,715.50	1,908,948.50	911,372.00	67,207.50	0.00	5,734,175.00
Monash University								
DP250100026	**Controlling magnetism and topology with an electric field**	80,933.00	171,789.50	186,355.50	95,499.00	0.00	0.00	534,577.00
Edmonds, Dr Mark T	This project aims to investigate the prospects of electrical control of both magnetism and topology in new layered magnetic topological insulator structures. These structures can pass current without resistance losses, and are predicted to have magnetic properties that can be switched with an electric field, making them ideal for next-generation low-energy logic and memory. This project aims to create new layered magnetic topological structures, fabricate devices and study their electronic and magnetic properties. Expected outcomes of the project will be understanding of electrical switching of magnetism and topology, which will benefit the search for more efficient logic and memory devices for sustainable information technology.							
	National Interest Test Statement							
	Information and computing technology, built on 20th century technologies, currently consumes almost 10% of the world's energy, easily surpassing the aviation industry in CO2 emissions. The IT industry has identified a need for new technologies to reduce the energy used in both information processing and data storage. This project aims to address this need by designing new quantum materials where both the electronic switching and magnetic memory properties can be controlled with an electric field making them ideal for next generation low-energy electronics and memory. As a result, this project will develop intellectual property for such technologies, and falls within the Government's Research Priority "Advanced Manufacturing", and National Quantum Strategy. A combined platform for low-energy electronics and memory storage technologies would help revolutionize the >$400B IT industry, as well as sustainably continuing the IT revolution, and its numerous societal benefits. Additionally, the project will train the next generation of researchers in forefront nanoelectronics that will be essential in tomorrow's electronics technologies. Results will be promoted via public science websites aimed at a broad audience, and shared with industry/government through a series of workshops and site-visits in order to forge new partnerships to develop these new quantum technologies.							
DP250100063	**Unified Model Building and Estimation in Dynamic Econometrics**	100,236.50	202,833.50	203,723.00	101,126.00	0.00	0.00	607,919.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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Gao, Prof Jiti	The aims of this project are to develop a new dynamic system of econometric models that simultaneously address high-dimensionality, nonlinearity and time-varying features. It is expected that the project will provide empirical researchers from a wide range of areas with a unified model building and estimation procedure, and user-friendly computational techniques and software packages for them to tackle challenging empirical issues in identifying factors influencing Australian house prices, and forecasting national and global energy demand. Expected outcomes of this project include enhanced statistical capacity to empirical model building and estimation for energy, environmental change and health, which are high priority areas for Australia. **National Interest Test Statement** The research objectives of this proposal will bring unique national benefits to help address three pressing empirical challenges in the Australian context: (a) Modelling and analyzing the housing price and rent data to help address the housing affordability and availability issue, which is a central issue as outlined in the Federal Government 2024 Budget Papers; (b) Projecting energy demand response to global warming and macroeconomic impacts from climate change, which aligns with the Federal Government's Science and Research Priorities in energy and environmental change; and (c) Building a new empirical model for the unified estimation of fiscal multipliers, the analysis of the transmission mechanism and assessment of the distributional effects of monetary policy. We therefore believe that this proposal will result in scientific, economic, environmental, and social benefits to Australia. In order to promote these benefits, we will work with the Monash Data Futures Institute, E61 Institute at Macquarie University, and Institute for Climate Risk & Response at UNSW to organize workshops for this team to demonstrate the research outcomes, along with online computational algorithms, the data and software packages. The target audiences include empirical researchers and industry practitioners from different governmental organizations and industry partners, such as the Australian Bureau of Metrology, the Australian Bureau of Statistics, the CSIRO and the Reserve Bank of Australia.							
DP250100091 Fiorenza, A/Prof Luca	**Unravelling the secrets of tooth enamel: implications for human evolution** This project aims to investigate the intricate relationship between morphology, wear and internal tissues of primate teeth by utilising advanced 3D computer methods, engineering and food science tools. This project expects to generate novel insights about the form and function of dental enamel and its significance in mammalian evolution. Expected outcomes include refining theories and models on primate dental adaptations, enhancing capacity to build interdisciplinary collaborations, and the development of novel methods to examine chewing efficiency. This should provide significant benefits to Australian research in evolutionary anthropology, dental biomechanics and in food industry. **National Interest Test Statement** The aim of this project is to resolve the longstanding questions about the form, function and evolution of human and non-human primate dental tissues and their adaptive significance with respect to diet. The project contributes to Australia’s national interests by shedding a new light on the fundamental mechanisms of human tooth wear and its specific role in the efficiency and health of our masticatory system. It is our intention to establish a new hub in evolutionary dentistry, which may eventually have the capacity to promote and shape new national strategies in preventing tooth decays, teeth grinding and gum infections. Furthermore, the results of this project can potentially attract the interest of food industry for designing and manufacturing new food products with particular benefits for people with difficulty in swallowing. The findings will engage the non-scientific community about dental functional biology through outreach programs (such as visiting schools, participation in events that promote sciences awareness, and giving public lectures) and they will raise the profile of Australian science around the world.	108,913.00	241,611.00	223,970.50	91,272.50	0.00	0.00	665,767.00
DP250100158 Scammells, Prof Peter J	**Development of Allosteric and Bitopic Ligands to Tune Receptor Signalling** G protein-coupled receptors are the largest protein family encoded by the human genome and the largest class of drug target. These receptors are located on the cell membrane and transduce extracellular signals into physiological effects within the cell. This proposal aims to develop new chemical-biology probes for selectively targeting signalling pathways mediated by these receptors using the M4 muscarinic acetylcholine receptor as an exemplar. Novel ligands that possess different binding modes to the natural ligand (i.e. allosteric and bitopic ligands) will be developed and their potential to act as pathway selective agents that can	170,662.00	346,281.00	356,173.00	180,554.00	0.00	0.00	1,053,670.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	preferentially activate the desired signalling pathways and reduce unwanted side effects will be explored. **National Interest Test Statement** A significant challenge in the life sciences is understanding how chemicals outside the cell signal to proteins inside the cell, how this produces a biological response and how these responses can be controlled by synthetic molecules. G protein-coupled receptors (GPCRs) are the largest family of cell surface signalling proteins and are responsible for the regulation of numerous vital physiological functions. They are also an important drug target, with over 30% of currently approved pharmaceuticals acting at these receptors. Despite their importance, much remains to be learned about the way in which small molecules regulate GPCRs. This project will generate new knowledge on how these receptors signal into the cell to produce their associated biological effects and will also develop novel approaches to control these processes. These goals will be achieved by developing tool molecules which interact with these receptors via novel binding modes that confer greater selectivity for the desired biological response and reduce unwanted side effects. In terms of expected outcomes, the proof of concept achieved in this study has the potential to advance new paradigms for the development bioactive molecules with more selective modes of action. This would provide significant benefits to Australia such as the generation of new intellectual property as well as the catalysis of commercial/translational activity and has the potential to afford significant downstream health benefits.							
DP250100229 Steinfeld, A/Prof Ron	**Securing Privacy-Preserving Cloud Computation Against Active Attacks** This project aims to devise practical cryptographic tools for securing privacy-preserving cloud computation applications from active attack threats that go beyond eavesdropping. It expects to remove a fundamental barrier to secure deployment of privacy-preserving cloud computation technology. The project is expected to generate novel methods to significantly reduce the risk of cloud data privacy breaches which have plagued enterprise and personal data in recent years. Expected outcomes of the project include a practical active security toolkit for deployment in cloud applications such as privacy-preserving Artificial Intelligence services. This should benefit cloud services by bolstering privacy and reducing the frequency of data breaches. **National Interest Test Statement** Cloud computing applications, including Machine Learning and Artificial Intelligence, are vulnerable to data privacy breaches and cybercrime, which have been estimated to cost over $40B annually to the Australian economy. Homomorphic Encryption (HE) is an emerging encryption technology that allows computation on encrypted data and has the potential to significantly reduce the likelihood of cloud computing data privacy breaches. However, a major practical barrier is that existing HE technology only provides privacy against cloud data eavesdropping attacks, but is vulnerable to a more realistic class of attacks known as active attacks, involving malicious data modification and injection. This project will address this problem by devising novel practical cryptographic algorithms for safeguarding a range of HE-based cloud computation applications against active attacks, enjoying strong security guarantees. The project will develop and evaluate an open-source active security software toolkit suitable for integration with existing HE technology. The toolkit will help enable Australian businesses to securely adopt HE technology to their cloud computing applications and significantly reduce their risk of data privacy breaches. The project will also train sovereign research and development capabilities in a cutting edge cybersecurity technology.	65,275.00	176,044.00	166,726.50	55,957.50	0.00	0.00	464,003.00
DP250100230 McCormack, Prof Jon P	**Encoding Material Agency: Generative Design for a Sustainable Future** This project aims to revolutionise design methodologies by controlling the spontaneous dynamics of emergent systems with the guidance of new artificial intelligence techniques. The project expects to develop novel design processes that embed material behaviour within agent-based and machine learning computational design strategies. Expected outcomes of this project include new design knowledge demonstrated through architectural prototypes that fuse computational design, robotic craftsmanship, and biomaterials. This should provide significant benefits by opening new territories in architectural creativity while delivering a sustainable blueprint to minimise waste, curtail mineral reliance, and reduce the carbon footprint of construction. **National Interest Test Statement** Architectural design and construction are currently facing major sustainability challenges, as building construction accounts for 18% of the nation’s carbon emissions and 25% of materials end up as waste. Recent progress in robotic 3D printing offers promising solutions for sustainable material fabrication, especially using renewable biomaterials. However, current generative computational design systems struggle to effectively design with these	71,006.50	199,331.00	203,656.00	75,331.50	0.00	0.00	549,325.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	complex, heterogeneous materials. This project will accelerate digital transformation in Australia's creative industries by enabling practical realisation of radically new forms of design. By creating zero-emission, sustainable prototypes, it will promote awareness and adoption among design professionals, yielding environmental, economic, and cultural benefits and advancing Australian design innovation. Additionally, the project will help catalyse innovation in building construction and enhance the uptake of additive manufacturing. The research will be disseminated through architectural demonstrators, academic papers, online media, and open-source code libraries. Architectural demonstrator projects will showcase the research's direct application to architectural design. A public media hub will provide access to computer code, material processes, robotic configurations, and other essential data for fabricating with biomaterials, allowing others to replicate and expand on the project's research.							
DP250100242 Walker, Prof Jeffrey P	**Advancing high resolution soil moisture and vegetation dynamics monitoring** This project aims to address a gap in high resolution monitoring of soil moisture and vegetation dynamics by leveraging a new radar satellite capability about to be launched. Accordingly, this project expects to develop mature algorithms for accurate high resolution mapping of soil moisture dynamics, woody plant & forest biomass, and fire burn areas and their recovery under Australian conditions. Expected outcomes include subsequent use by operational satellite monitoring repositories and carbon accounting systems. Benefits arising from this high resolution time-series information on soil moisture and vegetation status include a powerful tool for understanding the dynamics of carbon stores and consequent climate change impacts on Australia.	107,800.00	217,150.00	187,899.00	116,648.00	38,099.00	0.00	667,596.00
	National Interest Test Statement A detailed and accurate soil moisture and vegetation monitoring capability is critical for the Australian carbon accounting system that is fundamental to Australia's response to reducing its carbon emissions, and hence contribution to global climate change. At the continental scale, high resolution soil moisture and vegetation dynamics information will also result in better climate and extreme weather prediction and the ability to assess effects of climate change on Australia. The new NASA-ISRO Synthetic Aperture Radar satellite mission called NISAR will provide the data needed to make this possible, but the algorithms to interpret the data still need to be developed and tested for Australian conditions. This project not only lays the foundation for the new satellite capability required to meet this need, but will also provide the necessary verification of NISAR soil moisture, burn and biomass estimates for Australian vegetation types and environments. The algorithms developed will be deployed globally through its NASA, ISRO and TERN partners and have the specific environmental benefit of gaining an understanding of carbon and climate change impacts in Australia. Results will be shared with application communities and policy makers through workshops, meetings, and conferences to achieve the best possible adaptation strategies. Successful demonstration of this radar sensing technology will also cement Australia's position as a leader in soil moisture and vegetation monitoring.							
DP250100262 Phung, Prof Dinh Q	**Can Machines Unlearn? Toward Next-Generation Safe Artificial Intelligence** This project aims to develop new principles, theories, and methods to unlearn undesirable artifacts from an Artificial Intelligence (AI) system. It expects to produce new knowledge, algorithms, tools, techniques, and intellectual property to a new field of machine unlearning. Expected outcomes can be used to efficiently implement responsible use of AI such as protecting users' data from existing trained AI models or safeguarding contents generated by them. It will enhance Australia's leadership in AI research and practice; deliver trustworthy technology which benefits not only scientific and translational knowledge advancement but also in accelerating AI innovations and filling the AI skills demand in Australia.	90,824.00	222,614.50	264,094.00	172,760.50	40,457.00	0.00	790,750.00
	National Interest Test Statement Our discovery project introduces strategies for "machine unlearning" in Artificial Intelligence (AI) systems, with an emphasis on vision and image/video understanding. This technology is central for developing safe and trustworthy AI, ensuring compliance with privacy laws, and providing Australians with the "right to be forgotten," allowing for the deletion of personal data, such as medical records, upon request. Furthermore, machine unlearning addresses the challenge of removing harmful content from AI applications, such as the generation of pornographic images, thereby safeguarding the ethical use of technology. By enhancing compliance with privacy laws and correcting harmful content, our project supports the broader use of AI in sectors such as healthcare, mining, energy, and public services in Australia. This will potentially lead to improvements in personal data security for all Australians, promoting a safer digital environment. Another advantage of our project is that it ensures AI systems can comply with regulations without the need to retrain from scratch, promoting a more sustainable technological environment. We will actively promote the outcomes of our research through public engagements, educational workshops, and industry collaborations. These efforts will make our advancements accessible and advantageous for all Australians, supporting Australia's leadership in ethical AI research globally.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250100272 Stuckey, Prof Peter J	**Formal Explainability for Neuro-Symbolic Artificial Intelligence** Artificial Intelligence (AI) is widely used in decision making procedures in many real-world applications, but weaknesses in the reasoning capability of black-box AI has led to the development of neuro-symbolic AI combining the strength of black-box learning with reasoning. This project aims to develop methods to formally reason about and explain decisions of neuro-symbolic AI systems. Expected outcomes of this project are effective methods to explain to humans why a neuro-symbolic AI system makes a certain decision, using formal methods so that explanations are guaranteed to be correct. This should provide significant benefit since widespread use of neuro-symbolic AI will require the trust engendered through explainabilty. **National Interest Test Statement** This project will create the first methods able to explain the behaviour of next-generation neuro-symbolic AI systems, enabling users and developers to ask for explanations of decisions made by the systems. This will allow Australian companies developing and utilizing AI systems to evaluate, correct, and improve them. This advancement is crucial for Australia's economic and societal progress as it will increase reliability and trust in AI systems, which will be used ubiquitously, and sometimes in safety- and privacy-critical applications. AI is vital to Australia's future prosperity, and estimated to be worth at least AU$315 billion to Australia by 2028. But despite the recent success, AI systems can be brittle, biased or make drastically wrong decisions. In order to take full advantage of the AI revolution, Australians need to trust the AI systems that make use of, which the results of this project will help make possible. The research outcomes of this project will be made widely available as easy to use, well documented open-source software packages for evaluating AI systems, thus making it simple for developers of neuro-symbolic AI systems to interrogate the reasons why their systems make certain decisions, and hence improve them. We will run tutorials at major AI conferences to disseminate the results of the project as well as through publications.	84,232.00	168,895.00	173,751.00	89,088.00	0.00	0.00	515,966.00
DP250100291 Good-Jacobson, Prof Kim	**Investigating how nuclear bodies may establish cellular memory** This project aims to determine how nuclear bodies establish cellular memory. This project expects to generate new knowledge in molecular programming of immune cells, by leveraging interdisciplinary collaborations and using cutting-edge high-resolution microscopy, gene and protein knockout systems, as well as cell and chromatin biology techniques. Expected outcomes include new principles of how cells are reprogrammed for enhanced function & the ability to adapt to microenvironmental change for long-term survival. This should provide significant benefits such as knowledge creation that may lead to development of technology to reprogram cell function across many species, as well as enhancing Australian research capacity and recognition. **National Interest Test Statement** The ability of cells to adapt to changes in their environment is critical for sustaining life. This project uses the immune system as a model to investigate how cells learn from, and retain memory of, their experiences. This project will study how this is controlled by the ‘brain’ of the cell and how this cellular memory may help cells to better adapt to new experiences. While immune cells are being used to understand these phenomena, the findings from this project may be used to understand other cell systems of the body. The knowledge from this project can be used by bioengineers and industry partners to develop new tools to promote different types of cell functions. In the long term, it could lead to the design of better vaccines that provide long-lasting antibody responses in animals and humans, providing future benefits to prevent infectious diseases and for Australian industries that rely on animal health for food production. Research outcomes will be promoted to researchers, industry leaders and the public through conferences, public lectures, and publications, and could lead to increased health and agriculture industry engagement.	114,000.00	241,500.00	236,000.00	108,500.00	0.00	0.00	700,000.00
DP250100464 Mackintosh, Prof Andrew N	**How does glacier retreat threaten mountain biodiversity?** Glaciers are retreating worldwide and are expected to disappear or decline by the end of century. The impacts of this ice loss on sea level rise and river flows are the focus of much attention. In contrast, the biodiversity impacts resulting from glacier retreat are poorly understood and existing evidence is compromised by direct human influences. Here, we focus on a globally unique setting with pristine biodiversity - Heard Island in the Sub Antarctic - a World Heritage listed Australian	140,627.50	273,553.50	217,150.00	84,224.00	0.00	0.00	715,555.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	territory. We will assess and generalise the impacts of glacier retreat on biodiversity at Heard Island, helping to understand the future of indigenous mountain biodiversity worldwide, and securing the value of this unique asset for future Australians. **National Interest Test Statement** Worldwide glacier retreat due to global warming is causing sea level rise and changes in global water availability, risking coastal assets and geopolitical security in Australia. However, a less understood but critically important risk of glacier retreat is on mountain biodiversity worldwide. As ice retreats, exposing bedrock and new environments to colonisation, and removing ice-associated habitats, biodiversity devastation plays out. Heard Island, Australia's only glacier-covered territory is uniquely at risk because it contains a largely pristine ecosystem unaffected by local human impact. Our project will assess the changing biodiversity values of Heard Island which underpin its World Heritage status, and the impacts associated with current and projected glacier retreat. Alongside scientific publication and articles written for the public, our work will form the basis of policy briefs to government, outlining the impacts and risks posed by glacier retreat, and advising on strategies for securing its unique value. Doing so will help to ensure that Heard Island remains one of Australia's most important environmental assets for future generations of Australians.							
DP250100501 Wong, Prof Bob B	**Mind bender: how neuroactive drug pollution impacts wildlife cognition** This Project aims to investigate how widespread contamination by neuroactive drugs affects wildlife cognition and survival, and thus, the ecological communities they inhabit. It expects to generate new mechanistic insights into the emerging threat of pharmaceutical pollution across different scales of ecological complexity, from controlled laboratory experimentation to studies in the wild. Expected outcomes include new knowledge of direct relevance to chemical risk assessment and regulation. Findings should contribute significantly to understanding how wildlife respond to palpable environmental hazards, and enhance the evidence base for managing and securing biodiversity and vulnerable water resources—both in Australia and globally. **National Interest Test Statement** Chemical pollution is among the fastest-growing and most insidious causes of global environmental change. Pharmaceuticals, when they enter waterways and accumulate in the brains of wildlife, are of particular concern. Despite this growing threat, no research has considered the impact on animals' cognition, which governs all their behaviour in response to their surrounds. This Project uses ecologically important fish species to test how pharmaceutical contaminants affect the cognition and behaviour of wildlife, in a coordinated suite of world-first laboratory and field experiments. Beyond the clear advances in new science, it will fill a serious practice and policy vacuum with information for identifying and managing an emerging type of pollution that poses serious ecological, health, and economic concerns—as underscored by recent fears over the contamination of drinking water. Our findings will enable predictions of how pharmaceuticals can put at risk fragile ecosystems and the unique species they support, informing the secure management of freshwater resources. By training new researchers, this effort will expand Australia's reputation and capacity for conserving precious natural assets both locally and globally. The Project will draw on our team's consultative networks with community stakeholders as well as its strong links with national and international regulatory agencies, yielding translatable discoveries to inform risk assessment and regulation in this vital domain.	89,598.50	185,603.50	180,272.50	84,267.50	0.00	0.00	539,742.00
DP250100659 McGeoch, Prof Melodie A	**Thinning of nature** This research aims to understand how the declining abundance of life across foodwebs will affect the stability of ecosystems and the services they provide. Using pollination and seed dispersal foodwebs we will simulate and then test using real-world cases what happens to their properties and function when they lose individuals. The project expects to generate new knowledge about the resilience and vulnerability of ecosystems, using an innovative combination of methods. Expected outcomes include enhanced capacity to integrate these areas of expertise, and powerful models for predicting the consequences of environmental change. This should provide significant benefits including Australia achieving the goals of its Strategy for Nature. **National Interest Test Statement** This project is about the problem that when individual plants and animals are lost from ecosystems, the services that they perform, such as pollination and seed dispersal, are also lost – impacting nature and agriculture. Such	127,057.00	256,660.50	254,673.50	234,034.00	108,964.00	0.00	981,389.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	losses are expected under extreme climate change and land degradation. The research addresses the gap that the mass loss of individual plants and animals and the interactions between them have not yet been included in predictions of how climate change will affect nature and people, in Australia and elsewhere. The project aims to address this gap through analytical and computational innovation. The environmental benefits of this new research are being able to identify where in Australia this could happen, in which ecosystems, and to recognize its early signs so that government and land managers can intervene before the loss becomes irreversible. We will use our deep and well-established relationships with agencies responsible for nature in Australia and internationally to inform and guide the policy and management that underpins investment in nature to sustain people, agribusiness and tourism. We will build on our track record of experience on advisory committees, leading science-policy reports and volunteering to translate the outcomes and advance understanding of the research outcomes.							
DP250100785 Simpson, Prof Dayna	**Supply chain governance solutions for the gig economy** This project aims to identify ideal structures for business, independent workers and platforms, to ensure worker protection and service quality in the gig economy. Business depend on the gig economy for hiring flexibility and to lower costs. Gig work lacks the protection of other employment however with higher risks of worker injury or exploitation. Traditional buyer-supplier systems ignore independent workers and new buyer-supplier structures are needed to address a critical gap in labor governance. This Project uses an interdisciplinary approach to identify systems that achieve dual goals of worker protection and buyer flexibility. The Project's expected outcomes include better business oversight of gig work performance and protections.	57,711.50	137,167.00	123,067.50	43,612.00	0.00	0.00	361,558.00
	National Interest Test Statement Gig-economy work is a rapidly growing form of labour. Gig-labour has been used increasingly by Australian business as it is more flexible, lower cost and scalable. Online platforms (e.g. Uber) organise labour for businesses by using 'self-employed' gig-workers. Gig-workers' contractor status, however, allows business and platforms to avoid labour protections provided to other forms of employment. As a result gig-work has less oversight, workers experience higher risks of injury, income insecurity, and discrimination, and service quality is lower. Firms and their supply chains can bridge the labour protections gap faced by gig-workers, however, especially given gig-work provides a growing range of services in firms' supply chains. The Project will investigate the role and perspectives of key stakeholders (business, platforms, workers, consumers) in gig-work labour protections. It seeks to identify supply chain solutions that maintain the flexibility and scalability of gig-based labour but also ensure minimum fair, safe working conditions. The Project improves Australian workers' access to sustainable gig-work which is a growing source of income for many. It also supports the economy by reducing gig-labour risks for industry which improves the resilience of Australia's supply chains. Project outcomes will inform recent government changes to the national employment system, and will be shared with industry, workers, and the international academic community.							
DP250100935 Findlay, A/Prof Scott D	**Towards atomic scale magnetic field mapping and measurement** This project aims to map and measure magnetic fields at the fundamental atomic scale by building on new structure determination algorithms in electron microscopy and a new lens design enabling high resolution imaging of magnetic materials. This project expects to generate new knowledge about the structure of magnetic materials that will underpin next-generation technologies such as data storage and magnetic sensors. Expected outcomes of this project include new methods for characterising magnetic structures at smaller length scales than hitherto possible. This should benefit academic and industrial researchers for whom characterising magnetic structure is essential to improve capacity and energy efficiency of digital storage technologies.	93,592.50	187,574.50	188,203.00	94,221.00	0.00	0.00	563,591.00
	National Interest Test Statement With Australians generating more digital data than ever, the need for increased data storage capacity with improved energy efficiency grows every year. To maintain pace with this ever-increasing need requires new technologies that maximise the use of the magnets that underpin this technology. Developing such technologies requires improved understanding and characterisation of magnetic structures on increasingly small length scales. This project seeks to address a research gap in characterising magnetic structures by developing imaging theory and analysis tools to measure and map magnetic fields down to the fundamental atomic scale. By training the next generation of researchers and strengthening collaborative links with researchers in the USA and Japan, this project will help keep Australia at the forefront of advanced materials characterisation. By developing our understanding of magnetic materials, this project will provide tools and insights that will potentially lead to environmental benefits by enabling new developments in power-efficient electronics, and economic benefits by enabling improvements in data storage capacity. The algorithms produced by this project will be promoted through open-source software and workshops to both academic and industrial researchers for whom characterising magnetic structure at this scale provides the insights necessary to build the next generation of digital data storage technologies to meet the ongoing needs of all Australians.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250100953 Henckels, A/Prof Caroline	**National Security Exceptions in International Trade and Investment Treaties** This project aims to critically analyse national security exceptions in international trade and investment treaties, which states can invoke to justify treaty non-compliance. A recent proliferation of disputes reveals that some treaties' exceptions can be used as a guise for protectionism or other improper conduct, while others cannot be relied on when genuine security concerns arise. Expected outcomes include recommendations for negotiating, reforming and interpreting treaties that appropriately balance security concerns with liberalised trade and foreign investment protection. This will significantly benefit Australia by enabling it to take action to protect national security and by safeguarding the interests of Australian businesses.	34,837.00	138,436.00	198,456.00	136,431.00	41,574.00	0.00	549,734.00
	National Interest Test Statement Governments are increasingly invoking national security to justify non-compliance with international trade and investment treaties, igniting geopolitical tensions and revealing problems with these treaties' design. Many treaties permit states to rely on security as a guise for protectionism or other improper conduct with little or no judicial scrutiny, undermining the regime's objective of global economic development. Yet, other treaties do not permit states to act in relation to contemporary security threats such as energy security and cybersecurity, undermining their sovereign right to protect public welfare. This project, the first of its kind worldwide, will develop strategies for treaty drafting that ensure that global trade and investment are not hindered by spurious invocations of security, while safeguarding states' ability to respond to genuine security threats. The project will benefit Australia's economic interests by ensuring that Australia can protect its security interests without legal liability and by minimising the risk that other states will improperly invoke security to justify measures harming Australian businesses operating abroad. More broadly, the project will benefit the international community by proposing durable solutions to remedy the regime's problems. The project's recommendations will be disseminated to policymakers in Australia and internationally (with the assistance of the United Nations) to maximise their adoption.							
DP250101009 Premaratne, Prof Malin H	**Avant-Garde Kirchhoff's Laws Equivalent for Quantum Thermal Transistors** This project aims to formulate Kirchhoff's Current and Voltage Laws (KCL&KVL) equivalents tailored to quantum thermal transistors, which we pioneered. Drawing inspiration from the transformative impact of traditional KCL&KVL, which revolutionized the electronics industry, our endeavour seeks to extend these principles to the realm of quantum thermal transistors governed by the Schrödinger equation. This innovative approach will yield a unified set of KCL&KVL applicable to traditional and quantum thermal transistors, paving the way for advanced hybrid thermal control circuitry. The resulting software and design principles will catalyze advancements in electronics, including hybrid thermal management systems and chip-scale heat distributors.	98,481.50	192,697.00	188,431.00	94,215.50	0.00	0.00	573,825.00
	National Interest Test Statement Transistors are electronic switching devices that are ubiquitous in modern society. As the technology matured, the observation that the number of transistors in a dense integrated circuit doubled every 18–24 months became known as Moor's law. For a long time, Moore's law predictions were true yearly, but not anymore. Traditional transistor technology has hit fundamental limits, mainly due to heat extraction issues. This project will address this challenge by developing new transistor technology that can increase the density of traditional transistors by providing an active thermal management pathway via thermotronic circuits powered by quantum thermal transistors. The proposed technology heavily depends on quantum effects, a critical technology the Australian government is actively targeting and promoting. This project will generate fundamental knowledge on analyzing transistor circuits built using both traditional transistors and quantum thermal transistors for the thermal management of conventional electronics. The resulting hybrid technology will be faster and more efficient. The resulting circuit laws, modified simulation software and the new hybrid thermotronic technology, will inform further research in Australia and help the Australian defence industry, universities and the global strategic microchip ecosystem. The associated intellectual property will enable licensing opportunities and commercialization pathways to boost critical manufacturing capability in Australia.							
DP250101167 Kitchen, A/Prof Marcus J	**X-ray Scatter Imaging: Vast Information with Minimal Radiation** Aims: This project aims to develop new X-ray imaging technology to provide detailed information about microstructures deep inside of objects using minimal X-ray exposure. Significance: This project expects to generate new knowledge in X-ray imaging using innovative methods that decode information created when X-rays scatter from small objects. Expected outcomes: Expected project outcomes	105,000.00	220,000.00	230,000.00	115,000.00	0.00	0.00	670,000.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	include the development of high-resolution, three-dimensional imaging technology that gives vastly more information than today's X-ray scanners, using safe radiation levels. Benefits: This should provide significant benefits in many industries, including improved sensitivity for disease diagnosis and detection of illicit substances in airport security.							
	National Interest Test Statement							
	X-ray imaging is used everywhere from airport baggage handling to medical imaging. However, image contrast can be poor because it only utilises X-ray absorption properties. X-ray exposure can be harmful, causing illnesses including cancer, leukemia and infertility. Matter also scatters X-rays and this property can provide enormous amounts of information about an object, yet this information is not captured by conventional X-ray imaging. Scattering can reveal the size, shape, orientation and surface area of otherwise invisible microstructures. We aim to show that this vast information can be captured using new scatter-based X-ray imaging technology, and that scatter can help reduce radiation exposure by factors in the thousands. Scatter information usually requires specialised X-ray sources and optics to be detected, but we aim to demonstrate that scatter-based imaging can be achieved using table-top X-ray systems for real-time, low-dose imaging with micron-scale resolution. The potential benefits of this technology include enhanced detection of illicit substances in airport security scanners, and safer X-ray imaging with greater diagnostic capability. The vast applications of this technology mean it could also have great commercial benefits for developing new X-ray imaging scanners. Successful outcomes will be promoted to potential industry partners and clinicians, with the aim of translating this technology for industrial and medical use.							
DP250101202	**A molecular investigation into marsupial T cell mediated immunity**	147,878.50	294,484.50	297,106.00	150,500.00	0.00	0.00	889,969.00
Le Nours, A/Prof Jerome	Over ~ 400 million years, the immune system of vertebrates has constantly evolved to protect hosts from pathogens. Whilst much in-roads has been made in understanding immunity in humans and mice, there is a major knowledge gap in understanding how immunity operates in other mammalian species. This project aims to investigate T cell mediated immunity in marsupials and expects to generate new knowledge on a novel type of immune cell that is only found in marsupials. The expected outcomes of the project include a better understanding of the molecular correlates of immunity in marsupials. This should provide significant benefits for wildlife conservation in Australia.							
	National Interest Test Statement							
	The immune system has an essential role in health, through detecting threats in the environment and protecting against diseases. Most research on the immune system focuses on humans and mice, leaving a gap in our understanding on how the immune system works in other animals. This project will increase our knowledge of a novel type of immune cell that is found only in marsupials (e.g. kangaroos) and monotremes (e.g. platypuses). Understanding how these cells function and detect threats should lead to novel biotechnological developments. The outcomes of this project could therefore inform the development of treatments for animal diseases and protect Australian native animals threatened by disease (e.g. Tasmanian devils with facial tumour). This could ultimately fill a significant unmet need for conserving wildlife and provide a commercial and environmental benefit for Australia. The research outcomes will be promoted and shared with communities, non-governmental and governmental organisations (Wildlife conservation), and policy makers through a series of workshops, meetings, and seminars, enabling them to collaborate on implementation.							
DP250101283	**Safeguarding posthumous digital data: understanding Australians' views**	90,750.00	206,750.00	207,500.00	91,500.00	0.00	0.00	596,500.00
Petersen, Prof Alan R	This sociological project aims to understand Australians' views on how posthumous data is or should be managed after people die or become incapacitated. The team expects to generate new knowledge of people's views regarding the fate of personal data using community-based workshops, interviews, and a public forum. Expected outcomes of the project include a new concept of technological citizenship, enhanced international collaborations, and the training of researchers in a new field of vital importance to Australians. This should provide significant benefits such as deep understanding of the factors that shape people's views on posthumous data that will assist estate planning, and evidence-based support for effective strategies and policies.							
	National Interest Test Statement							
	Seventy percent of Australians are unaware of what happens to their digital data (e.g. online accounts, social media profiles, images, passwords) in the event of death or incapacity. Families are having to manage the digital							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	data and assets of loved ones with few resources at the most difficult time of their lives. But unless appropriately managed and secured, this data has the potential to be stolen and used for identity theft, fraud, or to create fake images. The project will investigate Australians' views on how posthumous digital data is and should be managed after people die or become permanently incapacitated. It will produce new evidence of people's views and practices regarding posthumous data, using a series of stakeholder-oriented activities designed to ensure that practical strategies are aligned with community needs, priorities and values. The findings will assist the eSafety Commissioner, Services Australia, the ATO, and other organisations and companies that collect, store, and share data. They will provide the basis for policy and guidelines for government departments, patient groups, and businesses (e.g. legal services) on managing posthumous data, create tools to enable families to safeguard individuals' data following their death or incapacity, and foster informed community debate on key issues. The outcomes will be widely communicated through public events, including live-streamed forums, podcasts, news articles, and open-access resources.							
DP250101360 Huang, Prof Aijun	**As-printed titanium alloys with exceptional strain hardening** This project aims to make breakthrough developments of additively manufactured titanium alloys by utilising a new strain hardening mechanism. The project expects to generate new knowledge on how to effectively strengthen the commercial alloys' microstructure and achieve superior damage tolerance. Expected outcomes of this project include an enhanced capacity to develop and commercialise titanium alloys with balanced mechanical performance that surpasses current versions. This should provide significant benefits, such as wide adoption of 3D-printed products in aerospace, transportation and energy industries and enhancing Australia's international standing in cutting-edge research on advanced manufacturing.	89,087.50	173,104.50	161,721.50	77,704.50	0.00	0.00	501,618.00
	National Interest Test Statement The project aims to develop innovative, high-strength 3D-printed titanium materials for use in industries such as aerospace, transportation, and energy. Current 3D-printed titanium alloys are prone to damage, limiting their application in critical components for airplanes, cars, and power plants. This project seeks to create more resilient titanium alloys that are less susceptible to breakage. The enhanced materials will significantly benefit Australian companies by enabling the production of safer, more efficient products through 3D printing. This technology will allow for time and cost savings, as well as the creation of intricate and customized designs. The outcomes of the project will advance the local manufacturing industry, leading to superior products, increased profitability, and fostering economic growth and innovation in Australia.							
DP250101387 Fang, A/Prof Xiaoping	**Internationalizing Epidemic Control in China, 1912–2022** This project aims to investigate the historic origin of China's international roles and practices in epidemic control and the government's involvement with domestic epidemic control schemes over the past century. It expects to generate new knowledge about ways the power of the Chinese state is exercised using historical and comparative approaches. Expected outcomes include fostering interdisciplinary collaboration between medical and socio-political historians by working with an international relations scholar to contribute to the study of the politics of epidemic control. This will significantly enhance the capacity of the Australian Government to respond to future global crises in which China is a prominent stakeholder.	32,500.00	82,500.00	87,500.00	72,500.00	35,000.00	0.00	310,000.00
	National Interest Test Statement We live in a globally interconnected world where diseases spread rapidly. The rise of China as a major geopolitical and economic force globally means that the actions of the Chinese state in response to public health emergencies influence outcomes both within and well beyond its borders. China is Australia's major trading partners and the world's second largest economy pursuing its geopolitical ambition in the Asia-Pacific region. This project adopts a multidisciplinary approach to investigate the exercise of the power of the Chinese state in epidemic control to pursue global and domestic outcomes over the past century. It will significantly advance historical and contemporary knowledge of how China responds to pandemics and their resulting public health emergencies. This project's social and cultural benefits are intended to improve understanding of China's potential responses to future pandemics, which will be of benefit to Australian (and international) scholars and health policymakers. This study will also help the wider public understand the geopolitical impact of pandemics and a new surveillance culture facilitated by AI and digital surveillance technologies. Results will be shared with the Australian public through the creation of a new database on the history of epidemic control, published media commentaries, and a project website.							
DP250101586	**Inducing essential bacterial enzymes to self-destruct** Antimicrobial resistance is a looming crisis. Breakthrough cell biology is needed to	129,656.50	264,722.50	278,030.50	142,964.50	0.00	0.00	815,374.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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Xie, Dr Stanley Cheng	identify new targets and new mechanisms of inhibition. This project aims to probe the susceptibility of bacteria to a novel “reaction-hijacking” mechanism, which has recently been discovered by our team. This work expects to catalogue targetable enzymes in bacteria and probe the inhibition mechanism using chemical, structural and cell biology approaches. Expected outcomes include the discovery of powerful chemical probes to study key metabolic enzymes in bacteria and a blueprint for the design of selective reaction-hijacking inhibitors. In the longer term, this work will underpin new therapeutic avenues for bacterial infections of humans and animals.							
	National Interest Test Statement							
	Australia’s National Antimicrobial Resistance Strategy recognises that an ever-increasing number of bacterial infections cannot be effectively treated due to the development of antimicrobial resistance (AMR). For example, ~40% of veterinary antibiotic treatments used in Australia work by blocking protein synthesis, but these treatments are at risk due to AMR, threatening Australia’s food security. We are exploring a new class of antibacterial inhibitors that target protein synthesis - in a new and unexpected way. We have discovered a class of molecules that blocks a key machinery in the protein synthesis pathway by “hijacking” a naturally occurring biochemical reaction in the cell. These molecules can induce the enzymes to generate their own inhibitors, leading to the death of the cell. We seek to understand the chemical determinants of this unusual "reaction hijacking" mechanism, so that we can design compounds that are more potent and specific for bacterial pathogens. This work will lead to new candidate antibiotics for treatment of animal diseases important to Australia. The project outcomes will be shared with industrial partners through meetings and conferences. In the longer term, this work could provide new routes to therapeutic interventions for bacterial infections of food animals and plants, and of humans. The work will generate new knowledge, build networks internationally and underpin new biotechnology applications to overcome global challenges in agriculture.							
DP250101606	**Mitochondrial apoptosis signals more than death in innate immune cells**	141,500.00	280,500.00	276,500.00	137,500.00	0.00	0.00	836,000.00
Lawlor, A/Prof Kate E	This project will investigate how mitochondrial cell death is triggered in innate immune cells to microbial threats and the downstream molecular and cellular events that control the immune response. This project is expected to generate new knowledge surrounding how mitochondria respond to environmental threats using advanced genetic, molecular and cell biology approaches. Expected outcomes include an enhanced understanding of cell death signalling networks, advances in cell biology research methods and new interdisciplinary collaborations. This should provide significant benefits to our basic understanding of how mitochondria shape immune responses and identify ways to manipulate cell death for future research and commercial applications.							
	National Interest Test Statement							
	All animals rely on an immune system to defend against damage and infection. Immune cells use different cell suicide programs to regulate this process. We will address a major knowledge gap by providing a fundamental understanding of the biological processes that control the lifespan of innate immune cells. These immune cells are vital to maintain tissue health by controlling the level of inflammation. This project will reveal a crucial way the body attempts to maintain status quo when challenged by its environment. It will enhance Australia’s research capacity by combining immunology with molecular and cell biology to expand our understanding of how the conserved process of cell death affects the immune system. As this work will be shared via research papers and presentations, and via news, social media and public lectures, it will boost Australia’s profile and direct future research. While still in the discovery phase, this research could eventually bolster Australia’s biotechnology sector via the creation of new tools. By identifying therapeutic targets, it may lead to immunomodulatory drug development to protect Australia’s $34.6 billion livestock industry from threats, such as respiratory infections in cattle that cause >50% of all feedlot deaths. Alternative strategies to tackle antimicrobial resistance in agriculture is a major priority according to the National Antimicrobial Resistance Strategy, so this work will have long-term economic benefits to Australian society.							
DP250101727	**Simple one pot bioconjugation using a novel molecular glue**	90,000.00	180,000.00	180,000.00	90,000.00	0.00	0.00	540,000.00
Johnston, A/Prof Angus P	Nanoparticle, polymer, protein and nucleic acid conjugation is critical for the fields of biosensing, synthetic biology, and drug delivery. However, most current bioconjugation techniques require chemical modification of biomolecules. This is costly, synthetically challenging, and can impair biological function. In this project, we will develop a family of proteins that act as molecular glue, allowing polymers, proteins, nucleic acids, and nanomaterials to be linked without the need to chemically alter the biomolecules. We will demonstrate the power of our novel conjugation technique by synthesising targeted nanoparticles, that are loaded							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	with DNA and sensors that will allow us to quantify subcellular delivery of cargo. **National Interest Test Statement** This project will develop a simple, cheap and effective new to join biomolecules together. Biomolecule conjugation (joining two biomolecules, such as DNA, proteins or nanoparticles together) is essential for making better biosensors, more efficient drug delivery systems and develop cutting edge applications of synthetic biology. Current methods of bioconjugation are expensive, time consuming and can lower the activity of the biomolecules. Biomolecules are a high value manufactured items, and there is a significant potential to value add to Australia's world leading expertise in the biotech sector. The project will expand Australia's knowledge base in biotechnology through the training of interdisciplinary researchers. It will also develop intellectual property that will benefit the emerging Biotec and MedTec industries in Australia, and will provide significant economic, commercial and healthcare impact. We will use out strong links with local and global biotech companies (Starpharma, Patrys, Halozyme, Avidity) the help translate these fundamental discoveries into commercially relevant products.							
DP250101768 Rosa, Prof Marcello	**Are Brain-Wide Activity Patterns Governed by Simple Connectivity?** This project will test key predictions of Neural Field Theory (NFT), an attempt to explain how patterns of neural activity are generated and propagate across the brain. It will use advanced optical technologies that afford high spatial and temporal resolution, important for critical tests of NFT. Among its aims is to investigate the potential to control brain-wide dynamics through resonance dictated by the brain's geometry, one if the implications of NFT. It will lead to a better understanding of the roles of neural connections and brain geometry in generating activity patterns. The project may pave the way for future more reliable stimulation techniques, with implications for cognitive enhancement, healthy aging, and mental health. **National Interest Test Statement** All of our thoughts, sensations, actions, and emotions arise from various patterns of neural activity expressed across the brain through space and time. This project seeks to understand how these patterns are shaped by the anatomy of the brain by testing key predictions of a well-established mathematical model of brain-wide activity called Neural Field Theory (NFT). Specifically, the project aims to determine how the propagation of neural activity is fundamentally constrained by the brain's geometry (i.e., its size and shape) and how brain-wide activity can be amplified by periodic brain stimulation applied at the right location and frequency, triggering resonant responses (similar to tapping a pond repetitively to reinforce waves). Current evidence supporting NFT relies on relatively imprecise non-invasive imaging techniques in humans. This study will scrutinize the universality of NFT by examining species separated by over 87 million years of evolution: the mouse and the marmoset. This will be achieved through the application of state-of-the-art optical technologies for precise monitoring and control of brain-wide activity, available only in animal species. This study will deepen our understanding of the roles played by neural connections and brain geometry in shaping neural dynamics. It also holds the potential to establish collaborations with the Australian MedTech industry to develop robust stimulation devices for cognitive enhancement.	110,500.00	256,592.00	272,721.00	221,508.00	94,879.00	0.00	956,200.00
DP250101843 Kamruzzaman, A/Prof Liton (	**Discovering the sustainable size of cities** This project aims to theorise sustainable city sizes and develop a model to assess the impacts of impending high-speed rail on achieving these sizes across Australian cities. The project will generate new knowledge on city size dynamics, employing an innovative method that blends interdisciplinary approaches. Expected outcomes include a theory of sustainable city size, Australia's first national level urban/transport model, a novel method informing high-speed rail planning, and a new approach to population distribution and urban growth management. The outcomes benefit Australia by reducing the burden of imbalanced population distribution (costing $200B/year) through a proactive planning of $200B investment in high-speed rail. **National Interest Test Statement** Australia faces a $200B annual economic burden due to a mismatch in population distribution, leading to excess pollution, congestion, crime, and resource wastage. The population is predicted to double by 2066, worsening these issues. The Australian Government urges aligning the population with city capacity but struggles to find effective policy levers. This project aims to optimise the impending Australian high-speed rail network as a key policy tool to redistribute the population towards more sustainable city sizes. New methods are developed that go beyond conventional inter-census growth rates, employing a strategic approach to assess how new infrastructure might affect growth rates to determine sustainable city sizes. The project benefits Australia by ensuring the effectiveness of the $200B investment in high-speed rail, saving $5.5B annually in rental expenses,	42,794.00	151,398.50	224,020.00	115,415.50	0.00	0.00	533,628.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	encouraging 44K more commuters to walk to work with health and environmental benefits, boosting community volunteering by 164K people, and saving millions annually by avoiding duplication in transport model development. It also provides new tools for pro-active population distribution management in Australia. The approach to impact builds on the CIs' extensive academic and policy networks. Project findings will be shared through policy and scientific advisory groups, experts involved in Delphi surveys and workshops, media releases, and policy briefs with local, state, and national governments for implementation.							
DP250101863	**Many ways to die: unveiling the hidden diversity in ageing**	106,544.00	247,891.00	238,202.50	96,855.50	0.00	0.00	689,493.00
Mirth, A/Prof Christen K	This project aims to investigate how organ failure during ageing leads to cause of death, and why individuals die of different causes. Understanding how an individual's genetic make-up interacts with influences from the environment, like diet, to alter the ultimate cause of death is lacking, but is crucial for advancing knowledge of why animals age and designing strategies to ameliorate health decline during aging. This project aims to expand ageing theory to include individual and environmental variation in cause of death. Benefits include enhanced understanding of the evolution of ageing and long-term improvements for the development of healthy ageing interventions.							
	National Interest Test Statement							
	Everyone wants to live a long and healthy life. However, the decline in organ function that happens with ageing and eventual death is inevitable. This has prompted researchers to explore why organisms age, and to devise a one-size-fits-all solution to delay this process. The problem with a one-size-fits-all approach is that individuals die of different causes and genetic makeup, sex, and environmental conditions can alter cause of death. Interventions to improve ageing outcomes that ignore this variation in cause of death are likely to be marginally beneficial, or even harmful, for many. This project aims to address this gap by identifying how and why the cause of death differs across individuals, sexes, and life experience using genetic model insects, fruit flies. This work has the potential to change how we think about ageing in all animals, enhancing Australia's reputation in ageing research. While this project explores fundamental principles of ageing in insects, long-term applications include changing gerontology practice to centre personalised solutions for ageing. Our research will be communicated to a broader audience by engaging with our science communication teams to develop press releases for Australian and International media and through social media channels, reaching millions of people in a matter of seconds. This will make our findings accessible to the public, as well as to practitioners aiming to improve health outcomes in Australia's ageing population.							
DP250101965	**Dissecting the implications of endosymbiont interactions for host fitness**	96,853.00	256,046.50	303,110.50	143,917.00	0.00	0.00	799,927.00
Dowling, Prof Damian K	This project aims to unravel the evolutionary implications of interactions between two endosymbionts - mitochondria and Wolbachia. All animals have mitochondria, and many carry the reproductive parasite Wolbachia. Each endosymbiont has profoundly shaped the evolutionary fitness of their hosts. Remarkably, however, each has been studied through different paradigms that ignored the capacity for the endosymbionts to directly interact to manipulate host function. Via an innovative approach, this project expects to generate new knowledge of the modes and mechanisms via which endosymbionts evolve, and the implications for their animal hosts. Expected benefits are results that directly inform the development of novel strategies for pest control.							
	National Interest Test Statement							
	Endosymbionts are living organisms that have evolved to live within the body or cells of another organism. Two of the most significant are mitochondria, the energy powerhouse of cells, and Wolbachia, a bacterium that can manipulate the reproductive and immune systems of their invertebrate hosts. Even though they reside side-by-side inside the cells of millions of species, they have only ever been studied separately. Incredibly, we have no knowledge of the capacity for these endosymbionts to interact with each other to shape the biology and evolution of their hosts. This project will redress this significant knowledge gap, opening a new frontier in the study of endosymbiosis. The project is expected to lead to significant national & international benefits. Wolbachia are key to biocontrol efforts; their introduction into mosquito populations blocks the transmission of mosquito-borne viruses, which would otherwise threaten the lives of millions of humans. By generating new insights into the implications to hosts of Wolbachia-mitochondrial interactions, the knowledge will have strong potential to shape development of more effective approaches to mosquito biocontrol. Project outcomes will be regularly discussed with Australian-leaders in Wolbachia-based biocontrol - the World Mosquito Program - and other stakeholders in biocontrol, such as CSIRO, through workshops and in-person meetings, thus enabling relevant insights to be incorporated into research & development pipelines.							
DP250102064	**Graphene for energy harvesting from the night sky**	127,431.00	247,007.50	236,791.50	117,215.00	0.00	0.00	728,445.00
Fuhrer, Prof Michael S	This project aims to establish the scientific foundations for new devices, based on the photothermoelectric effect in graphene, which generate energy from radiative							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	cooling to the dark sky. The project will develop methods to strongly couple thermal radiation to graphene, understand the relevant mechanisms of electron heat flow in graphene, and build and measure the efficiency of graphene thermoradiative generators. The expected outcomes will be the benchmarking of this new technology with prospects for significantly higher efficiency, enabling new applications in space- and Earth-based power generation. The project will benefit Australia through intellectual property and new capacity for research in photovoltaics and quantum materials.							
	National Interest Test Statement							
	Solar energy is important in addressing the societal challenge of net zero carbon emissions. Solar energy generation could be significantly enhanced by “thermoradiative” energy harvesting which exploits outgoing thermal radiation emitted (even at night) by warm objects exposed to the sky, while still utilizing incoming sunlight. However current thermoradiative generators harvest only a miniscule fraction of the available energy. This project aims to develop radically new device designs based on the unusual electronic properties of graphene (one atom-thick carbon), integrated with advanced nanostructures to efficiently release thermal radiation into the cold environment, potentially realising orders-of-magnitude efficiency improvements. The project will develop intellectual property, and manufacture and test prototype devices, falling within the National Science and Research Priorities of Energy and Advanced Manufacturing. Near-term benefits of efficient thermoradiative devices to government and industry will be new technology for power generation at night for autonomous vehicles and microsatellites, boosting Australian space and defence capability. The project will train researchers in forefront nano- and opto-electronics, essential in tomorrow’s energy technologies. Results will be promoted via public science websites aimed at a broad audience, and shared with industry and government stakeholders through workshops and site-visits to forge new partnerships for translation.							
DP250102065	**An investigation into metabolite-mediated immunity**	169,448.00	338,896.00	344,646.00	175,198.00	0.00	0.00	1,028,188.00
Rossjohn, Prof Jamie	This project aims to investigate how the immune system is modulated by metabolites, an emerging and key area of the life sciences. Presently, little is known about metabolite-mediated immunity, thereby representing a major knowledge gap. The project aims to combine mass spectrometry, structural and biochemical approaches to learn how metabolites are (i) presented by an antigen presenting molecule called MR1 (ii) how this leads to activation by specific T lymphocytes. Outcomes will significantly advance current understanding of the molecular basis underpinning metabolite-mediated immunity. Major benefits will include fundamental new knowledge about immunity that may ultimately be used by the biotechnology industry.							
	National Interest Test Statement							
	Metabolite-mediated immunity by T cells is emerging as a key area in the life sciences, being implicated in protective and unwanted immunity responses, and tissue repair. This proposal will explore the use of novel biochemical tools, combined with structural and mass spectrometry approaches to study how T cells of the immune system responds to metabolites. The national interest of this proposal lies in a) an advancement of basic knowledge in how metabolites modulate immune system function and b) the multi-disciplinary nature of the research proposal that will increase Australia’s research capacity within the life sciences via the training of a new generation of biochemists and immunologists with these skills. Further, this project will lead to patentable findings surrounding small molecule metabolites which will have direct implications for the biotechnology industry, where immunotherapies have the potential to treat many conditions relating to the function of the immune system. In addition to publication of results in generalist and immunology-based academic journals, the work will be disseminated to the public via media releases, social media and public lectures.							
DP250102067	**Assessing recovery in threatened Australian amphibians and reptiles**	98,000.00	198,000.00	202,500.00	102,500.00	0.00	0.00	601,000.00
Chapple, Prof David G	This project aims to use a new methodology for determining the recovery potential of threatened species, and assessing the effectiveness of conservation actions. Using Australian reptiles and amphibians as a case study, this project expects to determine what is required to improve the conservation trajectory of Australia’s threatened species, and examine the effectiveness of current conservation policy. Expected outcomes of this project are the identification of species that are at elevated risk of extinction, and determining the conservation actions required to prevent these. This should provide significant benefits for improving conservation policy and planning in Australia, and the way that governments measure species recovery.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	National Interest Test Statement Australia is one of the world's biodiversity hotspots, but it is widely recognized that the health of its environments is declining. Australia has one of the highest extinction rates in the world, and thousands more species are threatened with extinction. The United Nation's Convention on Biological Diversity (hereafter "the Convention"), which directs and informs international efforts on threatened species, has set targets to both prevent new extinctions, and ensure the recovery of threatened species. Although Australia's conservation policy aims to contribute towards achieving these goals, it does not currently incorporate the key indicators that are required to do so. This project proposes to develop and trial a new, integrated approach to threatened species recovery, which incorporates the approved metrics under the Convention. The development of this approach will enable Australia to meet its international obligations under the Convention. The project will work directly with government to ensure that our results are relevant to conservation managers, and likely to be integrated into policy, providing a mechanism to improve the conservation, and recovery, of Australia's unique biota. With predictions of the continued escalation of impacts from habitat destruction, invasive species and climate change, this project aims to provide an approach that will assist in ensuring Australia's unique native biodiversity can survive and thrive through appropriate management.							
DP250102224 Chong, A/Prof Trevor	**Neural mechanisms driving dynamic responses to fatigue** Fatigue is pervasive, yet individuals vary widely in their response to it – some people are able to continue investing effort in spite of their fatigue, whereas others choose to rest. The neurobiological principles that govern when and why people decide to work versus rest remain poorly understood. This research will combine a novel behavioural paradigm with computational models of behaviour, pharmacological manipulations, functional neuroimaging and non-invasive brain stimulation to understand how we dynamically adapt our behaviour in response to the ebbs and flows of fatigue. Ultimately, this project will lead to a comprehensive neurobiological framework that is able to explain, predict and optimise behaviour as fatigue evolves over time.	135,218.00	274,318.00	280,644.50	279,225.50	137,681.00	0.00	1,107,087.00
	National Interest Test Statement Fatigue is unavoidable, and our productivity critically depends on how we adapt our behaviour in response. Continuing to work in spite of fatigue may lead to accidents, whereas too much rest may reduce efficiency. Importantly, the brain processes that guide our response to fatigue are poorly understood. This project will combine cutting-edge neuroscience tools to reveal the key brain structures and chemicals that determine how we respond to fatigue as it waxes and wanes. It will extend a partnership between neuroscience experts at Monash University and the University of Oxford, and provide an outstanding opportunity for early career researchers to engage in innovative interdisciplinary research. In particular, this project will grow capacity in a brain stimulation technique (transcranial ultrasound) that has the potential to revolutionise neuroscience research, but which is only just being adopted in Australia. The results will lead to biological models that allow us to predict when and why individuals choose to work vs rest, which will have significant implications for theoretical frameworks of fatigue. The knowledge generated from this project can be incorporated into future strategies and interventions to optimise our response to fatigue in the workplace, in the classroom, or on the sporting field. This may in turn benefit Australians economically and commercially by enhancing productivity, efficiency and learning, while minimising errors and accidents.							
DP250102271 Tang, Dr Jie	**Hierarchical nanostructure effects on Nanoparticle-M Cell Interactions** This project aims to develop new design rules for advanced nanoparticle-based oral delivery systems targeting Microfold (M) cells in the gut, vital for efficient antigen transport. We will explore how nanoparticles' structures influence M cell interactions, focusing on transcytosis, differentiation, maturation, and enhancing mucosal immunity. Expected outcomes include innovative nanomaterials with specialized surface features tailored for M cell targeting, and fundamental knowledge into nano-mucosa interactions. This advancement promises to revolutionize oral vaccine delivery, offering substantial benefits in both the pharmaceutical and veterinary fields by improving vaccine efficacy and equitable access across diverse economic regions.	122,503.00	256,121.50	269,196.00	135,577.50	0.00	0.00	783,398.00
	National Interest Test Statement Nanotechnology holds significant potential for Australia's multibillion-dollar pharmaceutical and agricultural industry. Our project aims to use bio-mimicking nanomaterials to interact with Microfold (M) cells, essential gatekeepers in the gut that transport substances and regulate immunity. This research addresses a critical gap in understanding how these gut cells respond to changes in the surface nanostructure and chemistry of materials in mouse and chicken models and aims to develop new materials that specifically target and regulate M cells. This research will boost Australia's expertise in bioengineering and biotechnology, positioning the country as a leader in nanobiotechnology. The outcomes will benefit Australia socially, economically, and commercially by developing high-value materials and advances in the pharmaceutical and agricultural sectors. The new generation of M cell-targeting nanomaterials can be used in non-injectable delivery systems for nutrients, veterinary medicines, and vaccines, improving animal welfare and productivity cost-effectively, while ensuring better access across							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	diverse economic regions. We will share our findings through peer-reviewed publications and public presentations. Licensing the intellectual property will guide future research directions. By working with industry partners, we aim to translate our research into commercial products and influence national and international practices through engagement with policymakers.							
DP250102391 Johnston, A/Prof Angus P	**Deciphering the Intracellular Fate and Efficiency of mRNA Delivery** This project aims to improve the effectiveness of mRNA delivered using Lipid Nanoparticles (LNP). There is significant potential to improve mRNA potency through a deeper understanding of LNP interactions with cells. Our cutting edge approach combines innovative use of long read single cell sequencing with state-of-the-art nanoparticle targeting technology. The outcomes of the project will be: 1) quantifying intact and active mRNA delivered to cells 2) locating where mRNA is degraded 3) assessing cell behaviour after delivery of LNP/mRNA 4) engineering receptor-targeted LNPs that guide delivery of mRNA to where it is required This work will advance LNP delivery technology by maximising RNA expression and minimising off target effects.	139,997.50	301,491.00	349,474.00	187,980.50	0.00	0.00	978,943.00
	National Interest Test Statement Lipid nanoparticles (LNP) that encapsulate an mRNA cargo have been integral to the global response to COVID-19. While immensely successful for emergency use during the pandemic, there are significant gaps in our understanding of how LNP delivery systems work. This project will identify and overcome the inefficiencies in LNP/mRNA delivery so we can develop the next generation of mRNA delivery systems. The economic potential of mRNA technology means there will be significant economic and commercial benefits. The ability to develop and manufacture the next generation of LNP/mRNA delivery systems in Australia aligns strongly with the government's Advanced Manufacturing goals. It also complements the investments made in establishing mRNA manufacturing facilities in Australia. Our team has strong links with local and international biotech companies and will continue our track record of translating fundamental scientific discoveries into commercially relevant products. Furthermore, we will use our award-winning virtual reality (VR) models to engage and inform the general public about our scientific advances. We have demonstrated that the VR platform is a simple and entertaining way to communicate complex scientific concepts to a broad audience.							
DP250102452 Trevaskis, A/Prof Natalie L	**Are lymphatics a regulator of skeletal muscle growth, metabolism & renewal?** This project aims to investigate the impact of factors secreted by or transported via lymphatics on skeletal muscle growth, metabolism and regeneration using cutting-edge imaging and lymph collection techniques. This project expects to generate new knowledge about the precise location, 3D structure and functions of skeletal muscle lymphatics, including as a critical regulator of skeletal muscle growth, metabolism and regeneration. This will provide downstream benefits to: 1) Society: identify factors to reduce loss in muscle mass/function with age or disuse that are associated with disability, frailty, falls, diabetes and death; 2) Sport: improving recovery and performance; 3) Agriculture: increasing meat quality and quantity per animal.	120,000.00	242,000.00	244,000.00	122,000.00	0.00	0.00	728,000.00
	National Interest Test Statement The skeletal muscle accounts for ~40% of body mass and is essential for life - moving, breathing, eating and energy balance. New approaches to optimise skeletal muscle growth, repair and metabolism are critically required. The lymphatic system consists of lymph vessels and nodes that play key roles in fat absorption, immune function and fluid balance. Recently, we and others have revealed new lymphatic functions in controlling fat metabolism and heart growth and repair, however, the role of the lymphatic system in skeletal muscle is currently unknown. Using innovative imaging and physiological technologies, and in vitro/in vivo model systems, we aim to determine the precise location, 3D structure and functions of skeletal muscle. We will produce new knowledge on factors secreted and transported by lymphatics with exercise or muscle damage, and how these regulate skeletal muscle growth, metabolism and repair. By identifying new lymphatic targets for nutritional therapies or modulators to combat skeletal muscle dysfunction, our outcomes will have important benefits, leading to increased participation in sport, reduced frailty, and risk of hospitalization or death. We hope to identify factors that improve meat quality and quantity (primarily skeletal muscle) yielding economic and commercial benefits. Our new knowledge will be shared widely with scientific journals, conferences, press, community members and investors, and may be the subject of future patents and products.							
DP250102553 Pocock, Prof Roger D	**Dissecting Nervous System Function – One Neuron at a Time** This project aims to investigate how the nervous system communicates to control behavior, cognition, and physiology. The project aims to map the function of	102,821.50	205,241.50	207,692.00	213,397.00	108,125.00	0.00	837,277.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	communication molecules called neuropeptides in every neuron in a nervous system. This project expects to generate new knowledge in neuronal communication by employing innovative approaches in gene editing, animal behavior and physiology analysis. This study should provide significant benefits, such as training of Australian researchers in frontier technologies and acquisition of fundamental knowledge relating to brain function. This work may therefore stimulate future research in dissecting mechanisms that govern human neurological disorders and obesity.							
	National Interest Test Statement							
	Brain function is essential for controlling behavior, cognition and metabolism. As such, defective signaling within the nervous system can cause psychological and metabolic disorders from epilepsy and autism to obesity. This proposed study aims to enhance Australia's research capacity in the neuroscience field by enabling manipulation of the nervous system at an unprecedented level of specificity. This work may therefore identify future targets that are relevant to brain dysfunction. The potential economic, commercial, environmental, and social benefits are vast as better understanding of brain function is expected to have significant benefits for the health sector in the future. For example, the research findings will be of interest to pharmaceutical companies that design drugs for psychological and metabolic disorders. This project also expects to generate world-first tools to manipulate neuronal function at exquisite resolution and to expand our knowledge of how individual neurons control bodily functions. Further, this work will provide employment and exceptional training opportunities to Australian-based scientists and students in cutting-edge neuroscience techniques to expand Australian expertise. Beyond academia, our research outcomes will be promoted to the wider community through social media and media channels. Dissemination of our research will be aided by the Monash public relations office who are dedicated to assisting in communication of research discoveries.							
DP250102651 McArthur, Dr Kate	**The next great escape – how does mtDNA become extracellular?** Eukaryotic cells contain two genomes, nuclear and mitochondrial (mtDNA). There are myriad conditions in which mtDNA escapes its mitochondrial confines and once outside of its organelle, mtDNA becomes a potent danger signal to the cell, with potentially debilitating consequences to the organism. This project is focused on understanding the biological processes that allow mtDNA escape outside not just the mitochondria, but outside the cell itself. The study builds on discoveries made by a team with world-leading expertise in mitochondrial biology and microscopy – and brings innovative, cutting-edge techniques in cell biology and imaging to investigate a fundamental biological phenomenon for which the cellular mechanism is currently unknown.	120,237.50	243,482.00	249,261.50	126,017.00	0.00	0.00	738,998.00
	National Interest Test Statement							
	Mitochondria, the powerhouses of our cells, contain their own DNA (termed mtDNA). In some cases, mtDNA escapes from mitochondria and outside the cell. Once outside, mtDNA causes inflammation in humans and animals alike. This project addresses a fundamental unanswered question: how does mtDNA escape outside a cell? We will provide the first clear picture of mtDNA release and novel insights into this biological process. As such, the knowledge gain from this study has the ability to significantly impact the direction of future research & industry collaborations into the treatment of multiple agricultural and human conditions. For example: cell-free mtDNA has been found in cattle suffering mastitis- a condition that costs the Australian dairy industry ~35 million/yr- with no understanding of how the mtDNA got there. Thus, insights from this project could have major economic benefits to our nation's third largest rural industry. Further, mtDNA signalling is an emerging target in neurodegenerative and auto-immune conditions, thus (whilst beyond the scope of this project) our findings have the long-term potential to uncover new avenues for treating these major health burdens, with significant social and economic benefits to the Australian population. To maximise the understanding and translation of our research, all findings will be freely available through open access journals online, and directly communicated with any consumer/industry groups with potential benefits from our work.							
DP250102726 Han, Dr Meiling	**A new mechanism of bacterial membrane defence against environmental stress** Bacterial membranes serve as a critical barrier against external stress and often undergo changes to adapt. This project focuses on investigating a novel adaptive mechanism related to the production of lipoamino acids, a unique class of amino acid-containing lipids. Using systems biology and computational and biophysical tools, this project aims to elucidate the biogenesis of lipoamino acids and their impact on bacterial membrane stability, as well as their interactions with membrane-targeting compounds. By uncovering these mechanisms, this research will greatly enhance our understanding of bacterial adaption to environmental	117,126.50	243,528.50	259,624.00	133,222.00	0.00	0.00	753,501.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	stress and may inform the future design of new antibacterial approaches specifically targeting bacterial membranes. **National Interest Test Statement** Antimicrobial resistance has a significant socio-economic impact in Australia, posing serious challenges to health, agriculture, and the economy. Understanding how bacteria develop antibiotic resistance is crucial for addressing this pressing issue. This project focuses on investigating bacterial membranes, aiming to understand how bacteria alter their membrane composition in response to environmental changes and resist antibacterial compounds. Using cutting-edge technologies, including systems biology, and biophysical and computational tools, we will identify key factors, including genes and metabolites, involved in this process. These insights will inform the development of strategies to prevent the spread of antibiotic-resistant genes in the environment, which is crucial for preserving water and soil quality and safeguarding livestock health and food safety. Through strategic collaboration with established industry partners, our research has the potential to translate fundamental findings into commercial products. Ultimately, this project will contribute to improving environmental health and reducing economic burdens in Australia, aligning with the goals of Australia's National Antimicrobial Resistance Strategy 2020 & beyond.							
DP250102783 Simonov, A/Prof Alexandr N	**Energy efficient ammonia electrosynthesis** This project aims to develop an electrolytic technology for the production of ammonia from renewables with a significantly improved energy efficiency using first-of-a-kind electrode designs recently discovered at Monash University. New knowledge in sustainable technologies is expected to be produced by integrated experimental and modelling studies on previously unexplored materials for ammonia synthesis. The target outcome of the project is a sustainable ammonia synthesis method that can replace the current fossil-fuel-based process. The technology to be developed from these outcomes is expected to be of significant benefit to Australia as a source of low-cost fertilisers for agriculture and as a means of storage of renewable electricity. **National Interest Test Statement** Megatonne-scale production of ammonia – a key component of fertilisers required to satisfy escalating food demand – is critical to the Australian economy, but is among major contributors to the national carbon footprint. This project aims to decarbonise the ammonia industry through the development of a process that converts renewables to ammonia at previously unachievable energy efficiency, based on a recent breakthrough discovery of unique materials by Monash and RMIT scientists. Implementation of this innovative, fully renewables-powered process with enhanced energy efficiency will enable, currently economically unfeasible, on-site production of fertilisers by farming businesses and will remove the need for the use of fossil-fuels by large-scale ammonia producers. While creating new jobs and cutting national greenhouse gas emissions, deployment of this new technology will enable conversion of underused Australian renewables into a high-value, high-demand commodity for the national market and export, providing significant economic benefits. The project will promote adoption of the cost-effective sustainable ammonia synthesis to replace the current fossil-fuel based process through stakeholder engagement and established extensive connections to companies within the agriculture sector, fertiliser production, energy storage and distribution at all scales. This transition will reinforce national food and energy security, and will support Australia's 2050 Net Zero objective.	122,445.00	254,743.50	266,447.00	228,342.50	94,194.00	0.00	966,172.00
DP250102787 Collins, A/Prof Stephanie C	**Australia's Shared Responsibility for Pacific Climate Refugees** This project aims to build ethical guidelines for Australia's treatment of Pacific climate refugees, outlining how responsibility should be shared internationally, domestically, and with climate refugees themselves. It expects to generate new ethical principles, concepts, and policies for a model of shared responsibility, using a collaborative approach in which refugee leaders and practitioners are engaged with academic experts in ethical dialogue. Expected outcomes include detailed ethical guidelines for international and domestic policy innovation. This should provide significant benefits to Australian policymakers, refugee-focused NGOs, and climate refugees, and advance Australia's international leadership on climate refugee issues. **National Interest Test Statement** In the coming years, millions of people in the Pacific are at risk of being displaced by climate change, as a result of rising tides, extreme weather events, and economic disruptions. Australia has the opportunity to respond to this situation in a fair, legitimate, and sustainable way. But so far, there has been very little ethical reflection on what Australia should do and why. This project will bring Pacific leaders and affected communities into dialogue with Australian ethicists and international political theorists, in order to foster morally defensible policy-making and public conversation in this domain. The project will benefit Australians by guiding national policy for Pacific	17,783.50	67,394.00	65,097.50	15,487.00	0.00	0.00	165,762.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	climate-induced immigration, and investigating how climate-displaced communities can be supported in their self-determination. It will further deliver actionable ethical guidance for Australian policymakers and citizens, communicated through policy documents for government, teaching resources for students, and media commentaries.							
DP250102830 Kasza, A/Prof Jessica E	**Flexible stepped wedge and cluster randomised crossover designs** Cluster randomised trials are an important class of trial used to assess the effect of interventions. This project aims to develop flexible cluster randomised trial designs by developing statistical theory for designs that can adapt to changing circumstances, update cluster and/or participant recruitment, and the software tools for trial design and analysis. This project expects to generate adaptable and flexible cluster designs. Expected outcomes include tools to allow researchers across a wide range of disciplines to design these trials, the underpinning methodology, and international collaboration. This should provide significant benefits by supporting the conduct of more high-quality, cost-efficient research in Australia and worldwide.	91,511.50	204,185.50	219,160.50	106,486.50	0.00	0.00	621,344.00
	National Interest Test Statement Australia invests significant resources into trials to test the effect of new interventions on social and health outcomes. Cluster randomised trials are a class of trials where entire groups (e.g. all students in a school, all community members) are allocated to receive particular interventions. These are essential when assessing the impact of interventions implemented at the group level (e.g. changes in policy, education campaigns), and are frequently conducted in Australia. However, the way these trials can be conducted is restrictive; these trials cannot easily change in response to updated information about the intervention's effect. Further, recruiting groups can be difficult, particularly when the number of groups available to participate is limited. These issues can threaten trial validity, wasting the money and effort that Australia invests. This project will develop flexible new trial designs and statistical methodology, allowing modification of trials in response to accumulating data, and enhancing recruitment of groups. The knowledge and translational tools developed will be shared with those who plan and conduct these trials, through easy-to-use web apps and tutorials disseminated through national networks such as the Australian Clinical Trials Alliance. This will reduce costs and improve trial efficiency across application areas. This will bring benefit to Australians by allowing new interventions to be tested, leading to improved health and social outcomes.							
DP250102837 McArthur, Dr Kate	**Investigating mtDNA as a danger signal across the tree of life** Mitochondria (the powerhouse of cells) originated from ancient bacteria. Many mitochondrial components (eg mitochondrial DNA; mtDNA) retain bacterial-like features, and must be separated from the rest of the cell, to prevent inflammation. Host cell recognition of mtDNA as a potent immune trigger has been widely studied in mice and humans, but nothing is known of other eukaryotes. In a world-first, this project asks if mtDNA is a danger signal across kingdoms – both plant and animal. It builds on discoveries made by a team with renowned expertise in mitochondrial biology and microscopy – combining innovative, cutting-edge techniques to investigate a fundamental evolutionary question with wide-reaching benefits to many agricultural industries	137,500.00	275,000.00	277,500.00	140,000.00	0.00	0.00	830,000.00
	National Interest Test Statement Mitochondria, the powerhouses inside our cells, were once bacteria. Despite two billion years of evolution, mitochondria still harbour bacterial-like components which are potent immune triggers if not properly contained. For example, mitochondria possess their own DNA (mtDNA), which causes debilitating inflammatory diseases in humans if released outside mitochondria. However, it is unknown whether the same is true in other animals, or beyond the animal kingdom, in plants. We will address whether mtDNA is a danger signal in multiple species of animals & plants, and potentially identify entirely novel receptors that function in plant immunity. The knowledge gain from this study could lead innovative future research & industry collaborations into the treatment of multiple agricultural conditions. Specifically, this project utilizes cells from cows, sheep and rice, and thus may have direct implications for cattle & sheep immunity, and rice crop production – three industries that each generate revenues in the billions for Australia every year. Long term, this research could provide significant economic benefits to Australian agriculture, with the potential for decreased loss of animals/plants, and increased yields for multiple industries. To maximise the understanding and translation of our research, all findings will be freely available through open access journals online, and directly communicated with any consumer/industry groups with potential benefits from our work.							
DP250102842 Matuszek, Dr Karolina B	**Trimodal Materials to Unlock Synergistic Thermal Energy Storage Mechanisms** This project aims to develop new Thermal Battery materials. The significance of	96,406.50	200,672.50	211,428.50	107,162.50	0.00	0.00	615,670.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	this proposal stems from its potential to boost renewable energy penetration and uptake by creating inexpensive and reliable energy storage technologies based on thermal energy storage in thermal batteries. The project will focus on the design of innovative advanced materials with tailor-made properties, using advanced characterisation techniques including neutron scattering to probe their molecular features. Expected outcomes include a fundamental understanding of the molecular origins of high energy storage in thermal energy storage materials and a library of new high-performance materials that contribute to the goal of cheap energy from zero-carbon sources.							
	National Interest Test Statement							
	The objective of this project is to create inexpensive and reliable thermal energy storage materials to store energy from renewable sources like sun and wind at high efficiency. It will contribute to Australian national interests: (i) Environmental: Providing inexpensive zero-carbon energy in heat/electricity form, reducing carbon footprint and supporting transition to low-carbon economy, aligning with climate change mitigation goals. (ii) Commercial: Developing innovative distributed thermal battery techchnology (Carnot Battery), allowing Australian industries to pioneer this emerging market and capitalise on global sustainable energy demand. (iii) Economic: Novel technologies enabling efficient renewable energy utilisation, reducing energy costs, increasing affordability/adoption of renewables, and enhancing energy security. To maximise outcomes beyond academia: (iv) Knowledge dissemination through workshops, seminars, social media outreach to industry, policymakers, consumer groups for knowledge transfer and collaboration. (v) Active industry engagement for technology transfer, commercialisation, and practical adoption within the energy sector. These strategies ensure outcomes contribute to environmental, commercial, economic interests, and sustainable energy future through effective translation and adoption.							
DP250102951	**Dynamics of calcitonin family receptor activation**	98,538.00	206,673.00	219,867.50	111,732.50	0.00	0.00	636,811.00
Josephs, Dr Tracy M	Major life science challenges include how cells respond to their extracellular environment to mediate a biological response. This project seeks to elucidate how biological signals essential to life are transmitted through receptors on the surface of our cells. This project seeks to directly enhance our understanding of how receptors respond to essential life molecules to control fundamental physiological responses, with anticipated future benefits for the pharmaceutical industry. The primary outcomes of this project will provide detailed mechanistic insights on how receptors bind their stimuli and how this results in in their activation to mediate fundamental signalling that is important for all living organisms.							
	National Interest Test Statement							
	Cell surface receptors decode environmental signals and trigger cellular responses. These receptors can recognize a diverse array of signals, including hormones, odorants, light, ions, and nutrients. We have pioneered methods to study receptors in their natural state, revealing the range of structures they adopt in response to different signals. This capability is crucial for unravelling the complexities of receptor function and addressing critical gaps in our understanding. By positioning Australia as a leader in this cutting-edge technology, we will facilitate the discovery of receptor tool compounds, benefiting Australians through advancements in scientific innovation. Insights into these structural variations will enhance our understanding of receptor models, essential for future rational drug discovery. Improved structural models have the potential to streamline the drug discovery process, minimizing costly setbacks in late-stage development. Additionally, enhanced expertise in this field will open new research and commercial opportunities, reinforcing Australia's position at the forefront of global scientific research.							
DP250102966	**A crystallography for disorder: characterising structural complexity**	89,389.00	189,616.50	205,035.00	104,807.50	0.00	0.00	588,848.00
Liu, Dr Amelia C	This project aims to devise new measurement techniques to quantify disorder in complex materials. Complex, non-equilibrium materials predominate in both human technology and nature, and yet their structures cannot be fully understood from conventional methods. The project is expected to solve long-standing problems in the design and optimisation of complex materials for structural, magnetic and optical applications. The project may identify new directions for research in the areas of data driven microscopy and materials discovery. The research should provide new characterisation tools for Australian researchers and industry to accelerate materials design and manufacture in the areas of building, communications, automotive and manufacturing.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement This project aims to devise new approaches for measuring structural disorder in complex materials. The proposed research is of foundational importance to physics and complexity science but also addresses a critical impediment in materials engineering. Most materials, both engineered and naturally forming, have elements of disorder that are critical in determining their properties. Examples include pharmaceuticals, batteries, solar cells, food products, plastics, cement, glass and biomaterials, to name a few. Measuring this structural disorder is critical to engineering materials with improved or entirely novel properties, but currently no technique is available that can access this information. This project is expected to provide these new methods for Australian researchers and industry to solve diverse problems and accelerate materials discovery and design. This could generate intellectual property, new materials, manufacturing and processing techniques and products for energy, health, communications, transport, and manufacturing. These new analytical tools will be communicated at specialist workshops and schools for materials scientists, engineers and crystallographers and put into practice in Australia's microscopy and materials characterisation facilities.							
DP250102988 Quinn, A/Prof John F	**Organosulfur surfactants as novel antioxidants** This projects aims to investigate new organosulfur-based surfactants for application in formulation science. The project expects to develop new surfactants and block copolymers that can attenuate oxidative stress, offsetting unwanted side effects or enhancing the function of pharmaceutical or agricultural formulations. Expected outcomes from the project include improved nanoparticle-based formulations incorporating the new organosulfur surfactants which are less harmful than previous formulations, and which can therefore be applied in diverse applications. This should provide significant benefits, such as agricultural formulations that improve crop yield or pharmaceutical and veterinary products that reduce side effects to the recipient.	105,547.00	220,217.50	236,540.50	121,870.00	0.00	0.00	684,175.00
	National Interest Test Statement Liquid crystal nanoparticles are applicable to emerging applications in food science, agriculture and healthcare. As a result, the development of new surfactants and polymers that can be used to prepare such nanoparticles is a critically important endeavour, opening up new opportunities to develop new engineered materials with tuneable properties applicable in drug delivery, agricultural applications and veterinary medicine. The project has the potential to deliver economic and commercial benefits by providing opportunities for start-up companies, leading to employment and investment in Australian science and industry. Further, the new chemical entities synthesized will provide a robust intellectual property position for potential commercialisation, and the research team will work with industrial partners to develop these where appropriate. The project will provide additional national benefit by equipping PhD students and research fellows with strong cross-disciplinary skills that will be of benefit to industries recruiting graduates in science, technology and engineering. The project will enhance Australia's considerable international reputation as a leading country for colloid and interface science research.							
DP250103030 Lupton, Prof David W	**New polar and radical reactions via electron poor alkyne organocatalysis** Organocatalysts are small organic molecules able to catalyse chemical reactions. In contrast to metal or enzyme catalysts they are simpler to prepare, more robust, and cheaper. However, their use has largely focused on reactions at the carbonyl group (studies which led to the 2021 Nobel prize). In this proposal organocatalysts, either working alone or in tandem, are used to uncover new reactions of alkynes conjugated to the carbonyl group. The reactions targeted are all new and involve polar (2-electron) and/or radical (1-electron) bond formation, along with control of three dimensional shape (stereochemistry). The studies are focused on uncovering general reactivity patterns applicable in a range of contexts.	61,037.00	122,074.00	122,074.00	61,037.00	0.00	0.00	366,222.00
	National Interest Test Statement Society is increasingly reliant on new and sophisticated molecules to help address emerging problems ranging from health through to energy and beyond. As the molecules become increasingly complicated the challenges in their preparation grow significantly also. To address this those studying chemical synthesis must develop new reactions that provide the desired products more quickly, with greater efficiency, and with minimal waste production. By developing new reactions that exploit naturally occurring and readily recycled organic catalysts (so called organocatalysts) we have an opportunity to both access new chemical reactions and do so without the creation of excessive waste. By contributing to the discovery and deployment of such technologies Australia has the potential to create significant economic and environmental benefits. In this proposal we will develop new chemical reactions that use either a single or pair of organocatalysts (working together) to build valuable materials from cheap and readily available building blocks. These reactions are designed to have excellent control over 3D shape, and to perform with high levels of efficiency. These innovative studies will support Australia's chemical manufacturing community by providing new strategies, and human capital, necessary for the future of this sector. The knowledge generated in this project, combined with the human capital, will help build a knowledge based Australian economy necessary for a resilient future.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
DP250103032	**Body systems neuroscience: linking brain, body and cognition**	54,520.00	158,573.00	213,667.00	167,040.50	57,426.50	0.00	651,227.00
Jamadar, A/Prof Sharna D	How does cognition emerge from the brain? This Project aims to create foundational new knowledge about how the brain and body interact to drive cognition in young and older adulthood. To do this, a new sub-field of neuroscience will be developed, body systems neuroscience, enabled by two breakthrough innovations in biomedical imaging. The outcomes will be a new framework for measuring the biological determinants of cognition, and a new understanding of how age-related change in brain-body interactions contribute to cognitive change in ageing. The Project will provide significant benefits by identifying mechanisms that can be developed in the future to help Australian maintain their cognitive function and quality of life into advanced age.							
	National Interest Test Statement							
	Australia has a rapidly ageing population, and over 50% of older Australians will experience cognitive decline in their later years. A fundamental problem we face in addressing the economic and social burden of age-related cognitive decline is that we do not understand the biological underpinnings of cognition. Cognition is usually considered to be related to the structure and function of the brain, but the brain does not operate in isolation from the rest of the body. The body supplies all the fuel and nutrients to drive the brain, and the effectiveness of this declines during ageing. Here, we develop a new method for understanding brain-body relationships, and how they influence cognition across the adult lifespan. The new method will position Australia at the international forefront of the next frontier in biomedical imaging: whole-body imaging. The new understanding developed during this project will be the launchpad for future research to develop interventions to help people maintain their cognitive function into old age. By understanding how cognition is linked to interactions between brain and body, this research will benefit Australians by accelerating the development of new precision interventions: tailored not only to the person, but specific organ systems within the person. The research outcomes will be communicated to the community to help people understand how maintaining their bodies - not just their brains - contributes to their cognition in their later years.							
DP250103072	**Hippo signalling - from cell membranes to the nucleus**	118,550.00	230,630.00	221,160.00	109,080.00	0.00	0.00	679,420.00
Harvey, Prof Kieran F	This project aims to use cutting-edge microscopy techniques to define how the Hippo pathway relays signals from the cell surface to the nucleus. Hippo is an ancient signalling pathway and key regulator of organ size, but we have a poor understanding of how it relays messages in cells and thus activity. This project expects to deliver important insights into how the Hippo pathway controls cell fate and organ size, which are essential features of life. Expected outcomes include optimised methods to assess cell signalling in vivo and new collaborations. This should provide significant benefits such as creation of jobs, new knowledge on fundamental principles of life and stimulation of new research into cell signalling and organ size control.							
	National Interest Test Statement							
	Signalling pathways are groups of proteins that operate together to relay messages from the cell surface to the nucleus to change cell behaviour. Our proposal aims to better understand how animal cells use signalling pathways to respond to different stimuli and change their behaviour. This knowledge will be essential for understanding how organs (e.g. heart, liver, brain) grow to the right size as animals grow, and how cells are directed to perform certain specialised roles. Despite being essential for life, there is still much we do not understand about both organ growth and cell fate control. Our proposal will address these knowledge gaps, using a range of advanced microscopy technologies that will enable us to examine protein function with very high resolution. Our study will give employment and training opportunities to scientists and students in Australia, and impact research both nationally and on a global scale. For example, the knowledge we generate could have broad economic, commercial, and environmental benefits for Australians because control of organ size and cell fate are fundamental features of most species on earth (e.g. mammals and insects). In the long term, the discoveries we make could have impacts beyond academia. For example, industry could leverage the discoveries we publish to enhance certain types of food production like livestock agriculture, and our discoveries could lead to improvements in human health conditions such as growth disorders.							
DP250103243	**Can genomics identify and predict evolutionary limits to climate change?**	101,869.50	177,626.00	154,000.50	78,244.00	0.00	0.00	511,740.00
Sgro, Prof Carla M	Significance: Species are already responding to climate change, and many face high predicted rates of extinction. Some species will be able to avoid extinction via evolutionary adaptation. Yet we currently lack the ability to accurately predict which species do and do not have the capacity to adapt and avoid extinction. Expected outcomes: Expected outcomes of this project include enhanced ability							

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	to predict species' vulnerability to ongoing climate change. Benefits: This project should significantly improve our capacity to manage threatened and keystone species by identifying those that will require targeted conservation management. **National Interest Test Statement** Australia's biodiversity is facing an extinction crisis. Some species will be able to avoid extinction through evolutionary adaptation, but many will not. Predicting which species will be able to evolve their way out of trouble, and which won't, will be key to securing Australia's biodiversity at a time of rapid environmental change. Genomics, the study of all the genes of an individual within and between populations and species, represents our best hope of doing so. This project will reveal how genomic data can be used to accurately predict species' extinction vulnerability. The outcomes will inform the use of genomic data in threatened species management. By validating the use of genomics to identify species at risk we will be better able to use targeted management, such as habitat restoration, captive breeding programs or genetic rescue to mitigate extinction risk. The project may lead to advances in the agricultural and health sectors by increasing our ability to predict pest and disease vector responses to environmental change. This work will contribute to Australia's capacity to manage biodiversity and safeguard our environment. We will ensure these benefits come to fruition by communicating research outcomes directly to governments and biodiversity managers with whom we have direct links. This will enable us to develop pathways for the translation and adoption of the research into management strategies.							
DP250103251 Ernst, Prof Andreas T	**Learning to Value Constraints** Optimisation subject to constraints is key to improving efficiency in transport, energy and many other areas. This project will develop better optimisation algorithms by leveraging the power of machine learning to boost the handling of constraints. By developing more advanced constraint handling, the optimisation methods created in this project will enable larger and more complex optimisation models to be solved. A particular focus is optimisation in applications involving networks. The development of such machine-learning enhanced optimisation approaches is expected to lead to benefits in industries where optimisation plays an important role, including transport, logistics, and energy grid planning. **National Interest Test Statement** Optimisation is used extensively by Australian business to create efficient and effective plans and schedules. Solving such optimisation problems is computationally challenging, so mathematical and algorithmic innovations are required to create better solutions for increasingly complex problems. This project will use the growing power of Artificial Intelligence, and particularly Machine Learning, in this context. These techniques cannot directly solve optimisation algorithms. Instead, this project proposes to use them to augment the capability of existing algorithms which are already widely deployed in industry. The focus is on enabling better handling of complex constraints that are a characteristic of many practical scheduling and planning problems. The machine-learning based advances are expected to allow larger and more complex practical optimisation problems to be solved. To ensure that the benefits of research in this area are accessible to Australian businesses in improving their efficiency and effectiveness, the project includes an optimisation software company as a partner. Gurobi is one of the leading developers of optimisation software, which is widely used in Australia and across the world. Research outcomes will also be made publicly available in the form of both academic publications and open source software to support adoption of the innovations created in the research.	92,530.00	187,560.00	189,310.00	94,280.00	0.00	0.00	563,680.00
DP250103521 Lyras, Prof Dena	**The role of microbial interactions in controlling bacterial evolution** Bacteria evolve rapidly by sharing DNA through a process called conjugation. Conjugation enables movement of antibiotic resistance genes between bacteria within diverse niches, such as within the gut or in soil, facilitating the spread of antibiotic resistance genes. Using cutting-edge techniques, this project expects to generate new knowledge into how interactions between microbes allow antibiotic resistance genes to move amongst diverse bacteria, and how the cell receiving the DNA responds to, controls, and modulates this process. This project addresses a long-standing knowledge gap, and results can be used to combat antibiotic resistance, providing significant benefits to our economy, environment, society, and agricultural industries. **National Interest Test Statement** Bacteria can develop defence strategies against the antibiotics that kill them, known as antibiotic resistance mechanisms. This makes infections caused by antibiotic-resistant bacteria hard to treat, threatening human and animal health, and costing Australia $283 billion by 2050. Alarmingly, antibiotic-resistant bacteria can share resistance mechanisms with other bacteria leading to the spread of antibiotic resistance amongst humans, animals,	86,014.00	201,307.00	202,411.00	87,118.00	0.00	0.00	576,850.00

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	and the food chain. However, there is a lack of understanding on how bacteria communicate and share these mechanisms with one another. Using new technology, this project aims to study the major resistance sharing method, conjugation, which occurs when two bacterial cells come into close contact. This will allow us to better understand how conjugation is established to drive antibiotic resistance. The findings have the potential for social, economic, environmental, and commercial benefits for Australia, such as allowing humans and animals to lead healthy lives, protecting our food industry, and developing new drugs from targets identified from this project. The research outcomes will provide new knowledge towards treatments that block bacteria from sharing resistance mechanisms which will be pursued through industry collaborations. The findings can be adopted to help inform policy for Australia's National Antimicrobial Resistance Strategy which aims to minimise the spread of antibiotic resistance.							
DP250103525 Nie, Prof Jian-Feng	**Unveiling the mysteries of rare-earth additions in magnesium alloys** This project aims to use state-of-the-art characterization and computation techniques to unveil the elusive roles of rare-earth (RE) solutes in intra-granular and inter-granular deformation processes of thermomechanically processed magnesium alloys that hold technological significance. This project expects to generate new insights into deformation mechanisms and establishing a solid platform for designing innovative RE-free alternatives with unprecedented properties. Expected outcomes are likely to fill a substantial knowledge gap and offer solutions for a much-needed class of multifunctional alloys. This should provide significant benefits for Australia's research capability in developing advanced materials to tackle global challenges.	127,877.50	265,803.50	269,384.00	131,458.00	0.00	0.00	794,523.00
	National Interest Test Statement Magnesium, being lightweight and recyclable, holds tremendous potential for energy-efficient and environmentally friendly applications in automotive vehicles. Additionally, magnesium is bioresorbable, and its alloys are emerging as a new generation of bio-implants for bone-fixation and cardiovascular stents. However, these products often lack the necessary mechanical properties and usually need rare-earth metals, which makes them more expensive and difficult to resource, recycle, and ensure they are safe for the human body. This project aims to tackle these critical issues through the utilisation of state-of-the-art experimental and computational facilities. The expected outcomes include the development of clear rules for mixing metals to make alloys of better performance, the identification of rare-earth-free alloying additions to magnesium alloys, and the establishment of associated manufacturing processes that can significantly enhance even mechanical properties. These advancements will not only benefit the Australian magnesium industry but also contribute to the expansion of the manufacturing and bioimplants sectors to increase their international market share. The research findings will be disseminated through publications in open-access journals or repositories, as well as presentations at both national and international conferences. Additionally, this project will also seek collaboration with Australian industry partners for potential technology transfer opportunities.							
DP250103575 Hutchinson, Prof Christopher R	**A clean slate approach to solid-state nucleation in metals and alloys** Nucleation is the process of one phase forming from another phase. It is the first step of a phase transformation which is the most powerful means of modifying the microstructure of engineering alloys and therefore controlling their properties. This project aims to develop a completely new model for nucleation during solid-state phase transformations in engineering alloys, such as the steels and aluminium alloys used in transportation, and functional alloys such as nano-composite magnetic materials. The successful development of a new, predictive model for nucleation will enable better materials and process design and result in alloys with improved combinations of properties potentially benefiting all industries using advanced materials.	112,310.50	256,480.00	276,190.00	182,611.00	50,590.50	0.00	878,182.00
	National Interest Test Statement The project is about developing tools to design and produce better engineering alloys such as steels, aluminium & copper alloys. These alloys play a key role in construction, transport (cars, planes, trains), energy conversion & transmission, etc. We use these alloys because they have suitable properties: cost, strength, toughness, deformability, recyclability, durability, electrical conductivity, etc. These properties depend sensitively on the chemical elements in each alloy and the processing. The processing uses complicated thermal treatments. For example, an aluminium car body panel is first held at a temperature of 500C, cooled, pressed into the shape of the panel, slowly heated to ~200C and held. These heat treatments manipulate the way the atoms are arranged in the material and this is what controls the properties. The first stage of this atomic rearrangement is called 'nucleation' and it is not understood. This project aims to develop a new understanding of nucleation to allow better control of this atomic rearrangement process, so it can be exploited to produce higher performance metals. The potential benefits to Australia are both economic (through those producing these alloys) and environmental (through the benefits of longer lasting, stronger, more recyclable, etc, metallic materials in society). The outcomes will be translated to end users by working in collaboration directly with alloy manufacturers to integrate the new understanding into their processing.							
	Abelian integrals and Hilbert's 16th problem							

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DP250103601 Tucker, Prof Warwick B	Hilbert’s 16th problem asks for H(n) - the maximal number of limit cycles (isolated periodic orbits) the family of 2D polynomial vector fields of degree n can display. The restricted version of this problem asks for Z(n) - the number of limit cycles that can bifurcate from a perturbation of a Hamiltonian system. The aim of this project is to significantly improve our knowledge about the solution to Hilbert’s 16th problem and its infinitesimal version by proving upper and lower bounds for important families of planar polynomial vector fields. We will use a combination of tools from dynamical systems, validated numerics, and formal proofs to put the findings on a truly solid foundation. **National Interest Test Statement** This project studies the long-term behaviour of mathematical models based on differential equations. Such models are routinely used in all fields of study: finance, climate modelling, epidemiology or artificial intelligence, to name a few. Despite the ubiquity of differential equations, there are still fundamental properties of them that are not fully understood. One long-standing challenge is to understand how periodic motion can be displayed by low-dimensional differential equations. Even in the simplest setting this has not yet been settled, and it remains one of the grand challenges in mathematics. Given the recent advances in computer-assisted proofs, it is now possible to bring a modern set of mathematical techniques to bear on this problem. Expected outcomes include a better understanding of the one of the major cornerstones of mathematical modelling, which may lead to better predictive powers. The developed techniques may also be able to highlight bottlenecks in simulations, especially where accuracy is at risk. This can lead to more precise models, and therefore more efficient simulations. Australia's high-technological industries have great needs in modelling complex systems. Therefore, our proposed research may lead to improved economic and commercial benefits to the nations research intense industries. Results will be shared with relevant industries through a series of workshops, meetings, and site re-visits, allowing them to collaborate on implementation.	87,500.00	177,500.00	182,500.00	92,500.00	0.00	0.00	540,000.00
DP250103746 Parish, Prof Meera	**Strongly driven quantum gases** This project aims to generate new theories of quantum systems that are exposed to a strong driving field, e.g., light or radio waves. Such strongly driven systems provide a new way of creating quantum materials with desirable properties, an outstanding goal in physics. Yet they remain poorly understood. The key innovation is the use of cold atomic gases, where analogues of light-driven materials can be simulated, allowing theories to be formulated and tested. Expected outcomes include the realisation and control of correlated quantum phases such as exotic superfluids. As well as advancing fields in quantum physics, this facilitates the design of tailored devices that could reduce energy consumption and the reliance on rare minerals. **National Interest Test Statement** We are on the verge of a technological revolution, where there is the prospect of harnessing the principles of quantum mechanics to produce superior devices such as faster computers, ultra-sensitive sensors, and high-efficiency engines. Such quantum technologies are expected to shape the global economy and form a multibillion-dollar industry in Australia within the next decade, according to the CSIRO quantum technologies road map. However, to secure its place in this emerging global industry, it is critical for Australia to sustain and grow its investment in the latest quantum capabilities. This project promises to enhance Australia’s quantum capability since it aims to revolutionise our understanding of a new class of materials that rely on quantum effects: systems of quantum particles (atoms or electrons) under a strong driving field such as light or radio waves. This will generate new tools for transforming quantum materials with light, thus facilitating the design of tailored quantum devices that could reduce energy consumption and the reliance on rare minerals. The project takes cutting-edge theoretical expertise unique to Australia and combines it with world-class experiments that can test the theoretical predictions. The research is strongly aligned with Australia’s recently announced National Quantum Strategy, and the outcomes will be promoted beyond academia through outreach activities such as demonstrations at schools in order to foster the future quantum workforce.	77,539.00	159,478.00	160,523.00	78,584.00	0.00	0.00	476,124.00
DP250103750 Kalman, A/Prof Julie A	**Asterix and the Making of Modern France: The Creation of a National Myth** The aim of this project is to write a new social-cultural history of France after the Second World War, showing how the country came together through a new national myth: the Asterix series of comic books. Asterix, written by René Goscinny, the child of Polish-Jewish immigrants, is the most successful publication in French history. This project will bring new understanding to the creation of national myths, a phenomenon in every nation. It will bring to light the role of immigrants in creating such myths, and provide an enlightening	31,135.50	63,176.50	73,064.00	41,023.00	0.00	0.00	208,399.00

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	comparative example to Australia. It will renew the history of Jewish integration, bringing deeper context to the position of Jews in western society. Outcomes will include a book, and a Radio 4/ ABC program. **National Interest Test Statement** Every nation has stories and myths that define it. How are these myths chosen? Where do they come from? This project will explore the history of the making of a national myth in post-war France. It will demonstrate how and why the Asterix comic book series, the most successful publishing story in French history, came to play that role. It will bring to light the role of immigrants in creating such myths, and in doing so, provide an enlightening comparative example of the process of national myth-making for Australia, a similar immigrant nation to France. Moreover, as the author of the Asterix series was Jewish, this project will renew the history of Jewish integration, bringing deeper context to the position of Jews in western society, at a time when this is subject to painful and difficult conversations around the western world, including Australia. Outcomes from this project will include an academic trade book, accessible to general readers, and a radio program, produced for BBC4, and available for broadcast on the ABC.							
DP250103795 Sexton, Prof Patrick M	**Interrogating GPCR dynamics through high-resolution, time-resolved cryo-EM** Cell surface proteins called GPCRs provide critical control of communication within evolved organisms to maintain normal cell & tissue function. GPCRs are highly dynamic and ligand binding and receptor activation occur across different time scales. This project aims to develop cryo-EM methods that move from static snapshots of structures at different stages of GPCR activation to continuous assessment of protein dynamics using time-resolved sampling and sophisticated analytical methods. The expected outcomes will address key knowledge gaps in understanding of how the largest family of receptors works. They will evolve techniques broadly applicable to other membrane proteins, and they have potential to advance drug discovery and development. **National Interest Test Statement** Proteins are the key element for the propagation of all life and perform the overwhelming majority of biological functions. They achieve this by folding in specific 3D shapes and depending on the shape they adopt they can perform amazingly varied tasks, from chemical reactors, to molecular machines to chemical sensors. Until now our ability to understand the 3D shapes of proteins is by methods which capture a single snapshot of their 3D structure, much in the same way that a camera takes a static image. However, life at the protein level is never static and proteins constantly change shape depending on their environment and the specific biological role they are carrying out. This research plans to develop a new scientific method using cutting edge microscopy techniques that will capture ‘movies’ of the different shapes that proteins sample. This research program is akin to filming a movie scene rather than taking a photograph of the actors. This innovative project will provide a leap forward in Australian scientist’s ‘toolkit’ to study nature at the molecular level and will provide the basis for the acceleration of pharmaceutical drug design. The knowledge gained in this project will be widely disseminated by high quality scientific publications, but more broadly this new technology will be incorporated into training programs already provided by the investigators in this grant, ensuring that the Australian researchers are at the forefront of the molecular study of nature.	248,635.50	481,161.00	449,451.00	216,925.50	0.00	0.00	1,396,173.00
DP250103974 Chan, Prof Philip W	**New ion-pair species-driven strategies for complex molecule synthesis** Alcohols are ubiquitous and found in a broad-spectrum of natural resources ranging from petroleum to biomass feedstocks. Their frequent use to prepare valuable materials such as medicines and polymers is driven by the well-known reactivities of the molecule. This project aims to discover innovative and efficient chiral catalytic systems that allow these common building blocks to react in a completely novel way to make new compounds. The catalytic strategies will be of extensive utility by enabling the design and sustainable manufacture of agrochemicals, medicines, and functional materials. This will provide major benefits such as training the next wave of Australian synthetic chemists and wealth creation by supporting the chemical sciences. **National Interest Test Statement** Cyclic molecules are of immense importance due to the critical role they play as building blocks in materials that sustain as well as advance our current way of life, from the medicine we take to the food that we eat. The creation of new chemical synthesis knowledge to construct such building blocks is therefore essential to the development of new valuable materials. Catalysis provides a way of doing this more efficiently, minimise reagent and	89,866.50	185,510.50	196,186.00	100,542.00	0.00	0.00	572,105.00

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	energy use and develop safer reaction conditions. This project aims to realise new, powerful catalytic reactivity to assemble sophisticated molecules efficiently and ultimately impact the way valuable materials are made. It will provide new patentable and indispensable catalytic methods and materials that will give Australia the cutting-edge in research capacity to gain a greater share of the global US$5.7 trillion chemicals industry market. It will address the urgent global issue of the impact of chemical manufacturing on the environment by establishing and utilising new, low-cost and sustainable solutions to making molecules. The new IP generated by the new catalytic reaction chemistry will provide the potential to leverage existing collaborations with industrial partners in fine chemicals to enable their translation and commercialisation. It will also train a new generation of highly skilled synthetic chemists with the abilities to address future scientific challenges and essential to the growth of the Australian economy.							
DP250104109	**From sheep dogs to children: how food reward controls learning**	127,577.00	255,154.00	255,654.00	258,154.00	130,077.00	0.00	1,026,616.00
Andrews, Prof Zane B	Learning is essential to successfully adapt to changing environments. Anyone with pets or a farming background knows that food is one of the strongest universal behavioural rewards, and hunger or food tastiness motivates behaviour by increasing the reward value of food. Therefore, it is no surprise that hunger has provided one of the strongest evolutionary survival pressures to optimise behaviour. Yet, despite decades of behavioural research and millennia of agricultural practices showing that hunger and food reward enhances learning and motivation, we still don't how brain circuits sensing hunger influence experience-dependent learning. This project examines how hunger and reward pathways interact to control learning.							
	National Interest Test Statement							
	Learning is essential to successfully adapt to changing environments and food is one of the strongest universal forms of positive reinforcement guiding the rate learning, as people with pets will attest. This project examines how brain regions that regulate appetite also simultaneously control learning. An investigation into how the brain pathways controlling appetite and food reward affect learning is important for many industries in Australia. This includes agriculture, conservation and animal welfare, as they rely on learned behaviours in changing environments. For example, after catastrophic environmental events, such as bushfires or flooding, domestic and wild animals must learn to adapt to alternative feeding strategies or sources to thrive and survive. Therefore, enhancing adaptive learning through food reward may be an important pathway to impact. The inability to adapt, or inappropriate feeding behaviour, could impact growth rates, reproductive success and long-term welfare of animals causing economic hardship and a decline in productivity to certain sectors of society. More broadly, the research will make important contributions to our fundamental understanding of how the brain computes food reward and affects decision-making processes under different environmental conditions.							
DP250104165	**Untangling the mechanisms of visual attention**	118,978.00	242,889.50	252,855.50	128,944.00	0.00	0.00	743,667.00
Hagan, Dr Maureen A	No area of the brain works in isolation - brain areas are vastly interconnected and work together with precise temporal precision. How does the brain keep track of different connections and integrate them to control behaviour? This project aims to investigate the mechanisms the brain uses to integrate different information to guide visual attention. This project expects to generate a foundational knowledge about a fundamental brain process. The expected outcomes include novel research capacity in Australia and the development of novel methods to study brain function. Understanding neural communication will provide significant benefits to the development of neural engineering projects like neural prosthetics and computer vision.							
	National Interest Test Statement							
	Networks of brain areas orchestrate their activity with exquisite timing to support complex, cognitive behaviours like attention, decision-making and memory. How does the brain keep track of different connections and combine them to control behaviour? Despite being a fundamental brain function, we have a very poor understanding of how brain areas communicate information to one another to support behaviour. The overarching aim of this project is to understand how the brain integrates information to guide visual attention. Visual attention is a useful behaviour for studying how brain areas communicate because brain networks must combine incoming visual information through our eyes with our internal goals and intentions. The aims of this project do not study or address any diseases. However, we know that dysfunction in communication across brain areas can have devastating consequences. Many brain disorders - from Alzheimers to Autism, have symptoms affecting cognitive behaviours including attention, decision-making and memory. Understanding how healthy brains support cognition will give us insight into why this occurs. This project will generate a foundational dataset that we intend to make publicly available, to be shared with other researchers, as well as industry and clinical partners.							
DP250104201	**Exploiting duality in quantum relative entropy optimisation**	67,500.00	140,000.00	150,000.00	77,500.00	0.00	0.00	435,000.00
	This project aims to develop improved algorithmic and modelling approaches for							

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Saunderson, Dr James F	quantum relative entropy optimisation problems, which naturally arise in the design and analysis of quantum systems. This project expects to achieve this by developing a deeper mathematical understanding of duality for these problems. Expected outcomes include new algorithms for the design of quantum key distribution protocols, as well as theory to characterise the modelling power and limitations of quantum relative entropy optimisation. Possible benefits include the ability to design and reliably characterise properties of larger quantum information processing systems, as well as developing new application areas for this family of optimisation problems. **National Interest Test Statement** This project is about developing new mathematics, and incorporating it into computer programs, to reliably solve optimisation problems that arise in the design and analysis of quantum systems. For example, one way to make communications more secure is to exchange a key part of the information using the laws of quantum physics. Optimising the design of these schemes allows this to be done as efficiently as possible. Current computational methods to solve these optimisation problems either do not achieve high accuracy or take too much time or memory to solve problems of modest size. This research could benefit Australia by enhancing Australia's quantum industry, an area identified by the Australian Government as a critical technology in the national interest. This research could lead to a competitive advantage by developing tools that could be used to improve products known as quantum key distribution systems, currently being developed by Australian companies. The outcomes and algorithms developed as part of this research might be translated beyond academia via being incorporated as a part of larger software tools for the analysis and design of quantum systems, in partnership with Australian quantum technology companies. Because the methods developed in the project are expected to come with performance guarantees, they could be safely incorporated into larger software systems without the user requiring knowledge of the mathematics and algorithms going on inside.							
DP250104216 Formosa, Dr Luke	**Uncovering heme regulation, handling & transport in mitochondria** Life is sustained through many important biochemical reactions that can extract energy and build new molecules for the cell to grow. Important to many of these reactions is a metal-containing molecule called heme. Heme is made in the mitochondria and it is still unclear what the consequences are when there is too much or too little of this molecule. Additionally, we do not know how heme gets out of mitochondria once made. This project addresses these two important questions using new and complementary approaches. Staff and students trained during this project will develop highly sought-after skills that will showcase Australian innovation and research capabilities and lead to new insights that will benefit agriculture and the life sciences. **National Interest Test Statement** This research project focuses on understanding the critical roles mitochondria play in animal cell function beyond their well-known role as the cell's powerhouse. Here, we will investigate how mitochondria produce, manage, and transport iron packaged into heme, which is essential for many proteins to function in cells. This study fills a significant research gap in Australia by exploring how mitochondria react to changes in heme levels and how heme travels from mitochondria to other cellular locations. Understanding heme regulation is crucial for farming and livestock, as excess heme causes mastitis in dairy cows, and environmental metal poisoning blocks heme synthesis leading to animal deaths, which is detrimental to Australia's $13 billion cattle industry. The processes discovered here may also benefit biotechnology by developing new heme-binding proteins that can improve human health or have industrial uses. To ensure our findings reach beyond academia, we will share discoveries through social media, highlight research in mainstream media, and engage with industry leaders who may benefit from this work. Additionally, this project will train the next generation of scientists, improve international collaborations by partnering with leading global research institutions, facilitating knowledge exchange and fostering future joint projects. These efforts aim to maximise the understanding, application and adoption of our research, ensuring it positively impacts Australian society	97,936.50	201,299.50	207,159.00	103,796.00	0.00	0.00	610,191.00
DP250104240 Mitchell, Prof Christina A	**Cellular recycling, a route to productivity in ageing.** How can we age but remain productive? This impacts on Australia’s ageing workforce and productive lifespans of livestock and plants in agriculture. Remarkably, ageing in all species is linked to autophagy, the cells ‘garbage disposal system’ that declines with age. This project investigates an innovative strategy to sustain the anti-ageing power of autophagy by stimulating production of an essential component, lysosomes. Outcomes include understanding how autophagy failure impacts on muscle function and mobility, major contributors to a productive life. Our in-depth mechanistic characterization of lysosome production	137,500.00	300,000.00	331,492.50	258,992.50	90,000.00	0.00	1,117,985.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	will identify targets to mitigate ageing, providing opportunities for long term benefits across broad socioeconomic sectors. **National Interest Test Statement** Remaining productive while ageing has major socioeconomic benefits for Australia. Our population is ageing, as is its workforce, and coupled with falling birth rates this impacts economic productivity. In agriculture, the productive lifespan of livestock or crops falls many years short of their natural lifespan. We address this challenge by investigating a critical biological question – what makes us age well and productively? We focus on autophagy, the “garbage disposal” system inside cells that fails as we age. Preserved across a billion years of evolution from plants to humans, we are yet to harness its anti-ageing benefits. Our interdisciplinary approach integrates advanced microscopy (unique to us) with studies in animal models, to build a “molecular map” of components that sustain autophagy, and track their effect on ageing in real time. To deliver meaningful socioeconomic benefits we focus on muscle as the discovery of factors that sustain mobility are key to productivity. By revealing the molecular components involved, we may also provide long-term economic/environmental benefits in building strategies to monitor or prolong agricultural longevity. This is ideal for maximising food production within a limited environmental footprint. Knowledge will be shared across scientific reports, presentations and with the public via news, social media and public lectures. Monash University commercialisation teams will facilitate engagement with pharma and industry.							
DP250104242 Mitchell, Prof Christina A	**Cilia biology: an emerging frontier.** This project aims to define the molecular mechanisms that govern the protein and lipid composition of a largely ignored cell surface organelle named cilia, found in species from worms to mammals, which is essential for organ development. New knowledge will be generated using a multidisciplinary approach available in few laboratories worldwide, combining high-end imaging of proteins and lipids, proteomics and lipidomics of cilia. Expected outcomes include the first total proteome map of an entire organelle with altered lipid signals. Significant benefits include interdisciplinary training for students and enhanced national/international collaborations that will enable new technology generation, to answer previously unapproachable questions. **National Interest Test Statement** Primary cilia are hair-like microscopic projections on cells found in all animal species. They transmit messages within cells, which is essential for the formation of all organs and structures in the developing embryo. Defects in cilia result in devastating developmental abnormalities in organs such as brain, kidney and lungs. Cilia also contribute to the maintenance of good health by regulating metabolism and ageing. How these tiny structures regulate such important biological processes remains an unresolved scientific question. Our internationally recognised team will apply the latest advanced technologies to understand the role of cilia in organ development, and thereby how severe inherited malformations of mammals, fish and other species arise. Therefore, study of cilia will answer fundamental biology questions on a vital but understudied cell component. This work will strengthen existing international collaborations and initiate new partnerships with world leading scientists, bringing new scientific skills to Australia. Development of advanced scientific tools including cutting-edge microscopy and computing technologies is of national importance in training the next generation of scientists to support the sovereign capabilities of Australia’s growing biotechnology sector. Beyond academic publication and scientific meetings, our results will be communicated through Monash University’s strong profile in traditional and social media platforms and in public lecture series.	129,500.00	269,500.00	271,000.00	131,000.00	0.00	0.00	801,000.00
DP250104274 Imlach, A/Prof Wendy L	**Understanding how neural circuit activity is controlled by adenosine** The aim of this project is to understand how adenosine regulates neural circuit activity in spinal networks. Adenosine is a building block of life and essential for energy metabolism, but also functions as a signalling molecule. In this role, it has been studied extensively in the heart, but there has been less focus on neuronal signalling in sensory pathways. This project will focus on adenosine A1-receptor signalling to address this gap in the field by revealing the source of adenosine in this region, the effects of A1 receptor activation from the level of a single neuron, up to the network of sensory neurons regulated by adenosine. Lastly, we will develop new tools that can be used to understand adenosine signalling in multiple systems. **National Interest Test Statement** The nervous system serves as the body's command center, coordinating activities and ensuring proper responses to the external environment. To facilitate seamless communication through the nervous system, we employ a nerve modulator called ‘adenosine’, which plays important roles in controlling activity in the brain and spinal cord. This project seeks to understand how adenosine modulates sensory signals (eg: temperature, pain and touch)	103,234.00	214,078.50	208,403.00	97,558.50	0.00	0.00	623,274.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	as they are transmitted through the nervous system. While we know adenosine regulates incoming signals, the intricacies of how and where remain unclear. The insights gained may hold the key to developing treatments for conditions like chronic pain or spinal injuries, improving lives of millions of Australians. Beyond health, effectively targeting this system could yield economic benefits by allowing more people to return to work, fostering a healthier and happier society. In the short term, this project will provide Australian scientists with new pharmacological tools to explore adenosines roles in the nervous system and other vital organs. To ensure future research adoption, findings will be published in open-access general journals, reaching both the scientific community and the public. Conferences will be a platform for sharing results, and all tools and knowledge will be freely accessible. The broader public will be engaged through news releases and interviews, maximizing understanding and translation of these discoveries beyond academia.							
DP250104378 Forsythe, Prof John S	**Fabrication of 3D neural networks for next generation biocomputing** Aim: To engineer 3D neural systems that will underpin the development of next generation biocomputing. Significance: Biocomputers based on neuronal networks have hit a hiatus due to the inability to engineer 3D structures reminiscent of brain neural networks. Outcomes: The new 3D bioprinted system will produce neuronal networks that are scalable, can be interfaced to communicate with the real-world and perform recognition tasks. Models and algorithms will be established to optimise computational processes. Benefits: Compared to traditional silicon-based computing, biocomputing has the potential for faster decision making, continuous learning and enhanced energy efficiency, essential traits for the development of next-generation computing.	121,995.50	238,601.50	228,712.00	112,106.00	0.00	0.00	701,415.00
	National Interest Test Statement In this project we will use the latest advancements in biofabrication, biomaterials, neuroscience and information technology to make a world first, living Artificial intelligence (AI) device using neurons as the core computing element. AI is becoming increasingly important for nations as it plays a critical role in manufacturing, information technology and security. Silicon based AI is now ubiquitous but is encumbered by increasing energy use and is slow to learn, particularly when given incomplete information. In contrast, the human brain, the most sophisticated computer, is energy efficient and highly adaptable in learning and computing across a range of datasets. We will demonstrate the ability of our living AI device to undertake learning tasks and the outcomes will lay the foundation and design rules for biological neural networks integrated with computers. This will result in the formation of new AI technologies which are more energy efficient and powerful than existing AI platforms. The project has the potential to propel Australia to the forefront of a new branch of neural computing, generating new industries, employing highly skilled local workforce and building critical resilience in key national priorities such as advanced manufacturing. Patent protection of IP will accelerate links with commercial partners, and our results will be communicated by team members at local and international conferences to disseminate results to identify applications for our technology.							
DP250104571 Hutt, Prof Karla	**Ovarian somatic cells: guardians of gamete survival and quality** This project will define the DNA repair capacity of granulosa cells in primordial follicles, compared to growing follicles, in the context of exogenous and endogenous DNA damage. Longevity, combined with the arrested state of their chromosomes render oocytes and their supporting granulosa cells in primordial follicles vulnerable to DNA damage. As oocytes are irreplaceable, to ensure fertility and health of the future generations it is imperative that the health of these primordial follicles is maintained throughout reproductive life. This discovery research will generate entirely new knowledge regarding the mechanisms underpinning oocyte quality, with implications for improving mammalian female fertility.	106,145.00	232,690.50	228,380.00	101,834.50	0.00	0.00	669,050.00
	National Interest Test Statement Granulosa cells are essential for supporting egg development and female hormone production. As such, defective granulosa cell proliferation and function can cause infertility and hormone deficiency, leading to range of negative outcomes including impaired growth and development in animals. Granulosa cells are unique and cannot be replaced by any other cell types, but surprisingly little is known about their essential properties or how their functional integrity is maintained. This project expects to expand our knowledge of how granulosa cells use DNA repair to maintain function over their prolonged lifespan. It will also determine the importance of these processes for fertility and endocrine function. These advancements are essential for development of new assisted reproductive technologies, which can improve agricultural breeding practices and support conservation projects for endangered animals. Additionally, this work will foster international collaborations and train young Australian researchers in cutting-edge techniques to expand Australia's capacity and capability in this crucial area of reproductive biology research. Beyond the scientific community, the outcomes of this research will be shared with the broader public through social media platforms and various media outlets. The Monash public relations office, committed to aiding the communication of research findings, will support these dissemination efforts.							
	The molecular basis of rapid cellular replication in the malaria parasite							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250104773 Creek, A/Prof Darren J	This research will reveal how malaria parasites perform extremely rapid replication of their DNA. Malaria is a major health burden in tropical regions, but our understanding of the parasite that causes this disease is limited. The malaria parasite lifecycle requires three stages of rapid replication, and we have recently identified new components of the parasite's replication machinery that are likely responsible for this unique process. We will use new molecular and proteomics technologies, and integrate these with AI to reveal how proteins interact to facilitate rapid replication. Our findings will underpin future research aimed at developing new interventions for malaria and related infections in wildlife, livestock and humans.	120,027.50	293,660.00	300,489.00	126,856.50	0.00	0.00	841,033.00
	National Interest Test Statement This project will reveal the molecular mechanisms that malaria parasites use to rapidly replicate and divide within the cells of the people they infect, and the mosquitoes that transmit them. Malaria is a major global health and socio-economic burden, impacting over 200 million people every year, including many of Australia's neighbours, tourist destinations and military and economic partners. By better understanding how these parasites divide and spread within and between hosts, we expect to identify new molecular mechanisms that could underpin future research to control parasite transmission. Closely related parasites, that use similar mechanisms to replicate, infect animals that impact Australian agriculture and wildlife; our research may identify new control methods for these parasites too. This project is enabled by our technological breakthrough that allows us to study the way proteins interact in living cells in real time. This project will develop Australia's capability to implement this new technology so that it can be applied to other biological questions of agricultural, environmental and human health importance. We will promote this new technology to our national and international collaborators through publications and presentations, and promote our findings on cellular replication to the public through media and education outreach events organised by the Australian Society for Parasitology.							
DP250104894 Davidovich, A/Prof Chen	**Humanizing facultative heterochromatin in the yeast.** In all multicellular organisms, cell type-specific genes are maintained repressed, unless their product is needed. The robust gene repression system of multicellular organisms has been completely or partially lost in unicellular organisms. Yeast is a unicellular organism commonly used for fundamental research and biotechnology. This project aims to develop yeast strains that carry similar gene repression machinery as in multicellular organisms. By doing so, the project will allow gaining new knowledge into the way genes are turned off and maintained in a repressed state within cells during countless cell divisions. By generating methods for robust gene control in yeast, this project will also open paths for new biotechnology applications.	120,000.00	240,000.00	240,000.00	120,000.00	0.00	0.00	720,000.00
	National Interest Test Statement The yeast S. cerevisiae has an astonishing high economic and social value, given its usage for the production of commodities ranging from bread, wine, beer, chocolate and to biofuels. New S. cerevisiae strains of various functionalities are commonly generated through the introduction of new genes, called "transgenes". Transgenes must become active only at the right time in the case of many biotech applications. Yet, S cerevisiae cannot turn off many genes simultaneously and pack them until they are needed to become active again. This is a major bottleneck for the development of advanced biotechnology applications using S cerevisiae. This project aims to generate the first S cerevisiae strains that are capable of packing silenced genes using the same factors that human cells are utilising. By doing so, this project will enable the application of fast and robust yeast genetic approaches for the study of human-gene silencing processes that are otherwise too complicated to study in human cells. The project will strengthen the high reputation of Australia in genetics and transcriptional regulation. This project also aims to allow, for the first time, the engineering of yeast strains with a gene expression control similar to that of multicellular organisms. The usage of these new traits for the generation of genetically modified yeast lines will transform the biotech sector by enabling the engineering of complex pathways in yeast to revolutionise their applicability.							
DP250105091 Megalokonomou, Dr Rigissa	**Women in STEM: The Longer-Term Effects of Teachers** This project aims to understand the impact of teacher attitudes, gender, gender biases and behaviour on student performance in and preference for Science, Technology, Engineering and Mathematics (STEM) subjects and careers, and the impact of the school environment on teacher gender bias. The project will use exogenous variation to analyse the impact of teachers on student achievement in high stakes exams, effort and aspirations to pursue a STEM career. Expected	76,025.50	158,299.50	173,420.00	91,146.00	0.00	0.00	498,891.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	outcomes include a new understanding of the contribution of teachers to gender differences in STEM. This will benefit Australia that invests significant funding to gender equity initiatives to eliminate barriers for women's participation in STEM, and reduce the gender wage gap.							
	National Interest Test Statement							
	Research shows that there exist gender gaps in STEM degrees and careers, which contribute to the existing gender pay gaps in Australia and internationally. Central to rectifying these disparities are teachers, who are pivotal in shaping students' life trajectories and formulating their human capital. However, there are significant gaps in this research space that make it difficult to understand and predict how teachers' attitudes, behaviours, and potential biases influence these gaps, impacting students' motivation, effort, and pathways. With significant gender gaps in Australia, better policies are needed to improve students' long-run outcomes and motivate girls to apply to prestigious STEM degrees and occupations. This project will develop new methodologies and test their applications to understand to what extent teachers' attitudes and behaviours influence the gender gap in STEM studies and careers. The expected outcome and benefit of this project is to inform and design policies to improve long-run outcomes of students, eliminate barriers for women's participation in STEM and reduce the gender wage gap. The translation pathway includes formal submissions to government authorities dealing with the issues of gender and education, media engagement, and stakeholder forums to disseminate research outcomes to a policy audience. The potential future benefits of using these methodologies to support the changes required to address gender gaps in Australia and globally are immense.							
	Monash University	7,446,558.50	15,795,372.00	16,211,405.50	8,889,659.00	1,027,067.00	0.00	49,370,062.00
RMIT University								
DP250100125	**Near-infrared quantum emitters in diamond: a new frontier in photonics**	94,085.50	175,658.00	169,056.00	87,483.50	0.00	0.00	526,283.00
Reineck, Dr Philipp R	This project aims to develop near-infrared quantum emitters in diamond as a platform technology that may ultimately enable long-distance quantum networks, integrated photonics, and deep tissue biosensors based on diamond. The project is expected to generate the fundamental science required to discover new emitters and explore the potential of recently discovered emitters as near-infrared single photon sources and quantum sensors. The expected outcome is ultra-stable nanoscale light sources in the telecom range that bridge the gap between emerging diamond-based quantum technologies and mature near-infrared photonics and that may one day enable new biosensors for better health outcomes and quantum-assured communication for improved security.							
	National Interest Test Statement							
	Atom-scale light sources in diamond—so-called quantum emitters—are at the heart of today's quantum technology revolution and Australia’s National Quantum Strategy. However, they are currently incompatible with established light technologies that are the basis of modern telecommunications and many emerging biomedical sensing technologies. This project aims to address this bottleneck by developing industry-compatible light sources in diamond that enable quantum-assured communication networks and ultra-sensitive biomedical diagnostic tools. This will one day provide Australians with more secure communications technologies and better health outcomes through the early detection of pathogens and diseases. The materials and fundamental science developed throughout the project will bridge the gap between emerging diamond-based quantum technologies and cutting-edge telecommunications and sensing technologies. This will enable technological innovation and support Australia’s ambitions for economic growth in quantum technologies, and it may provide Australia with strategic defence capabilities in the long term. The project team will participate in the Australian Centre for Quantum Growth program and events and programs run by the Defence Science & Technology Group to promote project outcomes to end users in telecommunications, biomedicine, and defence. The project findings will be promoted to the public via social media and news stories in traditional media.							
DP250100311	**Synchrotron Nanocrystallography**	100,273.00	202,115.50	206,000.50	104,158.00	0.00	0.00	612,547.00
Martin, A/Prof Andrew V	The project aims to develop a new method to determine the atomic structures of macromolecular nanocrystals. The project expects to enable atomic scale studies of previously inaccessible molecules and enable molecular movies of chemicals interacting and changing the function of larger molecules, such as proteins. The expected outcome of this project is an advanced new technique for use at the Australian Synchrotron and international x-ray facilities. This should benefit the biological and materials research communities that use crystal structures to determine material properties and protein function, which are key steps in the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	rational design of materials and drugs respectively. **National Interest Test Statement** This project is about developing a new method of determining how atoms are arranged and move in crystals smaller than a micrometre in size (nanocrystals), allowing us to visualise the 3D shapes of proteins. Knowledge of how atoms are arranged is critical for understanding the properties of materials and how drugs work at the molecular level, driving technological and health innovation. Many dynamical processes are unmeasurable without using crystals smaller than a micrometre. By developing synchrotron nanocrystallography, this project will provide a new capability to record molecular movies of large molecules (like proteins) at the Australian Synchrotron and international synchrotrons. This will make nanocrystallography available to the Australian research community. The tangible benefits to Australian society are new materials or drugs that the Australian research community could discover in the future using our new technique. To maximise translation of this research outside academia, we will work with industry users of crystallography at the Australian Synchrotron and provide them access to equipment, analysis software and training to perform nanocrystallography. The longer-term goal is to enable industry to use nanocrystallography, as they currently do crystallography, for commercial research and development.							
DP250100582 Khalil, Prof Ibrahim	**Privacy-Aware Intelligent Digital Twin for Secure Critical Infrastructures** This project aims to address system privacy, trustworthiness, and efficient resource management within Digital Twins-based critical infrastructure. It expects to advance new knowledge in the area of intelligent systems and cybersecurity in the context of Digital Twins-based applications in smart critical infrastructures. Expected outcomes include an efficient, intelligent Digital Twin that provides data privacy and integrity by utilizing encryption techniques, machine learning techniques, and blockchain. It is expected that the outcomes of this project will benefit Australian Critical Infrastructures by providing the system with cost-efficiency and privacy, while increasing its trustworthiness and quality of services.	78,606.00	159,712.00	174,712.00	93,606.00	0.00	0.00	506,636.00
	National Interest Test Statement Critical Infrastructures hold users' private information, including their identity and behavioural data. With increasing cyber security threats, such as identity theft and data manipulation, data privacy and integrity have become increasingly major concerns for the Australian Government and the public. Recent cyber-attacks and data breaches in Australia have been reported to have an average cost of over USD 4.35 million per breach, representing a 12.7% increase over the past two years. This highlights the necessity of implementing effective privacy-preserving techniques to combat cyber threats and protect national safety, economy, and security, aligning with the Australian Government's Science and Research Priority of "Cybersecurity" and National Reconstruction Fund Priority of " Enabling capabilities". This project aims to develop easy-to-use security mechanisms and machine learning techniques for data privacy and integrity throughout its lifecycle in the emerging smart critical infrastructure. The knowledge acquired can be utilised by the Australian Government and companies to prevent adversaries from accessing and tampering with the data while ensuring system availability. The project's outcomes can be commercialised for safer and cost-effective critical infrastructure services for Australian essential sectors such as telecommunications, healthcare, and government artificial intelligence-based services, offering opportunities for Australian companies and organisations.							
DP250100922 Zhang, A/Prof Huacheng	**Designing subnanofluidic devices for precise divalent metal ion separation** This project aims to explore innovative subnanofluidic devices that can efficiently separate divalent metal ions. The project expects to generate new knowledge in designing membranes with biomimetic pore structures and functionalities for rapid and selective transportation of targeted divalent metal ions. The expected outcomes of this project include a sustainable separation method for reclaiming metal ions from wastewater streams and an effective way to advance mineral refining processes. These advancements should significantly benefit the chemical and energy sectors, reduce waste generated during mining and energy industries, and shift towards a circular economy paradigm by yielding valuable products from recovered metal ions.	78,000.00	167,500.00	189,500.00	100,000.00	0.00	0.00	535,000.00
	National Interest Test Statement In Australia, approximately 1.5 million tons of desalination concentrates are generated daily, containing numerous valuable ions worth over $1000 per ton. These ions are essential in construction, energy, agriculture, and chemical processes. Disposing of these concentrated brines into waterways is wasteful, costly, and environmentally harmful. There is an urgent need to develop new technologies capable of efficiently recovering valuable ions from these waste products, as current methods are inefficient and cannot recover specific metal ions for reuse. Therefore, this project aims to advance separation technologies to recover these valuable minerals, reduce waste during water treatment, and enhance mineral processing efficiency. The outcomes will yield substantial economic and environmental benefits for Australia by reducing waste from the water and mining industries, conserving resources, and mitigating the environmental impact of industrial processes. Enhanced recovery and separation technologies can lower operational costs for water treatment facilities by improving process efficiency and							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
	reducing the need for chemical additives. Additionally, the project has the potential to offer commercial benefits by positioning Australia as a leader in efficient ion mining technologies. We will actively promote the outcomes through invited talks, webinars, and collaboration with industry stakeholders to reduce global desalination waste and improve resource extraction efficiency.							
DP250100971 Rezk, A/Prof Amgad	**Acousto-Electrocatalysis: A New Frontier in Electrochemistry** This project aims to investigate the use of high frequency vibrations to enhance electrochemical reactions whilst avoiding the use of expensive platinum-based catalysts. This project expects to generate new knowledge in the area of high frequency, acoustically-driven fluidic systems and their novel utilisation in improving electrolysis efficiency. Expected outcomes of this project include prototypes for a new type of acoustically based electrolyser, particularly relevant to hydrogen-on-demand applications. This should provide significant benefits, such as less reliance on fossil fuels and reduction in carbon dioxide emissions, critical to our response to the current climate crisis.	84,150.00	167,182.00	156,814.00	73,782.00	0.00	0.00	481,928.00
	National Interest Test Statement Producing green energy, at scale, has not yet materialised due to the high operational costs and the need for expensive catalysts. This project explores the use of high frequency sound waves to markedly increase the production efficiency of hydrogen fuel generation while using cheaper platinum-free electrode materials. The project outcomes will strengthen green hydrogen and ammonia production technologies, with the potential to enhance Australia's clean energy output and strengthen the nation's contributions in carbon dioxide emission reduction through new investment opportunities and job creation. Cleaner energy production will reduce Australia's reliance on burning fossil fuels, which is a major source of pollution, and potentially mitigate catastrophic environmental consequences of climate change. The project outcomes extend far beyond scientific breakthrough discoveries utilising the novel use of high frequency sound waves to dramatically enhance catalysis for green hydrogen and ammonia production and will facilitate translation into building efficient and low-cost hydrogen generators. We will promote the outcomes of this project through the media team to attract industry partners to co-develop our acoustic platform into viable prototypes for green energy. This, in turn, will accelerate Australia's use of renewable and clean energy in the electricity market, which currently accounts for only 32.5% of the total market, compared to 67.5% produced through fossil fuels.							
DP250100973 Tetienne, Dr Jean-Philippe R	**Spins in flatland: a new platform for quantum sensing** This project aims to develop a new platform for quantum sensing, based on controllable electronic spins hosted by a two-dimensional (2D) material. By leveraging the unique properties of the 2D platform recently discovered by the investigatory team, the project expects to bring quantum sensors to the realm of atomic and molecular scales. Expected outcomes include novel high-resolution sensing methods and materials operating under ambient conditions, and the realisation of ultrasensitive biosensors and precision nanoscopes. This should benefit the sovereign development of quantum technologies, the training of the future quantum workforce, and lay the foundation for start-ups and technology translation to support local and global industry.	118,464.50	228,626.00	206,216.00	96,054.50	0.00	0.00	649,361.00
	National Interest Test Statement A quantum sensor is a device that can measure things with far better precision than conventional sensors. This project will develop a new class of quantum sensors that operate at a finer atomic level, making them even more powerful. The benefits to Australian society are primarily in health diagnostics, by enabling faster results from ultrasensitive biomolecular sensors, and defence, by improving the capacity and functioning of electromagnetic receivers used for communications in electronic warfare scenarios. This project will create intellectual property and may result in the commercialisation of the sensors, which could contribute commercially by growing the national quantum industry and workforce. To promote the implementation of the findings, the researchers will engage with key stakeholders such as the Australian Centre for Quantum Growth, and deliver presentations and demonstrations at events and programs run by the Defence Science & Technology Group, an Australian Government agency dedicated to the adoption of new developments in science and technology in the interest of Australian security and defence.							
DP250100980 Jia, Prof Baohua	**Laser Chemical Bond Engineering for Integrated Graphene Oxide Devices** This project aims to overcome the fundamental quality barriers in graphene production from cost-effective graphene oxides (GO) by conceptualising an innovative laser chemical reduction method. By using tailored ultrafast laser pulses to specifically target the oxygen group and defects, which are the	115,219.00	213,398.50	199,333.00	101,153.50	0.00	0.00	629,104.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	fundamental factors contributing to the low quality, this project is expected to improve the material conductivity by over 100 times, making it suitable for integrated optoelectronics devices. The expected outcomes are the development of new advanced manufacturing capability and technology platform for high quality, ultracompact, multifunctional and cost-effective graphene integrated devices, revolutionising many sectors in business and society. **National Interest Test Statement** This project focuses on laser chemical bond engineering to develop high-quality reduced graphene oxide (rGO) with properties approaching those of pristine graphene. Innovatively tailoring ultrafast laser pulses to selectively remove oxygen bonds in low-cost and scalable graphene oxide (GO), we aim to overcome the challenges of scalability and reproducibility that have hindered the practical use of graphene in integrated devices and addresses a critical research gap. The outcome will benefit Australian economy by enabling the mass production of advanced graphene devices, revolutionising industries such as electronics, renewable energy, and biomedicine. The greener manufacturing processes will reduce the energy consumption and chemical waste associated with current graphene production methods. Socially, the improved materials can enhance technologies that impact daily life, such as more efficient energy storage systems, personnel electronics and advanced wearable sensors. The research impact will be maximised beyond academia by engaging with key global stakeholders in electronics manufacturers, renewable energy companies, and medical device firms through planned conferences and collaborations, publications in open-access journals, and patent applications to facilitate commercialisation. Outreach activities with local schools, public lectures and device demonstrations will further promote understanding and adoption of the graphene technology, ensuring broad societal benefits.							
DP250101190 Gelmi, Dr Amy	**Understanding Transient Cellular Response to Electrical Stimulation** This project aims to determine how electrical stimulation modifies the biomechanical and biochemical properties of stem cells, using exciting nanoscale techniques to characterise and track the responses of living stem cells during electrical stimulation. This research expects to generate new knowledge in how we can use electrical stimulation to control stem cell fate for targeted tissue engineering. Expected outcomes include new bio-characterisation techniques, and closing the knowledge gap in the field of stem cell stimulation. This should provide significant benefits for patient derived tissue engineering, maintaining Australia's position at the forefront of basic stem cell research. **National Interest Test Statement** Stem cells in adult bodies have the ability to repair and heal our body; tissue engineering aims to use these stem cells to regenerate new tissue or control stem cell growth for specific outcomes. This project is about understanding electrical stimulation can be used to control how stem cells turn into bone, cartilage, fat tissue. Currently, we do not fully understand how electrical stimulation treatment can induce stem cells to grow into specific terminal cell types. The project will use cutting-edge tools to understand the changes in living stem cells in real-time, both inside and out, including the first system in Australia capable of performing single cell biopsies. Understanding how stem cells grow into different cell types can underpin the development of a stem cell treatment technology capable of inducing bone, cartilage, and muscle tissue would generate an efficient and cost-effective approach for patient specific musculoskeletal tissue engineering. The outcomes of this project will be disseminated and promoted via publications, conferences, and media statements in turn, this knowledge will benefit the regenerative medicine industry in Australia through the development of new technologies and products which utilise electrical stimulation for tissue repair and regeneration.	88,736.00	183,338.00	220,749.50	126,147.50	0.00	0.00	618,971.00
DP250101811 Yeo, Prof Leslie Y	**Acoustomicrofluidic Crystallisation of Covalent–Organic Frameworks** This project aims to develop a new, simple and fast method for synthesizing films of a new class of highly porous materials onto different surfaces not easily possible with other techniques. Elucidating the mechanisms governing the process will allow us to control the quality and stability of these films, which we will demonstrate for producing highly efficient gas separation membranes for carbon capture and storage, as an example application. Scaling the platform is expected to yield a thousandfold energy efficiency improvement, thus constituting disruptive technology that is an attractive economical and environmental alternative to conventional spray drying, and hence transforming industrial practice in the manufacture of these materials. **National Interest Test Statement**	81,600.50	173,992.50	181,458.00	89,066.00	0.00	0.00	526,117.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	The project seeks to demonstrate a novel, efficient, simple and green method for simultaneously synthesizing a new class of highly porous materials and coating them as films onto a variety of surfaces. If successful, it will overcome existing manufacturing challenges, thereby constituting disruptive technology that will provide an economically-viable and environmentally-friendly way to produce these materials. In addition to improving the efficiency of the downstream applications for which these materials can be exploited, such as gas separation, drug delivery and catalysis, the technology will provide another avenue for advanced and innovative production of niche, high-value-add products, which has been recognised as the future of manufacturing in Australia, as embodied by the government's Future Made in Australia Act, particularly in light of the recent sharp decline in the traditional manufacturing industry. In addition to the implications for domestic job creation, translation of the platform along the technology transfer pipeline towards commercial realisation will further contribute to an innovation economy by enabling Australian industries to capitalise on an emerging market for these materials, for which there exists strong interest and demand. Besides commercialising the technology, we will also seek to disseminate the research outcomes through media releases and STEM education outreach activities to promote wider public understanding of science.							
DP250102621 Payne, Prof Alice R	**Valuing the Handmade for Circular Fashion and Textile Economies** This project aims to investigate the value of the handmade within fashion and textile ecosystems in two Australian states. This project expects to generate new knowledge in the area of circular economy by using place-based approaches to foreground experiences of small businesses and craft communities that are typically excluded from the industrial view of a circular economy. Expected outcomes of the project include understanding and defining new forms of value within a fashion and textiles circular economy through surfacing the local economies of making, reuse and remaking. This should provide significant benefits, such as informing new strategies to reduce textile waste and contributing to Australia's transition to a circular economy.	77,981.00	158,740.00	163,573.00	82,814.00	0.00	0.00	483,108.00
	National Interest Test Statement Australia faces challenges with overconsumption and disposal of clothing to landfill, contributing to environmental pollution and resource depletion. Slowing down production and consumption through the circular economy approaches of reuse, repair and remake can help to reduce the use of new resources and the generation of waste. This project explores handmaking practices within two Australian states centring on small-scale industry, domestic and community settings. The aim is to understand the social, environmental and economic value of the handmade and how an understanding of its value can support the transition to a local circular economy, while generating wellbeing and social cohesion. It seeks to address a critical gap in circular economy thinking, which is the role of craft and the handmade in slowing the demand for new materials. Economically, the promotion of handmade practices could stimulate local economies by supporting small-scale businesses and artisans. Socially, it can foster community resilience and promote a sense of cultural identity through the preservation of craft knowledge. Environmentally, this research can lead to a reduction in textile waste and pollution. These outcomes will be communicated through workshops with the fashion industry and broader community, publications and a repository capturing handmaking knowledge to enable the translation to a circular economy.							
DP250103014 Balanzategui, Dr Jessica K	**Understanding Children's Mobile Gamble-Play Cultures: Gateways to Gambling** This project aims to minimize the harms involved in children's access to gambling by developing an understanding of how Australian children use mobile phones to engage in "gamble-play". It will generate a new evidence base to inform evolving regulation around children and gambling, and to improve child and parent literacies about the ways mobile media content introduces children to gambling-like play behaviours. Outcomes include child co-designed educational toolkits to build family literacies around the emergent mobile gamble-play sector, and a series of white papers for the policy sector. Benefits include informed gambling policy that accounts for children's mobile play habits and how mobile devices operate as gateways to gambling.	74,870.00	164,381.00	176,874.50	87,363.50	0.00	0.00	503,489.00
	National Interest Test Statement Gambling amongst children in Australia is emerging as a national crisis, with a 16% increase in the number of people under 18 seeking help for gambling in the past financial year. To combat this growing problem, State and Federal Governments are prioritising regulation that restricts children's access to gambling, but there are crucial gaps in the policy related to children's use of mobile devices. This project will generate an evidence-base of how children use mobile phones to access "gamble-play" via apps, social media and games that embed gambling mechanics, with and without explicit monetary transactions. Research with children aged 5-17 - including lab and home-based observation, interviews and workshops - will identify how mobile devices open "gateways to gambling" and determine how gambling-play behaviours escalate as children mature. This evidence will inform evolving regulation around the intersections between gambling, children, and media, including tracking and identifying gaps in new videogame and social media policy. The project will provide social benefits through educational toolkits that support family literacies, co-designed with children and promoted through a national media plan. An Advisory Board of industry and policy experts will ensure strong uptake of the project's white papers. Through initiatives							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	such as a Gamble-Play Summit and regular Board consultation, these white papers will assist policymakers with the development of evidence-based regulation.							
DP250103847 Ma, Prof Qian	**Breakthrough metal metamaterials with high strength and near-water density** Breakthrough metallic metamaterials with exceptional mechanical strength at near-water density are new enabling advanced materials for Australian manufacturing. This project aims to make a new major innovative leap to create such unprecedented metallic metamaterials by leveraging Australia's leading expertise in metallic metamaterial and 3D printing research. Expected outcomes include new national capabilities in breakthrough metallic metamaterials, new fundamental knowledge in material design and fabrication, a range of promising metallic metamaterial product designs, and interdisciplinary training of future leaders. This should provide significant benefits to Australian manufacturing in expanding existing markets and developing new ones.	88,638.00	181,745.50	188,080.50	94,973.00	0.00	0.00	553,437.00
	National Interest Test Statement Metamaterials are engineered materials with transformative potential for Australian engineering, where low-density and high-strength metals are essential but difficult to achieve. 3D printing has revolutionized their design and manufacture by enabling precise, customisable, and complex sub-millimetre structures previously impossible with traditional manufacturing. This project aims to use 3D printing technology to develop new metallic metamaterials that are lightweight, strong, corrosion- and heat-resistant, applicable across Australia's key engineering sectors generating significant economic benefits. These include manufacturing to creating new job opportunities; aerospace in advanced drone technology; defence in lightweight armour, and structural components for vehicles and aircraft; healthcare in patient-specific hard tissue implants; marine for durable, corrosion-resistant components; and energy in efficient, environment-specific turbine blades, heat sinks and exchangers. The outcomes should assist the expansion of Australian manufacturing in existing markets and lead new ones in a decarbonization-driven economy by reducing material waste and energy use. 3D printing considers recyclability and restoration, where traditional methods do not. The project will train early career researchers, strategically ensuring Australia's future leadership in this critical area. Key research findings will be shared via our industry networks and media channels to stimulate public interest.							
DP250103852 Ma, Prof Qian	**Addressing a major historical challenge for titanium alloy development** The project aims to initiate and establish a new conceptual framework to overcome a major historical challenge in the mechanical performance of high-strength titanium alloys since their inception. This project expects to generate new fundamental knowledge in alloy design concept, advanced metallic materials, and metal 3D printing. Expected outcomes include a fundamental solution to the design of breakthrough titanium alloys, new knowledge in 3D printing of these breakthrough titanium alloys, and interdisciplinary training of future leaders. This should provide significant benefits to Australian manufacturing in expanding existing diverse titanium markets, opening up new markets, and developing new business collaborations and partnerships.	89,615.50	186,060.50	192,245.50	95,800.50	0.00	0.00	563,722.00
	National Interest Test Statement High-strength, lightweight, corrosion resistant and damange tolerant titanium alloys are key engineering materials that are indispensable for many important applications in aerospace, defence, chemical, medical, energy production, maritime, shipbuilding, and other sectors. The Australian Government's list of Critical Minerals & Strategic Materials lists titanium as "essential to our modern technologies, economy and national security." Building on our recent breakthroughs in alloy design and 3D printing, this project aims to develop advanced sustainable titanium alloys with exceptional mechanical properties and damage tolerance. Importantly, these new titanium alloys can be made using recycled materials or scrap, or directly through Australia's abundant mineral resources (rutile and ilmenite). The outcomes from this project are expected to expand the Australian manufacturing industry in existing markets and advance into new ones in this decarbonisation-driven economy. Furthermore, it is expected to create new business opportunities and strengthen Australia's position on the global stage for advanced manufacturing. The project will also develop local talent to ensure Australia's future leadership in this important area. Major outcomes will be disseminated to the Australian manufacturing industry via Manufacturing e-news, industry forums, customised workshops, RMIT Research Translation Team, and to the public via RMIT's Media team to promote engagement beyond academia.							
	RMIT University	1,170,239.00	2,362,449.50	2,424,612.50	1,232,402.00	0.00	0.00	7,189,703.00

Swinburne University of Technology

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250100536 Liu, Prof Chengfei	**On processing and knowledge discovery in large dynamic multilayer networks** Multilayer networks contain rich and dynamic interaction information among objects spanning multiple aspects. Properly processing these networks and exploring cohesive information within find many applications and bring challenges as well. This project aims to devise efficient strategies for processing large and dynamic multilayer graphs and investigate different effective methods for searching different cohesive groups in various applications. The theoretic outcomes of this project will set the foundation for building cutting-edge technology for effectively modelling and efficiently searching/tracking interested information in large dynamic multilayer networks and contribute to theoretical foundations in big graph data management.	98,505.00	201,802.50	211,385.00	108,087.50	0.00	0.00	619,780.00
	National Interest Test Statement Many significant applications in Australia, such as financial systems, ecological systems, and epidemiological surveillance systems, are accumulating huge volumes of data containing rich and dynamic interaction information among objects spanning multiple aspects, which are better to be represented and processed as multilayer networks. Effectively modelling and efficiently searching and maintaining cohesive multilayer groups from multilayer networks are essential for providing the insights and values of this big graph data and bring great challenges and unprecedented opportunities for Australia. This project aims to fill in the research gap for reaching practical and scalable solutions for real-time processing and analysis of large-scale and dynamic multilayer networks. It will contribute to big data analytics of important cohesive multilayer group information from multilayer networks for different applications and bring considerable economic, social, and environmental benefits to Australia. The techniques, algorithms, and prototype systems developed in this project can be deployed to facilitate the smart use of big multilayer graph data in many advanced real applications across the nation, including business, society, environment, government, etc.							
DP250100868 Suslov, Prof Sergey A	**Electromagnetically driven flows in electrolyte layers with free interfaces** This project aims to understand electromagnetically driven flows in thin deformable layers. It expects to develop an analytical description of electrolyte flows required by microstirring and metallurgical applications. Expected outcomes include the development of new non-intrusive precision-controlled methods for manipulating fluids when mechanical intervention is impossible due to aggressive environment or extreme confinement. This should provide significant benefits to advance Australia's hi-tech microfluidic and metal recycling industries.	42,836.50	78,214.50	70,756.00	35,378.00	0.00	0.00	227,185.00
	National Interest Test Statement The Australian microfluidic sector, including innovative technologies, prototypes and lab-on-a-chip devices, has been estimated to be worth over $10B in 2024 and is expected to almost double by 2028. Yet the expansion of this industry may face a difficulty because common mechanical fluid manipulation approaches are not suitable for applications such as in pharmaceutics due to the need of handling accurately very small fluid volumes or because of the presence of chemically aggressive media. This project aims to develop a versatile framework for easy-to-control non-intrusive electromagnetic (EM) fluid flow forcing methods for use in micromixing, micropumping and targeted chemical delivery. This study will generate a better understanding of how EM driven film and shallow layer flows behave in various geometric configurations and how they are influenced by different wall conditions. It will suggest novel ways of optimising the operation of existing microfluidic devices and build a prototype experimental apparatus capable of inducing complex EM-driven flows. Research outcomes will pioneer new technological principles for developing next-generation applications benefiting the Australian microfluidic industry and its end-users. To promote our study beyond academia and to explore the opportunity of commercialisation, we will engage with CSIRO and Australian National Science Agency with the partnership proposal in their research production initiative under the microfluidics scheme.							
DP250101673 Forbes, Prof Duncan A	**Into the Darkness: Measuring the Properties of Dark Galaxies** A fundamental prediction of cosmology is that galaxies without stars, Dark Galaxies, should exist. This project aims to exploit the new era in radio observations with the Australian Square Kilometre Array Pathfinder telescope, combining its deep radio imaging with optical wavelengths, to identify large numbers of Dark Galaxies. With this first-ever sample of Dark Galaxies, and employing innovative techniques, the project will produce fundamental new knowledge, answering outstanding questions about galaxy formation and the nature of dark matter itself. National benefits include inspiring the next generation	110,246.00	225,258.50	229,025.00	114,012.50	0.00	0.00	678,542.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	of STEM students and scientists, while further enhancing Australia's international reputation in cutting-edge Astrophysics. **National Interest Test Statement** This project will study a sample of Dark Galaxies and thus advance our fundamental knowledge in astronomy and astrophysics. The project will employ state-of-the-art technology and innovative techniques, generating a unique database that will be used by scientists both in Australia and around the world. The project will help to train the next generation of astrophysicists in advanced skills to take advantage of Australia's multi-million dollar investments in large telescopes, supercomputers and our developing space industry. They will also develop skills relevant to the new knowledge economy, such as simulations on high performance computers and image analysis. The project will help to attract students into STEM subjects and careers, providing a long-term outcome that has cultural, economic and social benefits for the country. Research outcomes will be disseminated beyond academia via outreach activities and social media.							
DP250103137 McCormick, A/Prof John	**Moving With Robots: Advancing Human-Robot Collaboration and Communication** The use of collaborative robots by people in arts, social and health settings has the potential to improve their economic situation and their quality of life through increasing safe and cost-effective options for engagement, care and support. However, one of the barriers to adoption is how to achieve safe and trusted contact support for robots who are physically interacting with people in collaborative and assistive roles. Through choreographed interactions with movement experts, this project expects to generate machine learning strategies to understand how people and robots can reliably and fluently move together. Expected outcomes of this project include innovative methods for robot learning to improve shared movement quality. **National Interest Test Statement** Robots continue to transform many areas of the Australian economy, particularly the manufacturing and resources commercial sectors. However, in areas of society that require complex physical contact between people and robots, such as social, cultural, health and assistive settings, there are challenges to the integration and uptake of robots due to the trust, safety and comfort of human-robot collaborations. Leveraging the unique and innovative platform of dance to investigate the embodied nature of physical interactions, this project aims to develop a critical understanding of how people and robots can move fluently together even through complex physical interactions. We will use machine learning to develop new ways for a person and robot to smoothly move together and have complex physical interactions including contact and support. These are crucial abilities for robots supporting people in social, cultural and assistive settings and will have important benefits to support increased robotic uptake in these areas. The new interaction methods will generate dance performances for a human and robot that can be shown in theatres and galleries, showcasing new ways for people and robots to move together. Providing a reliable and effective framework for better collaborative movement between people and robots will increase safety, trust and comfort for people, and better physical adaptability for robots, placing the Australian robotics sector at the forefront of robotic innovation.	151,633.50	245,313.00	189,419.00	95,739.50	0.00	0.00	682,105.00
DP250104463 Li, A/Prof Lily (Yali)	**Green fabrication of robust micro/nano hierarchical surface morphology** This project aims to fabricate coating material with robust micro/nano hierarchical structured surface in ambient conditions through mimicking natural biological processes. This study expects to generate knowledge for translating natural biological processes into cutting-edge sustainable and scalable low-cost manufacturing technique using biowaste, minerals and waste plastic through interdisciplinary approaches. Expected outcomes include potential next-generation environmentally friendly marine coating exhibiting self-cleaning and drag reduction. This should deliver significant economic and environmental benefits for maritime industry and contribute to further Australian standing in the field of circular economy. **National Interest Test Statement** Australia’s shipping industry represents 10% of the world’s sea trade and over 95% of Australian exports. Biofouling on ship hulls not only brings extra costs through fuel penalty ($10 billion per year globally), but also ecosystem damage through migration of invasive species. Traditional antifouling coating predominantly involves toxic nonspecific biocides, harming marine biodiversity. This project develops sustainable antifouling products through cutting-edge nanotechnology and biomimicry research. Outcomes will help advance the skill levels of current manufacturing industries, ensuring they remain competitive. Addressing biofouling will bring economic	38,762.00	77,524.00	119,397.00	163,865.00	83,230.00	0.00	482,778.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	benefits to maritime industries, and environmental benefits to all Australians through reduced bio-contamination and protection of ecology. Findings on biomimicry solution to biofouling will be communicated to coating industries, maritime research organisations, advanced manufacturing research organisations, and government bodies to promote understanding of the novel technique and further collaboration for translation and adoption. Technologies developed through the project can contribute new manufacturing opportunities, enabling future growth in the marine, aviation, piping and renewables industries.							
	Swinburne University of Technology	441,983.00	828,112.50	819,982.00	517,082.50	83,230.00	0.00	2,690,390.00
The University of Melbourne								
DP250100058	**Mobilities of displacement in Australia's private rental housing crisis**	90,010.50	184,042.00	183,459.50	89,428.00	0.00	0.00	546,940.00
Bissell, Prof David J	This project aims to investigate the diverse experiences of displaced renters in Australia's private rental housing market by advancing understanding of how people rebuild their lives in the wake of displacement. This project expects to generate new geographical knowledge about resettlement after displacement by pairing innovative qualitative techniques with novel geographical theories of mobility and home. Expected outcomes of this project include enhancing geographical research capacity on mobility and home through the development of collaborations. The project should deliver significant benefits to Australia by supporting private renters and affected areas in managing the challenges of displacement and resettlement.							
	National Interest Test Statement							
	This project aims to assist Australian rental households by identifying the support requirements of tenants undergoing relocation and suggesting strategies to reduce the adverse effects of moving and rebuilding their lives. Over one quarter of Australian households reside in privately rented homes. Rising rental costs place considerable financial strain on these households and many are forced to move to more affordable housing options across suburbs, cities, or even regions. There is a lack of understanding regarding the challenges faced during this time with the process often separating established family groups, friends, community ties, and available job opportunities. The resulting community impact alters workforce availability and necessitates changes in infrastructure and services both in the original and new locations. The research aims to benefit Australians socially and economically by assessing how these relocations affect the demand for community infrastructure and services. Insights will be disseminated to households through various channels including a social media animation and an online exhibition. These findings will be communicated to policymakers to help address these issues, as well as industry stakeholders, and service providers through a comprehensive report and an industry summit.							
DP250100067	**Equitable reskilling for the future of work**	95,799.00	176,789.50	154,410.50	73,420.00	0.00	0.00	500,419.00
Bissell, Prof David J	This project aims to investigate how workers, households and communities in Australia are reskilling in diverse ways. Through world first quantitative and qualitative research, this project expects to create new knowledge about the social and geographical dimensions of reskilling in order to better evaluate the barriers and enablers of reskilling. Expected outcomes include an interdisciplinary collaboration that will enhance Australia's research capacity in understanding the social and geographical dimensions of the future of work. This should provide significant benefits through the development of policy responses for industry, service providers, communities and governments to assist reskilling in a socially equitable way.							
	National Interest Test Statement							
	Australia is grappling with a significant shortage of skilled workers, mainly because the skills required for the booming digital, low-carbon economy do not match those possessed by the current workforce. To address this, policymakers are emphasising the need to reskill existing workers. However, there is uncertainty about where and how this reskilling should happen and who stands to benefit. This project will identify the barriers and opportunities related to reskilling in three locations in regional Australia, considering a mix of social, cultural, and economic factors. Understanding these dynamics at the household, community and regional levels is crucial for ensuring an inclusive transition in the workforce. The insights gained from this project will not only promote a fairer distribution of reskilling opportunities across different demographics but will also help mitigate negative effects on Australian households, communities and regions by expanding employment opportunities. The findings will be shared through a comprehensive report and an industry summit involving relevant policymakers, industry representatives, and support organisations to improve skilled employment outcomes. A targeted social media animation and an online exhibition will engage individuals interested in reskilling.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250100201	**How do growth factors control transcriptional dynamics?**	119,000.00	234,500.00	236,000.00	120,500.00	0.00	0.00	710,000.00
Parker, A/Prof Benjamin L	Growth factors regulate the expression of our genes via intricate processes. Disruption of these processes is a major contributor to ageing. This project has discovered an exciting new mechanism of how growth factors such as insulin control gene expression, and revealed this is defective during ageing. The aim of this project is to understand if manipulating this new mechanism can limit the degenerative effects of ageing. The project will generate new mouse models and systems biology data to study transcriptional regulation. The outcomes of this research will provide fundamental knowledge of how growth factors regulate gene expression and the ageing process which has extremely broad applications.							
	National Interest Test Statement							
	Understanding how genes are expressed from our DNA is a fundamental research question in biology. The genes we express make us each unique. It's what makes a brain cell different to a muscle cell. We know that the expression of our genes change as we age and this drives the decline in cognition and physical function as we get older. We also know that growth factors circulating in our body change across our lifespan, and these growth factors can control the expression of our genes. But the precise molecular mechanisms are unknown, as is how these growth factors control the expression of our genes as we age. Our research team have discovered a completely new mechanism of how growth factors regulate our genes. Furthermore, we show this new mechanism changes throughout the skeleton in the elderly. We study bone as this tissue is the scaffolding foundation of life and age-related deterioration results in frailty across all animals. This project seeks to expand our knowledge and investigate if manipulating this new mechanism can limit the degenerative effects of ageing. This is highly relevant to Australia's ageing population as maintaining skeletal function is key to movement and healthy ageing. It could also lead to better livestock production and athletic performance. We will share our results at national and international conferences, in leading journals and in community media outlets, social media and public events.							
DP250100240	**How do cells keep the proteome soluble?**	126,349.00	274,024.00	298,387.50	150,712.50	0.00	0.00	849,473.00
Hatters, Prof Daniel M	The project aims to determine the cellular mechanisms regulating the solubility of proteins inside mammalian cells, which are poorly understood and, when they fail, lead to neurodegenerative diseases. The project expects to determine what features of proteins dictate how they aggregate inside cells and the patterns in proteins sensed by protein quality control networks that work to prevent protein aggregation from arising. Expected outcomes include illuminating critical cell biology pathways underpinning molecular responses to protein folding, aggregation, and stress. This should provide significant benefits to future research into cures for neurodegeneration and industries producing engineered proteins, such as antibodies and enzymes.							
	National Interest Test Statement							
	Four biomolecule types are needed to make the cells in our bodies: carbohydrates, lipids, proteins, and nucleic acids. Proteins, in particular, act as molecular machines to operate every function required for life. Yet, most proteins are complex and fragile, quickly malfunctioning when cells are stressed, diseased, or manipulated upon genetic engineering of cells or organisms. We need to understand more about how proteins are kept functional in cells. This project aims to fill gaps in understanding of the approaches cells have evolved to keep their proteins healthy and functional, knowledge that Australians will benefit from. One benefit is agri-food industries in Australia exploiting them to improve the efficiency of protein yield and quality in industrial applications involving proteins. Another benefit is establishing foundations for future research to maintain Australians' healthy brains during aging and in neurodegenerative diseases which feature protein dysfunction/clumping and are a leading cause of death of Australians. Practical benefits include more efficient ways to manufacture protein-based products and therapeutics – products widely consumed by Australians. The team will publicise the findings of key discoveries to Australian and international media outlets (TV, online and newsprint through the university marketing and communication office) and through direct liaison with biotech companies who might be interested to use the knowledge.							
DP250100300	**Optimisation based control for multi-agent systems**	77,085.50	155,213.50	159,255.50	81,127.50	0.00	0.00	472,682.00
Nesic, Prof Dragan	This project will explore fundamental links between near-optimality and stability in multi agent systems. Considering different interconnection topologies and different types of missions (e.g. consensus, randezvous), this project will exploit the stability of the closed-loop system in order to obtain better near-optimality. Expected outcomes include novel distributed near-optimal control algorithms, whose performance, stability and robustness will be investigated in detail. As							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	multi agent systems is a critical enabling technology spanning all sectors, significant benefits are expected, including enhanced control and monitoring for important classes of complex systems, including those arising in collaborative robotics and smart grid. **National Interest Test Statement** Collaborative robotics, smart grids, intelligent transportation, and advanced manufacturing depend on multi-agent systems, consisting of multiple decision-making entities working towards a shared objective within a common environment. One example is a swarm of drones equipped with sensors and computational capabilities for communication, which can be deployed in diverse tasks including monitoring critical infrastructure, assessing agricultural crops, or handling materials within factories. Such ground-breaking technology has transformative implications across many sectors. This research will enhance the design of these multi-agent systems by developing a design methodology for highly effective and robust control algorithms. These algorithms will substantially improve the performance, stability and robustness of multi-agent systems while carefully navigating the inherent design trade-offs. We will accelerate translation of this research through our existing industry and government contacts, as well as workshops, seminars, and media articles. The benefits of this research are economic, environmental, and social because the project will contribute to tackling key societal issues across all sectors, including climate change mitigation, smart infrastructure development, and advancements in defence applications.							
DP250100373 Urquijo, Prof Phillip	**Why is there more matter than antimatter? Probing CP violation with Hyper-K** This project leads a new Australian program with the Hyper-Kamiokande experiment in Japan, the largest underground Cherenkov detector in the world. Hyper-Kamiokande is being built to study neutrino oscillations to address long-standing puzzles of nature, such as the origin of the observed abundance of matter over antimatter in the universe. It will place Australian researchers in a position to make substantial contributions to the assembly and commissioning of this experiment and to have a critical role in the potential breakthrough discovery of matter-antimatter asymmetries in neutrino oscillations. **National Interest Test Statement** This project will develop technology to answer a decades-old question in physics: what is the origin of matter? It will use state-of-the-art photosensors to detect the faint flickers of light from neutrinos – ghostly particles that carry clues to the origin of matter. The project will develop machine-learning algorithms to interpret the data from these photosensors, helping to reveal how the Universe came to be dominated by matter rather than anti-matter. The project will cement Australia's role in the Japanese Hyper-Kamiokande experiment, enhancing collaboration with a strategic partner. The machine learning algorithms developed for this project will increase our capacity for advances in artificial intelligence, providing commercial and economic benefits for Australian industries and society, while shedding light on a fundamental human question. The pattern recognition code developed in the project will be made available through public repositories so that they can be used to explore other applications by Australia's information science community.	100,093.50	207,197.50	216,840.00	109,736.00	0.00	0.00	633,867.00
DP250100407 Loertscher, Prof Simon	**Incomplete Information Industrial Organization: From Theory to Practice** This project aims to refine the set of incomplete information models of industrial organization (Triple-IO) and develop a range of tools to evaluate the competitive effects of mergers, collusion, and related changes to market structure and firm conduct. This will significantly advance our understanding of markets and the role that bargaining plays in the efficiency of markets. Expected outcomes include expanding the set of Triple-IO tools available and enabling their practical application. Expected benefits include better informed, more sophisticated, and hence improved, decision making by competition authorities when evaluating the competitive effects of economic conduct. This will benefit societies by improving consumers' choice sets. **National Interest Test Statement** The digital age has led to unprecedented increases in productivity and market power because larger firms are better at reaping the gains from technological progress. To ensure Australian consumers also benefit from this progress, competition policy - credible, evidence-based enforcement of competitive behaviour - has an ever more important role to play. Traditional analytical frameworks that guide competition policy rest on ad-hoc restrictions on firms' behavior. Recommendations based on these are, therefore, vulnerable to the criticism that the conditions on which they are based may not be valid after a policy change, for example, a merger. The proposed project uses an innovative analytical framework that is robust to this criticism to provide fundamental insights into the effects of mergers, firms' incentives and ability to collude, and regulatory interventions. It gives competition	48,330.00	72,915.00	49,170.00	24,585.00	0.00	0.00	195,000.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	authorities like the ACCC a reliable economic framework to analyze mergers, acquisitions and anticompetitive conduct. It will lead to software tools for diagnostic tests that quantify the likely effects of mergers on firms' abilities to collude and the competitive effects of mergers. By improving competition policy, the project will lead to lower prices and thereby greater choice for Australian consumers. Translation and dissemination through workshops with practitioners and researchers will promote the outcomes and lead to their adoption in future research.							
DP250100450	**How cells perform error-free repair of damaged DNA?**	113,500.00	228,500.00	232,000.00	117,000.00	0.00	0.00	691,000.00
Shakeel, Dr Shabih	This project aims to understand how a molecular machine, called the dissolvasome, fixes tangled DNA to ensure error-free repair of damaged DNA by homologous recombination (HR), a critical process in all life forms. This will generate new knowledge about HR pathway by recreating the function of dissolvasome in a test tube and providing atomic snapshots of its individual steps using advanced imaging technology of cryo-electron microscopy. The expected outcome will be a ‘molecular movie’ of the fundamental process of DNA repair. The project's outcomes would have significant implications, from regulating sexual reproduction and creating genetic diversity in agriculture to improving cutting-edge gene editing techniques.							
	National Interest Test Statement							
	Often double-stranded DNA breaks and becomes tangled. There is a complex molecular machine in cells that helps with this untangling. We understand how some parts of this machine work, but fixing DNA needs all the parts to work together. We are not sure exactly how they coordinate because this machine is large and can change shape which has made it impossible to study using previous technologies. In this project, we will use a revolutionary new imaging technology called cryo-electron microscopy to create atomic snapshots of this machine while it is at work. These snapshots will give us a fundamental understanding of how this machine functions dynamically and increase our knowledge of DNA repair, an indispensable process to sustain all life forms. The direct visualisation of this machine will allow us to understand how this machine works and how each part contributes to its function. Catching this machine in action will generate new knowledge about DNA repair that could lead to commercial opportunities being exploited in the future including precise gene editing for enhanced agriculture productivity, better understanding of aging-related diseases and promoting healthy aging. We will communicate to the general public through our department newsletter, social media platforms like Facebook, Twitter and LinkedIn, and science events geared towards the general public, like National Science Week, where the University of Melbourne is a regular participant.							
DP250100477	**Variety is the spice of life: the mathematics of biological heterogeneity**	92,800.00	196,450.00	199,400.00	95,750.00	0.00	0.00	584,400.00
Johnston, Dr Stuart	Diversity between individuals shapes the fate of populations in many fundamental biological processes. This project aims to improve our understanding of how population behaviour is dictated by diversity in individual characteristics. This project expects to develop new mathematical theory that formally reveals the relationship between diversity in a particular characteristic and population behaviour. Expected outcomes include a new mathematical modelling framework, and advances in knowledge in mathematics, biology and ecology. This should provide significant benefits, as we will identify how diversity between individuals ensures regular development for cell populations and robustness to environmental changes for whale populations.							
	National Interest Test Statement							
	Every biological organism, from bacteria to humans, is unique. Understanding how that uniqueness benefits a population of organisms will lead to a better understanding of the complex processes that govern life. This project will develop mathematical tools to predict how the diversity in individuals across a population affects the behaviour of that population. It will study whether individual diversity in cells can ensure the development of complex organisms, and by using whales as an example, examine whether diversity can protect a navigating population from human-driven environmental changes. In doing so, this project will generate knowledge and techniques that are relevant to a wide range of biological and environmental applications. These insights will provide significant economic and environmental benefits to Australia. Greater understanding of cell biology will reduce unnecessary experimentation, and its associated time and financial costs. Understanding the susceptibility of whale populations to human-driven change will assist with environmental decision-making, safeguard Australia’s valuable whale-watching industry and help protect whales from human actions. The mathematical and software tools developed in the project will be made freely available through repositories such as GitHub, so that they can be used to explore other applications.							
DP250100497	**Photonics Computing Enabled Ultra-Broadband Wireless Communications**	102,662.00	199,469.50	196,247.00	99,439.50	0.00	0.00	597,818.00
	The goal of this project is to develop photonic reservoir computing (PRC) as the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Lim, Prof Christina	bridging technology to enable cognitive capabilities in ultra-broadband wireless and radar/lidar systems. This project expects to generate innovative PRC configurations to provide unprecedented processing speeds with reduced energy consumption. The expected outcome will pave the way for the high-speed signal processing mandatory for future autonomous platforms not limited to telecommunications and sensing systems. Significant benefits include establishing Australia at the forefront of research in this emerging technology with the potential for future development in beyond 5G wireless systems, cognitive radar/lidar systems, autonomous vehicles and imaging.							
	National Interest Test Statement							
	Our world is rapidly transforming into a highly networked society, with seamless access to communications, data, and content. These communications are universal and must be possible anytime and anywhere. Wireless communications have now become an indispensable commodity with end users expecting reliable and high-speed connectivity at all times. As businesses and society can no longer tolerate even minor interruptions to their services, existing infrastructure must be adapted to prevent any service outage. Our research will address this massive challenge. We will investigate and develop solutions to realise intelligent high-speed communication systems that in the event of service interruptions are able to self-configure and quickly restore connectivity without triggering any outages. Our project will use an emerging technique to process signals in real-time to make informed decisions that will reconfigure the network with minimal intervention using low computational power and energy. We will use white papers and presentations to empower practitioners, and engage with groups focusing on standards to help shape policy and guidelines. The outcomes of our project will provide future Australian communication networks with greater protection against and prevention of network failures, providing economic and social benefits to Australia. Wireless payment will be free of costly outages for businesses and our quality of life will be improved.							
DP250100512	**The History of the Hourglass: Temporalities, Material Culture and Science**	89,310.00	167,750.00	161,677.00	83,237.00	0.00	0.00	501,974.00
Champion, Dr Matthew S	This project seeks to write the first history of the hourglass from its origins c.1300 through to its global circulation in the sixteenth century. The most precise time-measurement device of its era, the hourglass changed the course of history through its role in maritime travel, scientific experiments and everyday time management. It transformed time into a silent, interior flow crucial to a wide range of cultural projects: in Cairo classrooms or alchemical labs; in the cook's kitchen or preacher's pulpit. Alongside its critical intervention in the history of time, the project seeks to pioneer new scientific methods for analysing these fragile objects, with major benefits for their conservation in Australian and international collections.							
	National Interest Test Statement							
	From iphones to luxury watches, mobile timekeeping devices are a constant feature of contemporary life. They seem to embody an obsession with measuring and managing our precious time in a pressured modern world. Yet such devices are nothing new. Small, precise, mobile, personal: the sandglass was a pioneering medieval technology that has been overlooked in histories of technological progress. Its complex uses in daily life, science, travel and the movement of European time across the world are poorly understood. This project seeks to write the first history of these remarkable objects from their origins in the fourteenth century through to their global ubiquity by the sixteenth. It encourages Australians to reflect on our experiences of time's passing as the hourglass remains a potent image of time running out, from symbols of climate crisis to timers in showers during drought. Partnering with major research institutions in Germany and the UK, the project also seeks to put Australia at the forefront of analysing, conserving and displaying these fascinating and fragile objects. The project is designed to improve curatorial practice in Australian museums, and to provoke public reflection on objects that shape our experience of time, through media appearances, innovative public object laboratories to crowdsource stories of sandglasses, and a compelling new digital platform displaying sandglasses to wider publics.							
DP250100531	**Animal building for a changing world**	100,503.50	204,423.50	211,136.00	107,216.00	0.00	0.00	623,279.00
Medina, Dr Iliana	This project aims to reveal how animal constructions will cope with the damaging effects of global warming. Most animals build structures critical for survival (or that of their progeny) but there is no information on how animal designs will react to modern climate change. Using a powerful integration of experimental and analytical approaches, this project will uncover how animals can adjust their designs in response to temperature within their lifetime and at at evolutionary scale, using bird nests as model system. This project will pioneer the study of animal constructions as buffers of climate change. It will inform predictions of							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	species vulnerabilities in future conditions by assessing animal capacities to modify their constructions. **National Interest Test Statement** There is currently no information on how animal constructions will cope with the novel climatic challenges projected in Australia and the world. Most animals build constructions, such as nests, that are critical to their survival or reproduction. These structures have been refined over millions of years of evolution to protect species from climatic variables, but our climate is changing rapidly. Our project will combine detailed data from Australian species and analyses over thousands of species worldwide to generate a framework to evaluate the capacity of animal builders to adjust their designs to cope with the increasing temperatures forecast. We will focus on birds because their embryos are extremely vulnerable to temperature increases and high nest temperatures are already threatening some populations. Our research will benefit Australian fauna and ecosystems by assessing animal capacities to adapt to increasing temperatures. We will generate a modelling tool that will allow researchers to evaluate the risks of embryo death for different species and locations in Australia. Our global analysis will also enable us to identify vulnerable species where protection from building behaviours is constrained. Partnerships with government agencies will allow the dissemination of this model and information to agencies involved in conservation research and monitoring. Finally, this project will solidify Australia's leadership in ecology and evolution.							
DP250100553 Haydon, A/Prof Michael J	**Targeting the circadian clock to improve grain quality in wheat** This project aims to establish a novel approach to improve protein content of wheat grain without loss of yield in Australian conditions. The project expects to build a mechanistic understanding of how the circadian clock, which controls daily and seasonal rhythms, adjusts the timing of leaf senescence and affects grain nutrient content in wheat. Expected outcomes include an expanded view of the extent and influence of circadian clock variation within Australian wheat cultivars and deeper functional knowledge of circadian clocks in a cereal crop. This would provide significant benefits for breeders, growers and consumers because protein content determines the economic value of grain and end-use characteristics of flour. **National Interest Test Statement** Wheat is Australia's most productive crop, representing more than 10% of total agricultural production and worth ~$15 billion/year. The protein content of grain is an important trait because it affects the baking properties of flour and therefore the value of the grain. A long-standing challenge is that increased grain protein content is typically associated with loss of yield. This is controlled by the timing of key developmental stages in wheat growth and influenced by environmental conditions. This project aims to develop a new approach to improve grain quality of wheat grown in Australian environments by identifying genetic components and mechanisms that control the timing of growing processes. Increasing protein content of wheat grain by as little as 0.5% can add up to 20% to the value of the crop. Therefore, successful outcomes from this project could contribute to the sizeable agricultural economy, benefiting growers and consumers. Research outcomes from this project could be used by those within the agricultural and biotechnology industries via reports to inform growers of their local growing conditions and provide breeders a knowledgeable assessment of Australian conditions.	108,600.00	233,600.00	245,000.00	200,000.00	80,000.00	0.00	867,200.00
DP250100622 Petersen, Dr Charlotte F	**Metallic glass nanomaterials: New theory and syntheses** Our limited understanding of glassy (disordered) metallic nanoparticles is impeding the development of next-generation materials for biotechnology and clean energy. This project aims to use theory to guide fabrication of a new range of metal 'nanoglasses'. This is significant, because the properties of disordered materials can be vastly different from their crystalline counterparts, exhibiting enhanced plasticity, heat capacity, and chemical reactivity. Expected outcomes include a model for predicting the optical properties of nanoglasses and novel syntheses of gold-based nanoglasses, whose properties can be optimised at will. This should provide significant benefits, such as new options for cancer phototherapy and solar fuel synthesis. **National Interest Test Statement** Metal nanoparticles have useful properties that have been harnessed to develop new biological sensors and new methods to generate clean fuels. This development was possible because the properties of crystalline materials are well understood. The properties of non-crystalline materials are not well understood. This project addresses this research gap, by studying a type of material called metallic nanoglasses. It is expected that the new nanoparticles developed in this project could more efficiently convert light energy into heat. This would make them ideal for new applications, such as in biotech, and lead to increased health benefits for Australians. This project	117,478.50	240,373.50	167,380.00	44,485.00	0.00	0.00	569,717.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	will also seek to discover nanoglasses that can use energy from sunlight to speed up chemical reactions. Such particles could be used to permanently remove carbon dioxide from the atmosphere, creating an environmental benefit to Australians through its use in combating climate change. Taking the lead in developing and understanding these new materials will grow Australia's standing as a world leader in nanomaterials research and allow us to train the next generation of innovators. We will seek local partnerships to commercialise applications of these new particles, which will benefit the Australian economy.							
DP250100676	**Deciding cell fate: the beta common receptor family**	121,000.00	247,500.00	256,500.00	130,000.00	0.00	0.00	755,000.00
Parker, Prof Michael W	This project aims to unravel missing molecular details of how a family of proteins, called the betacommon receptors, is able to signal across cell walls. This project aims to generate new knowledge about how membranebound receptors transmit biological signals in living organisms. Despite their fundamental importance in biology, how these proteins work remain enigmatic. Expected outcomes include discovery of novel mechanisms general to these types of protein receptors and fundamental insights in understanding vital physiological processes across all kingdoms of life. Ultimately, this new knowledge should benefit efforts to discover novel treatments in cases where malfunctioning receptors cause diseases in animals and humans.							
	National Interest Test Statement							
	This project will provide insights into the fundamental biology of a class of protein hormones called cytokines that trigger a myriad of instructions to blood cells. They do this by binding to specific protein receptors on the cell surface. This work will build on the work of Australian pioneer Professor Don Metcalf AC FRS FAA of the Walter and Eliza Hall Institute, who discovered these proteins in the 1970's and launched a new field of biology led by Australian scientists. Don's work was focused on fundamental biology of cytokines, which has led others to research side-effects of chemotherapy and combat viral infection in animals. This project asks the big unresolved question of how cytokines can induce so many different activities on a cell by binding to a single receptor type. Can we engineer cytokines to produce just one type of signal that would be beneficial in the treatment of animal and human diseases without the side-effects? In the longer term it has potential to impact the Australian economy, through the development of engineered cytokines. The resultant intellectual property offers impact beyond academia, with the translation and adoption of novel applications, leading to spin-off companies and licensing deals. The benefits and outcomes will be disseminated to the public through the biotechnology industry, collaborations with leading European & US laboratories and animal health groups.							
DP250100818	**Climate-related relocation: improving policy and practice outcomes**	102,877.50	192,997.50	188,818.50	120,201.00	21,502.50	0.00	626,397.00
McMichael, Prof Celia	The proposed project will significantly advance knowledge of the factors that enable successful relocation of communities away from sites of climate risk. Relocation of communities is a complex and difficult task and little is known about how to support such processes in ways that safeguard, dignify and improve people's lives. Through in-depth case studies of community relocations in Australia, Fiji and the USA (Alaska), each at different stages of the relocation process, this project will generate new knowledge of the factors that determine successful and equitable outcomes. Expected project outcomes include novel and policy-relevant evidence on climate relocation, and new international research collaborations.							
	National Interest Test Statement							
	This project will significantly advance knowledge of the factors that enable successful relocation of communities away from sites of climate risk. Australia, Fiji and the USA (Alaska) are among the first countries globally where relocation of low-lying coastal communities is occurring, and little is known about how to support such processes in a way that safeguards, dignifies and improves people's lives. Through in-depth case studies of community relocations in Australia, Fiji and the USA (Alaska) - each at different stages of the relocation process - this project will generate new knowledge of the factors that determine successful and equitable outcomes. Expected project outcomes include novel and policy-relevant evidence on climate relocation, comparative legal analysis and new international research collaborations that will provide great value to Australia socially, culturally, and environmentally. Research findings will be disseminated to relevant government ministries in Australia, Fiji and the USA, as well as international agencies, community organisations and community members. The project will enhance preparedness for climate-related relocation and adaptation, and advance Australia's national interest in climate adaptation both locally and across the Pacific Ocean region.							
DP250100819	**Discovery of missing pathways for breakdown of marine organosulfur**	109,563.50	224,507.50	230,270.00	115,326.00	0.00	0.00	679,667.00
Williams, Prof Spencer	Sulfur is an essential nutrient for life and is transferred between organisms using small molecules termed metabolic currencies. Sulfur metabolic currencies have							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	planetary-scale significance and support agri/aquaculture. Yet which microbes degrade them and what metabolic pathways they use, remain unknown. This project aims to discover microbes that can grow on organosulfur molecules, identify the pathways used, elucidate the chemistry of the enzymes they exploit, and study their environmental distribution. Expected outcomes include new knowledge of environmental nutrient cycling. Long-term benefits include improved understanding of microbial ecosystem recycling services supporting sustainability and resilience of marine production systems.							
	National Interest Test Statement							
	Marine algae harness sunlight, fix carbon, and synthesise chemical building blocks that sustain the ‘food web’ in Australia’s vast marine ecosystem, contributing to global nutrient cycles. This project aims to uncover the microbial pathways used to breakdown marine organosulfur, filling a critical knowledge gap in sulfur cycling in natural ecosystems. This will help accurate modelling of marine nutrient cycles and support practical advances in sulfur nutrition. Australia’s vast marine jurisdiction spans over 8 million square kilometers and supports a thriving ‘blue economy’ of >400,000 jobs with > $100 billion annual revenue. Identification of the breakdown pathways for organosulfur will lead to the discovery of new biological catalysts with strong commercial potential for the Australian biotechnology sector. Additionally, it will inform microbe bioengineering strategies to reduce reliance on synthetic sulfur-based fertilizers, supporting sustainable agri/aquacultural practices. To ensure broad impact, we will disseminate our findings to environmental experts and the public, maximizing the potential translation of our research into actionable solutions.							
DP250100824	**Character sheaves and Langlands duality**	22,106.00	121,182.00	198,152.00	176,796.00	77,720.00	0.00	595,956.00
Xue, A/Prof Ting	In the recent years a large part of mathematics has been driven by the Langlands program. The aim of work proposed is to contribute to this program from our unique point of view. The expected outcomes include a comprehensive understanding of character sheaves and how they apply to longstanding difficult problems in mathematics. In addition to addressing fundamental questions in mathematics and expanding our understanding, the research program connects Australia to the most exciting recent mathematical developments thus benefiting Australian researchers and students. The project will also train highly qualified individuals who can make significant impact on science, industry, technology, and economy through their specialised skills.							
	National Interest Test Statement							
	This project makes a fundamental contribution to representation theory, a pivotal branch of mathematics focused on the study of symmetries, particularly those that occur in nature. Representation theory serves as a vital tool across various mathematical disciplines, including topology, geometry, combinatorics and number theory. By researching representation theory, the project aims to bridge gaps in understanding algebraic and geometric structures essential to both mathematics and physics. Its findings will inform and support long-term applications in fields such as cryptography, GPS technology, Google search algorithms, machine learning, and quantum computing. This will provide commercial and economic benefits for Australia, positioning Australian information technology and finance industries at the forefront of pioneering developments. The research findings will be disseminated through open-access publications and presentations at public events, conferences and seminars, ensuring accessibility to a diverse audience.							
DP250100890	**Emotions as Complex Systems: Non-Linear Approaches to Real-World Emotions**	48,513.50	124,167.50	160,358.00	84,704.00	0.00	0.00	417,743.00
Koval, A/Prof Peter	Daily emotional experience is central to human well-being, but also highly complex. Maximising well-being and resilience requires a full understanding of the complex dynamics of real-world emotions, which cannot be achieved using standard linear statistical approaches. This project aims to apply cutting-edge empirical dynamic modelling tools, developed by ecologists to characterise complex systems, to model emotions in the world's largest database of daily emotional experience. Expected outcomes include new interdisciplinary collaborations, enhanced research capacity, and new knowledge of theorised complex emotion dynamics. This should result in significant benefits to emotion science and inform future interventions to enhance well-being.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement Our day-to-day feelings are central to our well-being, making it essential to understand what drives emotional fluctuations in daily life. However, real-world emotions remain poorly understood because scientists have lacked the analytic tools and large-scale data needed to characterise the intricate, and seemingly unpredictable ways that emotions unfold. We address this gap by applying mathematical techniques from ecology to the world's largest daily emotion database to model the complex dynamics of real-world emotion. The knowledge generated by this project will improve scientific models of emotion and will thus inform how to effectively manage emotions to maximise resilience. As emotions are central to virtually every domain of human functioning, this project's findings could benefit Australians by informing efforts to increase job productivity, improve social relationships, and enhance overall well-being. To ensure our research outcomes reach a wide audience, we will communicate our findings via media engagement and public-facing workshops. To maximise the future translational potential of our findings, we will engage with mental-health practitioners who develop and implement novel online/digital treatments for a range of common emotional disorders. Finally, by introducing novel mathematical tools to psychology, this project may improve understanding of other psychological processes beyond emotion.							
DP250100918 Maher, Prof Megan J	**A mechanistic exploration of fern proteins that target lepidopteran pests.** This project will investigate the mechanisms of action of a newly discovered class of insecticidal proteins from ferns. These proteins show broad activities against the larvae of common crop pests (lepidopterans; i.e. butterflies and moths), including those resistant to existing insecticidal approaches. The project will employ an integrated biological, biochemical and structural approach to determine how these proteins impart their insecticidal activities and to optimise their efficacy for future agricultural applications. Major benefits include interdisciplinary research training and the future development of transgenic crops expressing these proteins, to increase crop yields and underpin domestic and global food security.	154,000.00	313,000.00	255,500.00	96,500.00	0.00	0.00	819,000.00
	National Interest Test Statement This project will address critical gaps in sustainable pest management for Australian and International agriculture, by investigating a new family of fern proteins (Fips), which target lepidopteran pests, (butterflies and moths). With escalating concerns over chemical pesticide use and the emergence of resistance in pest populations, alternative insecticidal strategies are urgently needed. This new class of insecticidal proteins offers a promising natural solution that has the potential to reduce reliance on costly and environmentally harmful chemical pesticides. By elucidating the molecular details of the mechanism of action of these proteins, we aim to underpin the development of sustainable, environmentally friendly, and economically viable pest management alternatives, to optimise crop yields and provide strategies for domestic and global food security. The success of this proposal will provide interdisciplinary training for a new generation of junior researchers (postdocs and students) and translatable outcomes that will underpin the future of Australia's technological and agricultural advances.							
DP250101054 Kohn, Prof Tamara	**Do-It-Yourself Commemoration of the Dead** This project aims to investigate the emergence of contemporary do-it-yourself commemorative practices that are reshaping how people care for and mourn the dead in Australia. The impacts of these self-organised rituals that are increasingly occurring outside of traditional institutions are profoundly significant but poorly understood. Through a grounded interdisciplinary study, this research will produce critical insights and knowledge about how diverse groups are navigating choices at the end of life. Our work aims to benefit individuals, communities, professionals, and policymakers by empowering personal expression and advancing sustainability and governance associated with the care of the dead in Australia.	107,959.00	218,560.50	220,718.00	126,222.50	16,106.00	0.00	689,566.00
	National Interest Test Statement Australian deathcare practices are changing. A significant shift toward do-it-yourself commemoration is radically reshaping the sector and transforming how Australians care for their dead. Such practices include 'direct' cremation without ceremony, creative treatment of ashes for memorialisation, consumer-led DIY funerals, and alternative disposal arrangements for the body. The growing popularity of these new, hyper-personalised forms of commemoration significantly impacts Australia's $1.7-billion funeral industry and the cultural, social, economic, and commercial environments that surround it. While such practices are proliferating in Australia and overseas, they are poorly understood by academics, the industry, religious and community organisations, and the wider public. This research project aims to address this gap through an interdisciplinary, multi-methods approach that uncovers the scope, drivers, and implications of these changes, informed through national surveys and fieldwork with families, deathcare professionals, and community leaders. Outcomes will be communicated through symposia, academic publications, public-facing exhibitions and popular media coverage. This research aims to advance scholarship on ritual change and – given the profound importance afforded to the treatment of the dead by families and communities – to extend knowledge in industry and society so as to chart a better path into the future for deathcare in Australia and internationally.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 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)
DP250101065	**Multifidelity data-driven autonomous precision robotic polymer synthesis**	161,948.00	322,993.50	288,868.50	127,823.00	0.00	0.00	901,633.00
Qiao, Prof Greg G	This project aims to develop an automated and autonomous precision polymer synthesis platform by integrating robotic polymer synthesis, online & offline characterisation, molecular simulation, & machine learning feedback loop. This project expects to generate knowledge in areas of materials informatics, accelerated materials discovery, and real-time process monitoring through employing innovative and interdisciplinary approaches. Expected outcomes of this project include enhanced capacity in robotic process automation and precision synthesis and new material design and development practices. This should provide significant benefits to Australian manufacturing industries via providing them with a competitive advantage in their market.							
	National Interest Test Statement							
	A polymer is a chain of molecules. In nature polymers, such as spider webs or keratin in hair, have a wide range of useful attributes. Therefore, engineers synthesize polymers for many different advanced materials. Yet, current synthesis methods are unable to match the qualities and function of natural proteins and biological peptides, particularly in their precision and repeatability. We lack control in synthesising polymer's lengths, composition and block sequences. This project will develop a new robotic platform to synthesis precise polymers autonomously using machine learning. This new, more efficient pathway can address existing limitations in control and revolutionise the field of materials science. The efficient production of effective advanced materials has many economic, environmental and social benefits for Australia. The project will change our manufacturing processes, providing Australian advanced manufacturers with highly marketable new products, particularly in the project's showcase area of nanoengineered antimicrobial polymers, as well as in the pharmaceuticals and defence sectors. With potential to develop decomposable green plastic, the project could have significant environmental and social benefits. Project outcomes will create opportunities for start-ups or consulting companies, and be communicated with the team's extensive contacts in industry accelerating its commercial potential.							
DP250101069	**Controlling Feedback in Big Multi-Module Statistical and Econometric Models**	59,790.00	168,289.00	170,011.00	61,512.00	0.00	0.00	459,602.00
Smith, Prof Michael S	Large statistical and econometric models that combine multiple modules, each representing different aspects of the problem or data, are emerging. However, their estimation presents many unsolved challenges. By extending innovations in machine learning and Bayesian analysis, this multidisciplinary project aims to develop new methodology to address these. Expected outcomes include scalable methods that control feedback from mis-specified modules and allow for accurate uncertainty propagation between modules. The methods will be applied to large multi-modular econometric models for macroeconomic and financial variables. Benefits include increased accuracy in forecasts and the measurement of risk in systems to enable improved decision-making.							
	National Interest Test Statement							
	Mathematical models that deliver accurate predictions are essential in science, business and elsewhere. In complex scenarios, such as customer-level marketing studies or macroeconomic forecasting, statistical models built from multiple component sub-models are emerging as a powerful choice. The components are called modules, and the resulting multi-module statistical model is scalable, more fully uses all available data sources, exploits any inter-disciplinary knowledge, and can greatly improve prediction accuracy. However, the methodology required to operationalize such models is under-developed, and this project fills this gap. A problem unique to multi-module models is called feedback, which is where one or more unreliable modules can corrupt the other modules. Combining innovations in machine learning and data science, this project will produce algorithms and methods to identify and prevent feedback. This fundamental research will extend the use of multi-module statistical models to many new situations and greatly improve predictive accuracy. We will use it to develop econometric models that provide greater consumer insights in marketing and more accurate probabilistic predictions in macroeconomics. By providing software in the public domain, along with extensive examples, we aim to further promote adoption of these new powerful methods by researchers and practitioners. Finally, the project will train researchers in an area of skill shortage in Australia.							
DP250101089	**What drives moral amplification?**	58,500.00	159,727.50	205,362.00	104,134.50	0.00	0.00	527,724.00
Bastian, Prof Brock B	Morality provides the foundation for human cooperation, however amplifying everyday moral attitudes, judgements, and beliefs has the potential to sow intolerance, social conflict, and polarisation. This project aims to explore how facing threats, from those experienced day-to-day to widespread societal issues							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	and ecological contexts, can lead people to adopt more unforgiving moral stances. The findings will provide that basis for a new theorectical framework from which to understand the functions of morality and will feed into practice by identifying psychological processes through which intollerace can emerge, and in turn highlighting critical junctures for targetted interventions aiming to build social cohesion.							
	National Interest Test Statement							
	Australia is facing a range of threats from climate change and disease outbreaks, to rising inequality and geopolitical instability. This project will examine how feeling threatened can lead to "moral amplification," where people not only judge others more harshly but also cling more rigidly to their own beliefs – in turn increasing social tension with those who think differently. The findings will provide insight into when and why specific challenges facing Australian society may lead to a generalised outbreak of societal unrest and intergroup conflict. The project represents a first attempt to understand moral amplification as a generalised response which has the capacity to shape attitudes and judgements across a range of contexts, and, ultimately, to splinter Australian society. The findings of this research will inform strategies to promote tolerance within an increasingly diverse and pluralistic society, with a particular focus on contexts where collective action and cooperation are essential for overcoming significant challenges facing the Australian population. Research outputs will be communicated to the Australian public through a variety of media outlets, briefings, blogs, and feature articles. They will also be directed to policy makers and interest groups seeking to build evidence-informed interventions that will improve the social cohesion of Australians.							
DP250101149	**Mooring offshore floating wind turbines onto Australian seabeds**	48,631.00	177,994.50	219,807.50	90,444.00	0.00	0.00	536,877.00
Tian, Prof Yinghui	This project aims to address the geotechnical challenges to mooring offshore floating wind turbines onto Australian seabeds. This is significant because the current limited knowledge and empirical design method hinder confidence in the next generation floating wind development. This project will use innovative geotechnical centrifuge and numerical modelling to develop design guidelines to underpin offshore renewable energy development. With geotechnical mooring system solution accounting for ~35% of the total cost, the completion of this project will bring significant economic benefits in reducing costs to unlock renewable energy from our oceans.							
	National Interest Test Statement							
	Offshore wind farms, where power generation is more reliable and consistent, are globally considered a key solution for renewable energy. Up to now, the global offshore wind industry has developed rapidly in shallow waters with fixed-bottom turbines. Yet further offshore in water depths exceeding 60m winds are stronger and even more consistent. Here, floating wind turbines (FWTs) have technical and economic advantages over fixed-bottom solutions due to their greater size and capacity. However, key to the success of FWTs is an effective mooring system, which currently costs ~35% of the overall investment. Comprising mooring lines and embedded anchors, mooring systems must be advanced, especially for deployment onto Australian seabeds that have problematic carbonate soil and harsh environments. This project will deliver scientific knowledge and engineering solutions to support mooring systems for offshore FWTs in Australian waters. We will share our research findings with industry networks to accelerate adoption and report them publicly through media articles. It will have economic, environmental, and social benefits for Australia. New renewable energy projects provide commercial income, create local jobs, and bolster domestic electricity supply, while reducing greenhouse gas emissions. FWTs will increase Australia's renewable energy supply providing access to reliable, secure, and affordable energy as well as supporting our ambitious goal to reach net zero by 2050.							
DP250101371	**Assessing the impact of gender inequalities across Australia**	95,686.50	226,932.00	266,921.50	242,917.50	107,241.50	0.00	939,699.00
King, A/Prof Tania L	Gender inequalities persist in Australia, limiting opportunities and experiences for people of all genders. Applying the newly developed Australian Gender Equality Index, this project aims to address gaps in understanding about gender inequalities across Australia. This project expects to generate new knowledge of the impacts of gender inequalities on social, economic and health outcomes, and geographic and intersectional variations. Expected outcomes include evidence that will inform programs and policies to monitor and reduce gender inequalities across Australia. This project expects to deliver significant benefits to the population, enabling individuals to reach their full economic, social, and health potential, irrespective of gender.							
	National Interest Test Statement							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Gender inequalities disadvantage girls and women globally, leading to reduced opportunities, lost human capital, and lost potential. A key driver of violence against women, gender inequalities also cost lives. Research suggests that living in a more gender-equal society benefits everyone. For these reasons, addressing gender inequality is a key priority for Australia. However, current measures do not capture the complexity of how gender inequalities operate, interact and impact on society, meaning that efforts to tackle gender inequality may be ineffective. This project directly addresses this issue. Applying innovative analytical approaches to the newly developed Australian Gender Equality Index (an area-level measure comprising 12 indicators of gender equality), this project will map, clarify, explore and monitor how gender inequality operates and impacts on lives, and identify optimal levers to reduce these inequalities, whilst also exploring how experiences of gender inequality differ for different groups of people. This project will produce knowledge about how gender inequality is patterned in Australia and the implications this has for social, economic and health outcomes. This information is essential for governments to maximise the benefits of gender equality initiatives and ensure future policy is effective. Translation and adoption of project results will be facilitated and expedited by a diverse advisory committee and via established links with external partners.							
DP250101545 Tarzia, A/Prof Laura	**Sexual violence against older women: Enhancing recognition and response** This project explores the hidden problem of sexual violence against older women. Drawing on national longitudinal data, in-depth interviews and novel arts-based methods, the project expects to generate vital new knowledge about the context, impacts and lived experience of sexual violence for older women and how services can promote justice and healing. Through analysis of mainstream media and legal documents, it aims to illuminate community attitudes. Anticipated outcomes include new theoretical tools for understanding sexual violence against older women, actionable guidelines for policymakers and services and increased community awareness. This in turn should enhance support for older women survivors in Australia and abroad.	102,000.00	159,500.00	97,500.00	80,000.00	40,000.00	0.00	479,000.00
	National Interest Test Statement By 2050, a quarter of Australia's population will be aged over 65, most of them women. Many of these older women will be impacted by sexual violence, to the serious detriment of their well-being. Despite this, there is a tendency to view sexual violence as an issue affecting only younger women, neglecting the voices and needs of women in later life. This project fills a critical gap in knowledge by aiming to understand older women's experiences of sexual violence, its context and impacts in older age, and how it is represented in law and in the media. Findings will be translated into a suite of resources to strengthen trauma-informed responses across health, justice and social services, ensure that policies are inclusive, address ageist attitudes in the community, and promote help-seeking for victim/survivors. This will generate social and cultural benefits for Australians – particularly older women – through increased understanding of the hidden problem of sexual violence in this cohort, amplified community awareness and improved service delivery through the development of education modules, guidelines and an exhibition. The project addresses the strategic national priority area of violence against women, contributing to the reduction of its economic and social cost.							
DP250101804 Howden, Prof Benjamin P	**Unravelling Toxic Cyanobacterial Ecosystem Challenges in Wastewater Reuse** This project seeks to tackle a pressing environmental and public health challenge: the threat posed by toxic cyanobacteria in the water we recycle for growing food. With climate change affecting water availability worldwide, using recycled wastewater for irrigation is becoming increasingly necessary. However, this water can contain harmful toxins and antibiotic resistance genes, which might end up in the food we eat. Our research aims to understand how these toxic algae live and interact in the wastewater effluent and to find effective ways to remove them. By doing so, we hope to make recycled wastewater safe for irrigating crops, ensuring that the food produce is safe to eat.	121,593.50	250,502.00	257,675.00	128,766.50	0.00	0.00	758,537.00
	National Interest Test Statement A pressing issue in Australia's arid climate is the safe and sustainable management of water resources, particularly in our escalating climate uncertainty. Our research aims to comprehensively evaluate toxin-producing and antibiotic resistance gene-harbouring cyanobacterial blooms in wastewater, which are significant barriers to its reuse for Australian agricultural and urban landscapes. We will devise bloom control by novel oxidation methods. The project will benefit Australian public health by ensuring safer water supplies and reducing risks associated with cyanotoxins, which can cause severe health issues in humans and animals, and the spread of antibiotic resistance genes. Improving water reuse capabilities will significantly reduce the stress on Australia's freshwater resources, allowing sustainable development and environmental conservation. Partnerships with government agencies, water utilities, and farming groups will allow adoption of recommendations from the research outcomes. The interdisciplinary approach supports the advancement of Australia's scientific research capabilities. By fostering collaboration across multiple fields, the project addresses immediate environmental and health challenges while strengthening Australia's position as a leader in innovative water management solutions. Results will be disseminated and communicated to industries through industry-oriented workshops and conferences, and to academia via peer-reviewed publications.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250101828	**The Physical Mathematics of String Dualities**	107,063.50	217,257.50	218,020.00	107,826.00	0.00	0.00	650,167.00
Knapp, Dr Johanna	This project aims to uncover new connections between mathematical structures by studying their physics in string theory. It will generate new knowledge in physics and pure mathematics using an interdisciplinary approach utilising a remarkable collection of symmetries, known as dualities. Expected outcomes from this synthesis of research fields include a new understanding of quantum corrections in both string theory and the mathematics of algebraic and differential geometry with cross-institutional collaborations at the national and international level. Significant benefits include bringing leading international researchers to Australia, cutting-edge research outcomes and research training in high-profile international collaborations.							
	National Interest Test Statement							
	This project concerns string theory, a mathematical framework that can unify theories of quantum physics and gravity. String theory is a pathway to solving the big questions about our universe, such as the physics of black holes and the mechanisms of the Big Bang. The intricate mathematical structure underlying string theory remains unsettled. The goal of this project is to resolve open questions about this structure and provide new knowledge within both physics and mathematics. There are string theory research groups at universities worldwide, but it is still a developing field in Australia. This project is an opportunity to bring world-leading figures into our sphere of influence, fostering young Australian talent. It will also bring us closer to realising real-world applications of these theories, such as advanced materials design and quantum computing, which will provide commercial and economic benefits for Australian industries. There is already a strong interest in string theory in the general public, and we intend to capitalise on this by promoting our results beyond academia via activities such as public lectures. This will provide additional cultural and societal benefits in fostering a love of fundamental science among Australians.							
DP250101934	**An innovative steel-concrete system for molten salt energy storage vessel**	102,773.00	213,276.50	220,919.00	110,415.50	0.00	0.00	647,384.00
Ngo, Prof Tuan D	This project aims to develop a novel steel-concrete composite vessel for molten salt (MS) energy storage. By leveraging the merits of the two most prevalent construction materials, the developed vessel will provide the excellent performance and durability under extreme conditions of MS storage (high temperature and corrosion). Expected outcomes include advancing knowledge in the behaviours of steel-concrete composite under high temperature and corrosive environments, and developing a new generation of MS storage vessel that is highly scalable, efficient, and cost-effective. This should provide significant benefits to Australia in accelerating energy storage technologies and fostering the national and global renewable energy transition.							
	National Interest Test Statement							
	Australia’s abundant renewable solar energy requires energy-storage systems to manage its variability in energy production. Molten salt technology is a commercially used technology to store the heat collected by concentrated solar power. Molten salt-storage vessels are traditionally constructed of steel, which are prone to failures due to issues related to the vessel design and construction as well as its operation under high temperature cycles. Thus, Australia has an urgent need for safe, reliable, and cost-effective vessel design. This project will develop the next generation of molten salt-storage vessels using steel-concrete composite systems. We will use experimental data and computational models to determine system performance under molten salt environments and create technical guidelines. We will promote the results and guidelines through our extensive academic and industrial networks as well as public presentations. Translation of the research will be accelerated through demonstrations to relevant companies in the construction and energy sectors, leading to commercial and economic benefits. Finally, the next generation of molten salt-storage vessels for solar power will increase the reliability and utility of solar energy creating enormous environmental benefits for Australia. Importantly, it will help Australia reach our net-zero goals by 2050.							
DP250101973	**Harnessing viral elements to understand efficient mRNA translation**	58,462.00	119,924.00	121,174.00	59,712.00	0.00	0.00	359,272.00
Mackenzie, Prof Jason M	The incredible power of mRNA technology has been significantly demonstrated in generating innovative protection against pandemic viruses such as COVID-19. However, to fully realise the potential of mRNA we need to understand what ensures high level protein expression and how this can be modulated under different conditions. This project aims to identify and exploit the molecular mechanisms of viral elements directing protein translation. The significance is that							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	the research will provide the development of specific reagents that promote high level protein production from mRNA. The expected outcomes include important knowledge gains in basic virology to identify viral elements that can meaningfully benefit the development of mRNA technology. **National Interest Test Statement** Viruses are remarkable. They can translate proteins from unique and modified mRNAs. They utilise structured RNA elements and viral proteins to recruit host factors that lead to substantially increased production of viral rather than the host proteins.This project will explore the mechanisms underpinning how some viruses control host protein translation. The newly acquired knowledge will advance our understanding of virus infection nationally and internationally, enhancing Australia's reputation in these fields. The research outcomes will extend beyond academia as the new knowledge gained within this project will supercharge the emerging field of RNA biotechnology with innovative approaches for high-yield protein production from any mRNA molecule. This project will benefit Australians as it has the potential to substantially boost the performance of cutting-edge mRNA technologies. Commercial benefit will ensue by generating intellectual property and aid in establishing sovereign capacity in the development and manufacture of mRNA preventatives and therapeutics. The overall research outcomes will be communicated via scientific forums, publications in leading journals, open access and through engagement and collaboration with the commercial sector and industry. We envision that all of this combined will provide a research direction to increase the training and workforce in virology and mRNA biology in Australia.							
DP250102188 Caruso, Prof Frank	**Next-Generation Lipid Nanoparticles** Lipid nanoparticles have broad application as carriers in the food, environment, and healthcare sectors. Key to their use is controlling their internal nanostructure and composition, however currently this is achieved by using a small and limited number of lipids. This project aims to produce a new class of lipid nanoparticles with tuneable nanostructures by exploring a library of natural polyphenols and lipid molecules. This project expects to generate new knowledge in polyphenol–lipid nanoparticle interactions to tune their nanostructures and biological interactions via experimental and modelling approaches. The expected outcomes are advanced lipid nanoparticles, which should benefit prospective applications in diverse fields. **National Interest Test Statement** Lipid nanoparticles are of widespread interest because of their ability to deliver encapsulated cargo, such as pesticides, bioactives, and therapeutics in the agriculture, food, and healthcare sectors. Yet, specific and broader applications of lipid nanoparticles are limited by the poor understanding of their interactions with biological systems and the difficulty in controlling their internal structure and composition, all of which determine their function and performance. We will develop a library of a new class of lipid nanoparticles engineered with tuneable internal structure and composition, and then explore their behaviour in biological environments. The design rules for engineering these novel lipid nanoparticles and their biological interactions will be informed through computer simulations. We will promote our results through publications and seminars. Licensing of intellectual property will support the translation and commercialisation of these engineered lipid nanoparticles. We will explore commercialisation opportunities to spin out new technologies. This research will benefit Australia economically, commercially, and environmentally through the development of high-value materials for the future benefit of the Australian agriculture, food, and biomedical sectors by contributing to improved crop productivity, nutrient uptake, food shelf life, and therapeutic delivery.	153,182.50	314,307.00	330,084.00	168,959.50	0.00	0.00	966,533.00
DP250102236 Greenaway, Dr Katharine	**Harnessing Eco-Emotions for Social Action on Climate Change** The effects of climate change are escalating and the emotional impact is costing Australia in money and lives. This project aims to understand 'eco-emotions' about climate change and harness their power to promote much-needed action. Combining cutting-edge experimental and experience sampling methodology, the project expects to create new knowledge on functional and flexible regulation of eco-emotions in everyday life. Expected outcomes include new theory of emotional complexity in the context of climate change and new methods of studying collection action in situ. Potential benefits include enhanced national capacity in emotion science, increased climate action, and greater well-being among Australians coping with the climate crisis. **National Interest Test Statement**	37,421.50	115,454.50	131,835.00	53,802.00	0.00	0.00	338,513.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	Climate change threatens all Australians, and the emotional toll of this threat places a psychological and financial burden on our society. Current approaches to managing 'eco-emotions' focus on lowering the intensity of feelings about climate change at an individual level. These approaches are not scalable and risk dampening the emotional fire needed to fuel action on climate change. This project recognises the opportunity in eco-emotions and aims to harness their power to promote climate action. It will achieve this aim while launching a world-first investigation of eco-emotions using experience sampling—a technique capable of modelling emotion dynamics in the course of people's everyday lives. Key outcomes include new literature on functional and flexible regulation of emotions, new methods for assessing social behaviour in situ, and enhanced knowledge of how to channel eco-emotions into climate action while also preserving personal well-being. These outcomes will be translated to relevant stakeholders through academic publications and presentations and community-based outreach in the form of public addresses, opinion pieces, and factsheets. Benefits will be social in the form of enhanced well-being, environmental in the form of collective action on climate change, capacity-enhancing in the training of research personnel, and intellectual in the generation of new knowledge that places Australia at the forefront of easing the emotional burden of the climate crisis.							
DP250102381 Cameron, Dr Hayley	**Copepod adaptation to global change and its impacts on carbon fluxes** Copepods, a key component of the zooplankton, must adapt as oceans warm and food becomes scarcer due to global change; but this evolution may alter their role in marine food-webs and carbon sequestration. This project aims to leverage a 6-year evolution experiment to explore how an Australian copepod evolves under future thermal and food regimes. This project expects to provide new knowledge on the consequences of evolution for traits, population dynamics and carbon cycles by blending empiricism with population and biogeochemical models. The intended outcomes should provide predictions of how climate-induced evolution in copepods alters ecosystem services; with benefits for the sustainable management of the fisheries that copepods underpin.	105,681.50	215,235.50	214,611.50	105,057.50	0.00	0.00	640,586.00
	National Interest Test Statement Australia's marine environment is experiencing global change more rapidly than most places on earth, and our native marine fauna must adapt to these new conditions. Copepods (small marine crustaceans) play an essential role in marine food webs and the carbon cycle. By consuming and excreting phytoplankton (microscopic marine plants), copepods export a major proportion of the world's atmospheric carbon to the seafloor. Copepods also underpin marine food webs to support fisheries and healthy marine ecosystems. But despite their ecological importance, we know surprisingly little about how copepods will adapt to global change. This project will address this knowledge gap by evolving an Australian copepod to future temperatures and phytoplankton availabilities to explore how climate change will alter their abundance and role in marine ecosystems. By focusing on an Australian native species, this project will provide direct benefits for the Australian marine environment and commercial marine economy. This project will deliver a novel framework that will allow a more robust and accurate accounting of Australia's marine carbon sequestration potential under future climates, and will provide information essential for futureproofing Australia's $3.6 billion fisheries industry. We will communicate our findings directly to stakeholders via our links with marine industry partners and government agencies to inform policy regarding sustainable fisheries and net carbon targets.							
DP250102520 Craig, Prof Jocelyn (Lyn) P	**Measuring What Matters: Capturing Critical Aspects of Time in Work and Care** This project aims to address Australia's looming dependency crisis by exploring tensions between increasing women's labour supply whilst maintaining adequate fertility rates. Using a revolutionary new tool to measure the quality as well as the quantity of time spent in employment and unpaid family care, it expects to generate new knowledge on how workplace changes in digital technology, location and scheduling impact care, and on factors that support gender-similar care involvement. Expected outcomes are the capacity to monitor time allocation, develop policies promoting the combination of adequate care and employment and ensure Australia complies with international care data standards, with benefits to families, employers and governments.	116,065.00	174,110.00	115,951.00	57,906.00	0.00	0.00	464,032.00
	National Interest Test Statement Like other advanced economies, Australia is on a collision course between work and care. To slow population aging, nations must increase labour supply, while maintaining adequate fertility rates. But Australia ranks poorly in terms of gender equality in both paid work and unpaid domestic labour and care. This project will provide new knowledge on the factors shaping these intertwined challenges, using cutting-edge time-diary data to reveal critical aspects of family time and the gendered divisions of labour that conventional indicators miss. It will benefit Australia by providing a new perspective on how to make the work-care juggle fairer and more sustainable, including the impact of practices such as working from home, flexible hours and non-parental care. Partnerships with government, civil society and non-government organisations will ensure the project findings contribute to new policies that can both advance gender equality and better support families to care. This will bring valuable cultural change: improving the economic security of women, benefiting families and employers, and growing the national economy. A range of outputs will be produced, including an open-access database, a series of popular media communications and a project website to ensure the findings are accessible to policymakers, employers and the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	general public.							
DP250102552 Kieburg, Dr Mario	**Exploiting Spherical Transforms for Random Matrices** Much of the success of random matrix theory is due to its predictions of explicit universal limit laws found in applications. Applications apply broadly when matrix and probability theory intersect; examples include quantum physics, multivariate statistics, complex systems and wireless communications. This project aims to advance recently formulated matrix integral transform methods, based on matrix harmonic analysis, to a new level and exploit the results for the discovery of new limit laws and their applications. Benefits will include the impact on research directions in the field, training of graduate students, and a continued leadership role in random matrix theory that Australia enjoys within the Asia-Oceania region.	96,313.50	195,257.50	205,020.00	106,076.00	0.00	0.00	602,667.00
	National Interest Test Statement This project investigates key concepts in random matrix theory, a versatile mathematical tool used not just in maths but in physics and engineering. It seeks to create general mathematical models based on random matrix theory that will have downstream practical applications in fields such as telecommunications, machine learning, data analysis, complex systems and quantum science. Using and developing these models and findings will thus have commercial and economic benefits for Australia, positioning Australian computing, finance and engineering industries as world leaders in the global information economy. The project team have established strong connections with partners in Germany and South Korea, and will use these to communicate project findings and outcomes with academic, industry and government groups throughout the Asia/ Oceania region.							
DP250102606 Stuart-Fox, Prof Devi M	**Bioinspired analogues of nature's structurally coloured materials** This project aims to discover new ways that nature produces vivid colours using nano-structures and how these complex structures assemble from simple building blocks. This knowledge will be used to develop sustainable material analogues using biodegradable chitin and cellulose-based polymers. Such structurally coloured biodegradable materials are a promising green alternative to coloured materials currently produced using plastics and toxic chemical pigments. By integrating biology with physics and materials chemistry, this project addresses a significant biological knowledge gap and expects to develop novel, environmentally responsible materials and fabrication processes, providing both economic and environmental benefits to Australia.	107,420.00	193,541.50	174,562.50	88,441.00	0.00	0.00	563,965.00
	National Interest Test Statement Industrial colourants are commonly chemical dyes and pigments that fade with time and involve toxic raw materials and waste products. Nature offers an alternative: colour produced by nanostructures that self-assemble from simple building blocks due to their molecular properties. Mimicking nature’s self-assembled nanostructures can provide a low-cost, low-energy alternative to chemical colourants or structurally coloured materials manufactured using expensive nanofabrication techniques. However, our ability to draw on nature’s designs – optimised by millions of years of evolution – is limited by our ignorance of how complex nanostructures form during biological development. This project’s multidisciplinary team, spanning biology, materials chemistry and physics, aims to unlock nature’s secret to producing vivid colours using extraordinarily efficient processes, and develop bioinspired analogues using abundant, biodegradable polymers such as cellulose. Sustainably produced, structurally coloured materials have diverse applications of commercial benefit to Australia including security features, packaging, labelling, and sensors. The advanced fabrication process will significantly benefit Australian industry by opening possibilities to efficiently manufacture materials and devices using greener technologies, reducing Australia’s impact on the environment.							
DP250102690 Haslam, Prof Nicholas	**Understanding cultural shifts in concepts of mental health** This project aims to investigate how and why public understandings of mental health have shifted in recent decades, and to examine the impact of these conceptual changes. The project will generate new knowledge of how mental health-related concepts have broadened their meanings, using innovative computational methods for evaluating semantic change. Expected outcomes of this project include enhanced knowledge of cultural shifts in mental health discourse and of how these shifts affect stigma, help-seeking behaviour and	92,925.00	190,230.50	197,243.00	99,937.50	0.00	0.00	580,336.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	diagnosis-based identities, as well as new computational methods for studying conceptual change. These outcomes will provide significant benefits for understanding the social dimensions of the current mental health crisis. **National Interest Test Statement** Australia is in the grip of a mental health crisis. Rising rates of mental illness impose enormous economic and human costs and heavy burdens on health services. Understanding what is driving this crisis is a matter of national urgency, but little is known about the cultural and social changes that contribute to it. This project will examine historical shifts in how the public thinks about mental health and illness, the sources of these changes, and their impact on people's well-being. The research will clarify how concepts of mental illness have expanded their scope, so that they refer to an increasingly expansive range of experiences. It will reveal the changing cultural beliefs and values that underpin this expansion, and how broad concepts of mental illness can increase people's vulnerability to mental ill health. Understanding these cultural and psychological dynamics can help us foster ways of thinking about mental health that boost rather than undermine resilience. The outcomes of this research will be actively shared in news articles and media appearances, capitalising on the researcher's high national profile as a science communicator. The research will create a foundation for new ways of promoting mental health and preventing mental illness, with substantial social and economic benefits for Australians.							
DP250103127 Bell, Prof Sarah J	**Bottom-Up Urban Resilience: Community Networks in Infrastructure Governance** This project aims to answer the question: How do community networks influence governance for infrastructure resilience? It expects to contribute new knowledge in theories of urban resilience, methods for community-based research and the practice of community planning. The expected outcomes are a critical framework and typology for community-infrastructure engagement that will support communities and decision-makers in creating conditions for effective engagement to improve resilience. The ultimate benefit of this research is for cities to be better prepared for and able to recover from increasingly frequent, intense and inter-connected shocks and stresses, including climate change and pandemics. **National Interest Test Statement** Infrastructure is critical to safeguarding communities from the increasing frequency, intensity and complexity of hazards faced by Australia cities. Community resilience is increasingly important in disaster response and recovery. This project investigates the connections between community resilience and infrastructure resilience. It works with community networks in Victoria to bridge this gap in research, practice and policy to better support the delivery of resilient infrastructure services and foster community resilience. Project outcomes will provide evidence and frameworks for communities, governments and infrastructure providers to work more effectively together to address critical risks facing Australian cities. The ultimate benefit of this research is for cities to be better prepared for and able to recover from increasingly frequent, intense and inter-connected shocks and stresses, including climate change and pandemics. A stakeholder reference group of government, infrastructure providers and wider civil society will inform the research, maximise transferability and aid in dissemination and impact. Policy and practice briefing notes will be disseminated through existing professional networks for infrastructure, resilience and community development. The research will support exchange of knowledge between community networks through the workshops, media and social media.	117,843.50	252,272.50	230,394.00	95,965.00	0.00	0.00	696,475.00
DP250103199 de Gier, Prof Jan	**Closing the gap between integrable models and branching processes** Integrable stochastic lattice models are highly effective for the study of universal phenomena in transport, directed polymers and interface dynamics. This project aims to address a key knowledge gap by developing and studying new integrable models for processes that (i) do not obey particle conservation and (ii) display population-dependent branching mechanisms such as in realistic reproduction dynamics. Such models are mathematically tractable and, as a result, the project will lead to a deeper understanding of key processes such as those that regulate bacterial colonies and proliferating cancer cells, and provide new insights into how interdependence and heterogeneity of individuals affects the late time behaviour of growing populations. **National Interest Test Statement** This project will explore the deep connections between integrable vertex models in mathematical physics and branching processes in probability theory. Integrable vertex models are crucial for understanding complex systems, while branching processes are pivotal in mathematical modelling. Linking these areas will push the boundaries of mathematical sciences, leading to new insights and methodologies – many of which will have real-world	92,440.00	182,600.00	183,360.00	93,200.00	0.00	0.00	551,600.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	applications. For instance, better understanding of branching processes will improve models used in epidemiology for predicting disease spread, and in environmental science for predicting forest fires and assessing climate change impacts, providing social and environmental benefits for Australia. The researchers trained in these discoveries will be well-prepared for careers in academia, industry, and government sectors, enhancing our workforce in critical STEM areas and providing economic benefits for Australia, as well as positioning our country as a global scientific leader. The mathematical tools developed will be made freely available through open-access repositories and libraries.							
DP250103322 Dimitriadis, Prof Evdokia	**microRNA 124, a key modulator of uterine receptivity to establish pregnancy** In mammals, pregnancy is established when embryos adhere and implant to a “receptive” uterus. The uterine surface epithelium is normally a barrier to embryo adhesion and must remodel in a small time window within each estrous or menstrual cycle to lose its barrier function enabling embryo implantation. If the endometrium does not remodel to become receptive this leads to failure of implantation and no pregnancy is established. There is a profound lack of knowledge on how and precisely when the uterine epithelium prepares itself to accept an embryo to ensure pregnancy is established and healthy offspring. This project will define the regulatory mechanisms by which the endometrium remodels to become receptive to embryos.	118,723.50	273,609.00	259,385.50	104,500.00	0.00	0.00	756,218.00
	National Interest Test Statement In mammals, pregnancy starts when embryos adhere to the uterine lining (epithelium) that must lose its barrier function to allow embryos to implant. There is a profound lack of knowledge on how and when the uterine epithelium becomes receptive, yet receptivity is crucial for establishing pregnancy of mammals. While research suggests that microRNAs in uterine epithelial cells are crucial for allowing embryos to implant, how this happens remains elusive. Our initial findings suggest microRNA-124 that remains elevated in the uterine lining during receptivity leads to failed pregnancy. This project will investigate how microRNA-124 regulates uterine surface changes to allow embryos to implant in mammals including cows, sheep, and marsupials as well as some lizards. We have made a genetic mouse model where we can switch microRNA-124 on in the uterine lining at a time of choosing. We will use this model to determine whether microRNA-124 is critical for establishing pregnancy. Our findings have the potential to inform and enhance future agricultural practices and help regulate fertility in both livestock and native species. The insights gained may inform wildlife conservation and breeding programs, thus aiding in the preserving biodiversity. We will engage stakeholders in veterinary medicine, biotechnology and agriculture to promote and translate our research outcomes.							
DP250103346 Li, Prof Dan	**Probing ionic micro-environment at electrochemical interfaces** The project aims to develop new materials and experimental tools to probe and exploit the complex ionic microenvironment at electrochemical interfaces – a centrepiece of clean energy and sustainable technologies. The novelty lies in using tuneable porous membranes made from electroconductive materials and charged polymers as a new platform to amplify and detect signals from the interfaces. Harnessing advanced characterisation and modelling, this project will build a key framework of the local ionic landscape and offer a new screening protocol for application-targeted ionic microenvironment design. This tool will help bridge the gap between basic research and real-world utility and accelerate Australia’s transition to a net-zero economy.	109,945.50	219,891.00	219,891.00	109,945.50	0.00	0.00	659,673.00
	National Interest Test Statement Electrochemical interfaces are junctions where electrically charged materials meet fluids that conduct ions. They are foundational to numerous sustainable technologies, such as batteries for energy storage, electrolysers for chemical and fuel production, fuel cells for electrical power generation, and water purification for clean water production. The efficiency of all these systems relies on the structure and movement of ions near these interfaces, which remain largely unknown. This project will develop new materials and tools to better understand the dynamic and complex ionic behaviour at these interfaces and use this new knowledge to improve electrochemical system designs and operations. The resulting new insights will be made broadly available through workshops, seminars, and media articles. The Australian industries adopting the project results will benefit commercially from the improved system and process efficiency and their reduced cost, accelerating the wide adoption of these clean and sustainable technologies. The increased use of these technologies will have profound environmental and social benefits to Australia through cleaner industrial processes and lower carbon emissions. Most importantly, this project will contribute to a cleaner future for Australia and assist in meeting our net-zero carbon emission targets by 2050.							
	Multifocal multicolour super-resolved tracking of biomolecular interactions							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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DP250103363 Fan, Dr Daniel	Understanding fundamental dynamic biophysical processes occurring inside a live cell environment requires measurement of multiple biomolecules in real-time with nanometre precision in 3D, which current methods cannot achieve. This project aims to solve this problem by advancing and synthesizing the latest developments in super-resolution microscopy (also known as nanoscopy). The intent is to generate new knowledge in the design and construction of super-resolution microscopes used for biophysical studies at the nanoscale. Expected outcomes include the development of advanced manufacturing methods and improved state-of-the-art optical microscopy and nanoscopy instrumentation that can lead to scientific discoveries in structural biology.	53,606.00	85,462.00	67,112.00	35,256.00	0.00	0.00	241,436.00
	National Interest Test Statement To understand the whole of biology we must understand biology at its smallest scale, the nanoscale. Although current microscopes can measure and track biomolecules at the nanometre scale, they cannot measure and track different biomolecules at the nanometre scale within a large specimen volume. Thus, our understanding of nanoscale biology within our three-dimensional cells is limited by the performance of current microscopes. This project aims to use cutting-edge technology in applied optics and micro-technology to design and build advanced microscopes for the study of fundamental biological processes at the molecular level. Inside the cell, biomolecules such as DNA and proteins have important functions. Yet, there is much to learn: how are these biomolecules transported inside the cell, how do they interact, and how are genes expressed? New knowledge about how cells operate can be used to develop better therapies against disease and improve health. The recent success of mRNA-based therapies is one example. State-of-the-art instrumentation would provide economic and commercial benefits to Australia, in addition to social and health benefits gained from a greater understanding of molecular processes in cells. The new instrumentation will be widely reported through relevant scientific and industry networks to find a pathway to commercialisation.							
DP250103407 McFadden, Prof Geoffrey I	**How is uniparental inheritance of organelles achieved in a microbe?** Inheritance after sex results in offspring getting half their genes from the mother and half from the father, but two parts of cells—the mitochondria responsible for energy conversion, and the plastids responsible for photosynthesis—do not follow this pattern. Rather, mitochondria and plastids, including the genes therein, are typically inherited from just one parent, usually the mother. We will investigate the molecular machinery that results in maternal inheritance of mitochondria and plastids in a unicellular microbe. We will identify genes preventing microbial fathers from contributing mitochondria or plastids to their offspring.	121,665.50	255,659.00	266,708.00	132,714.50	0.00	0.00	776,747.00
	National Interest Test Statement Parasitic diseases cause $96m of losses in Australia’s cattle industry & a further $433m of losses to other Australian livestock industry. Related parasites infect our companion animals. For instance, Australia has 6.4 million dogs, and the annual spend on a veterinary package to keep our best friend parasite free is $450. Parasite control relies heavily on antiparasite drugs that target select genes. Inheritance of these genes is poorly understood, which hinders our ability to control the spread of resistance if these genes become resistant to our drugs. Our project aims to tease out the mechanism of gene inheritance in a model parasitic microbe, dissecting how such non-standard inheritance works, which will inform resistance management strategies. It is important to understand how only the mother can pass on this cohort of genes as they are the targets of drugs that we use to control parasites of livestock & humans. The benefit of this research is to address the gap in drug resistance management and better understand the control mechanisms.							
DP250103500 Christo, Dr Susan N	**Mapping tissue-resident lymphocyte diversity and interactions** Most immune threats enter via our tissues, not the blood. Thus, our organs are packed with different immune cells that fight off danger. However, not all immune cells are equal and can behave differently depending on the organ they live in. It is not well understood why immune cells in different tissues exhibit altered functions, therefore, using cutting-edge high-resolution technology, we plan to create an ‘atlas’ that maps the immune cell network in various organs. This will reveal cell and protein interactions with immune cells that will allow us to test how this network can support the tissue landscape. These outcomes will provide a novel resource for understanding how different organs support immune cell neighbourhoods and behaviours.	112,109.00	224,218.00	231,139.50	194,275.50	75,245.00	0.00	836,987.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	National Interest Test Statement							
	Our organs are packed with various immune cells that fight infection and protect us from invaders like viruses and bacteria. Most immune responses start in our organs, not the blood. This is where invaders enter the body and cause harm. We know that immune cells in organs better protect us from infection than those in the blood. Within the tissue, they can quickly destroy these threats. However, the organ environment is complex. What allows our immune cells to best protect us in this terrain is unknown. Therefore, our project aims to create an 'immune cell atlas' of the body. Using the 'cell map' of each organ, we will explore how the tissue landscape supports effective immune protection. By understanding how immune cells work together, we will gain critical knowledge on different immune responses in different organs around the body. Our immune cell atlas will be free and accessible via an interactive web app, offering a novel educational tool that will attract the next-generation of scientists. The project will promote global collaborations, placing Australia in a competitive position to attract further investment towards understanding varied immune responses. This will result in substantial knowledge gain for industry and research sectors. We will communicate our findings to the community by publishing in high-impact journals, presenting at international conferences, and sharing our work with the public through social media, press releases, science-based radio and TV shows.							
DP250103607 Liu, Prof Zhe	**Unravelling the pivotal role of interface water in electrochemical systems** This project aims to unravel the pivotal role of the electrode/electrolyte interface water on key electrochemical properties in aqueous electrochemical systems by integrating state-of-the-art molecular simulation and experimental results. The obtained fundamental knowledge advancement will be used to develop a modern electrical double layer theory model. This project expects to meet the challenge of highly efficient and quantitative nanoscience-based design tools for advanced electrochemical energy storage and conversion devices and systems. The outcome will allow the design and operation of more efficient and sustainable technologies in the energy industry, benefitting the Australian economy and environment.	87,269.50	174,539.00	177,039.00	89,769.50	0.00	0.00	528,617.00
	National Interest Test Statement							
	Numerous electrochemical technologies, including energy storage, electrocatalysis, and water desalination, are based on electrified surfaces, where electrolytes are in contact with conductive solid materials. When these solids interface with electrolytes, they can form an electrical double layer (EDL) where the adsorbed ions balance solid surface charges. The EDL theory is the bedrock for designing electrochemical devices and systems in real applications. Its theoretical framework was developed in 1924, and recent advanced experiments and simulations have shown that the current EDL theory is too simple. This project will develop a new fundamental theory for the EDL at the electrified surface. It will establish new theoretical models to accelerate the design of next-generation ionic technologies. The results will be published in industry media and be commercialised to develop and design novel technologies and devices for Australia's knowledge-based manufacturing. Once applied, this research will benefit many sectors through its use in Australian applications such as chemical or pharmaceutical production processes, water desalination, mineral extraction, and advanced technology for electrochemical energy storage and conversion. Thus, these devices and real-world applications will provide many economic, commercial, environmental, and social benefits for Australia.							
DP250104864 Goodman, Dr Christopher D	**Can we make gene drives work in protists?** The project aims to explore ways to harness unusual protist biology to build gene drives - genetic control systems that can be applied in nature. Our unique experimental system enables the manipulation of factors predicted to influence gene drive success and allows direct testing of these bespoke changes over multiple generations. The project expects to characterise the fundamental determinants of efficient gene drives in protists. These findings will provide the scientific basis for designing species-specific control systems to combat harmful protists, which significantly impact Australia's economy.	111,269.00	239,399.50	257,569.00	129,438.50	0.00	0.00	737,676.00
	National Interest Test Statement							
	Gene drives are powerful new tools that can fundamentally alter species in nature. They are simple to make, easy to introduce, and designed to spread through widely dispersed populations. They can be customized to change any trait, and in the extreme, drive entire species to extinction. The simplicity and power of these tools presents both significant opportunities and risks for Australian agriculture, environment, and biotechnology industry. This project aims to address the almost complete absence of research in how gene drives will work in protists – complex, single cell organisms that are only distantly related to animals, plants, and bacteria. In Australia, protists are both beneficial – e.g. ensuring the growth and survival of coral reefs – and damaging – e.g. a major disease burden for the $33 billion livestock and poultry industries, and significant infective agent in native wildlife. By understanding how gene drives will work in protists, we will provide knowledge essential to safely regulating and developing this technology while addressing the risks of, and responses to, their accidental introduction or malicious use. The findings will be used for decision-making by agriculture and biotechnology industry bodies, policy makers, biosecurity, and public health organisations.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250104922	**Impact of Delayed Sleep Phase on Fear Extinction Circuitry in Adolescence**	56,113.50	111,942.50	151,459.00	191,260.00	95,630.00	0.00	606,405.00
Felmingham, Prof Kim L	Sleep onset is progressively delayed from puberty and this sleep phase delay peaks in late adolescence, a developmental stage characterised by marked disturbances in sleep and the emergence of mental health problems. Light exposure is critical for synchronising sleep and the internal 'body clock', but developmental changes and night-time light exposure in late adolescence delay sleep timing, leading to impaired sleep and emotion regulation. Despite these associations, the human brain circuitry underlying sleep phase delay, light responses, and fear processes is relatively unknown. This advanced imaging project will provide the first insights into the impact of sleep and circadian ('body clock') factors on fear processes in late adolescence.							
	National Interest Test Statement							
	This project examines whether sleep and circadian factors such as delayed sleep timing and exposure to evening light in late adolescence leads to poor fear regulation. Late adolescence is the peak time for delayed sleep onset, sleep disturbances, exposure to evening light with light-emitting device use, fear regulation difficulties and the emergence of anxiety. This is the first study to examine how these sleep and circadian factors affect fear regulation responses and brain circuitry using novel ultra-highfield neuroimaging, and tracking naturalistic sleep and light exposure using wearable devices. The project will provide crucial new knowledge into the impact of sleep quality, delayed sleep timing and light exposure on fear regulation putting Australia on the cutting edge of sleep and developmental science. It will also help identify causal factors in the escalating crisis in youth wellbeing, which will lead to social and economic benefits, by enhancing productivity at school and work and reducing absenteeism. Results from this project will help us identify the specific sleep and circadian factors that lead to impaired emotional wellbeing in teenagers. This information will help us develop novel guidelines on recommended sleep and wake times, and amount of evening light exposure to promote optimal youth wellbeing. This information will be disseminated to parents, educators, clinicians and teens in workshops, online and social media forums, and school presentations.							
DP250104954	**Science for monitoring the Kunming-Montreal Global Biodiversity Framework**	111,395.00	218,651.00	220,459.50	113,203.50	0.00	0.00	663,709.00
Nicholson, Prof Emily	This project aims to develop new science for effective monitoring of policies to halt and reverse loss of nature, in Australia and globally. Loss of nature threatens biodiversity, human wellbeing and the economy. The UN Convention on Biological Diversity has set new goals for nature, but its indicators for measuring progress are untested. This project will provide the first comprehensive evaluation of global and national monitoring capacity to track progress towards the Convention's goals. Expected outcomes include new theory and methods for monitoring change, and policy tools for governments and the private sector. Expected benefits include improved indicators for monitoring action and nature recovery in Australia and around the globe.							
	National Interest Test Statement							
	Loss of nature threatens biodiversity, human wellbeing and the economy. Australia is a signatory to the UN Convention on Biological Diversity, which set new goals for nature in 2022. However, most of its indicators for measuring progress are untested in their capacity to track changes in biodiversity. This project will provide the first comprehensive evaluation of global and national monitoring capacity to track progress towards the Convention's goals. It will analyse national reports submitted to the Convention, and develop new models for evaluating the pathways to achieving the Convention's goals. This will improve indicator sets for monitoring action and nature recovery, in Australia and around the globe, providing environmental benefits for Australia. It will also strengthen Australia's capacity to deliver on its commitments to the UN Convention, benefiting Australian society and other sectors with similar demands for indicators, including government-led ecosystem accounting and private sector reporting. Project findings will be translated into evidence-based guidance for governments, NGOs and the private sector, for strengthening indicator sets, and for targeted investment for effective monitoring.							
DP250104965	**Perfect codes in Cayley graphs**	89,246.00	183,662.00	193,662.00	99,246.00	0.00	0.00	565,816.00
Zhou, Prof Sanming	Perfect codes are fundamental objects of study in combinatorics. Studied extensively in classical coding theory, perfect codes have a natural generalisation to the setting of Cayley graphs, where they correspond to interesting tilings of groups. This project aims to undertake an in-depth study of perfect codes in several important classes of Cayley graphs, with a focus on their existence,							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
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	construction and connection with underlying groups. A series of foundational results essential to further development of this young area of research are expected, via techniques from algebraic graph theory, coding theory and group theory, thus substantially enriching the theory of perfect codes in a broad framework.							
	National Interest Test Statement							
	This project delves into the critical realm of coding theory, the backbone of modern information transmission. At its core is the concept of perfect codes, which can provide maximum error correction without ambiguity. The project will develop theories of perfect codes within a broad framework demanded by new communication technologies, with a focus on networks described using algebraic structures. It will unveil a series of groundbreaking mathematical insights into perfect codes, paving the way to new research avenues. This research holds immense potential to benefit Australia across multiple domains. Economically, it contributes to foundational advancements in communication theory, potentially leading to more efficient and robust communication systems. Socially, it enhances international collaboration, reinforces Australia's research standing in fundamental science, and provides opportunities for knowledge exchange. Culturally, it promotes the growth of a vibrant academic ecosystem by ensuring the continuity of expertise in this critical area. The project team will use diverse pathways to promote the research outcomes beyond academia, such as hosting interactive workshops with local libraries and schools, organising public lectures, and engaging with digital media outlets.							
DP250104980	**Circular RNA transport and function**	110,000.00	250,000.00	280,000.00	140,000.00	0.00	0.00	780,000.00
Wickramasinghe, A/Prof Vihandha O	This project aims to investigate how a new type of RNA, circular RNA, is regulated by advancing on our ground-breaking work just published in the premier journal in science, Nature. This project expects to generate fundamental new knowledge of gene regulation and will use cutting edge circRNA export assays. Expected outcomes of this project include establishing new research areas and capacity in Australia, and further building national and international linkages. This proposed project builds on research momentum of an established fundamental RNA biology laboratory and promises to deliver exciting new insights. This should provide significant benefits, such as harnessing circRNAs for the next generation of RNA based technologies.							
	National Interest Test Statement							
	Emerging RNA-based technologies, such as mRNA vaccines, are revolutionising the biotechnology and therapeutics sectors. However, we still do not understand how different types of RNA are made and processed by cells. There has been massive global investment into a new class of RNA, circular RNA (circRNA) because they are more durable than mRNA. However, key features of how circRNAs function remain unknown which is a major barrier to harnessing them for technological purposes. Our proposal aims to provide the first insights into an entirely new pathway responsible for the nuclear export of circRNAs. Uncovering the key proteins in circRNA production and transport and understanding their regulation will be key to fulfilling the tremendous potential for circRNAs in the next generation of RNA based technologies. Our study will impact research on a global scale and the fundamental knowledge we aim to generate has the potential to lead to employment and study opportunities for young scientists in Australia and internationally. Our studies will help keep Australian science at the forefront of discovery of molecular mechanisms in this area. At a societal level, future applications of the fundamental knowledge generated here may include new ways to improve the efficiency of these emerging RNA based technologies and therapies in plants and animals. We will promote our findings through publication in journals with suitable open access policies, press releases and through social media.							
	The University of Melbourne	4,964,623.50	10,303,601.50	10,394,423.50	5,568,890.50	513,445.00	0.00	31,744,984.00
	Victoria	15,567,732.00	32,634,396.50	33,220,579.50	18,024,401.00	1,954,560.00	84,074.00	101,485,743.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	2028-29 (Column 8)	2029-30 (Column 9)	(Column 10)
Western Australia								
Curtin University								
DP250102020 Hurley-Walker, A/Prof Natasha	**Investigating the enigmatic slowly repeating radio transients** The Australian sky has revealed a new celestial mystery: slowly-repeating Galactic radio transients. Our cutting-edge data processing and search algorithms, optimised for the vast fields-of-view and sensitivity of new radio telescopes, are unearthing a new population of these enigmatic objects. We propose to unravel their true nature by swiftly following up new detections with multiwavelength observations, and modelling the sources' evolutionary paths and magnetic field configurations. The expected outcome of this project will rewrite our understanding of the evolution of magnetic compact stellar remnants such as white dwarfs and neutron stars. Success would establish Australia as a leader in this new field of radio astronomy.	100,106.50	205,846.00	219,601.50	113,862.00	0.00	0.00	639,416.00
	National Interest Test Statement Australian researchers have discovered an exciting new kind of astrophysical object that has never been seen before: bright, slowly-repeating radio sources. The radio emission cannot be explained by current theories; one possibility is an unusual form of neutron stars, potential progenitors of the mysterious Fast Radio Bursts, that provide an extremely useful cosmological probe. This project will find more of these slowly repeating radio sources and follow them up using telescopes from around the world, to understand their nature. The proposal uses the unique capabilities of the Murchison Widefield Array and Australia Square Kilometre Array Pathfinder, radio telescopes located in outback Western Australia. The search will push the limits of the systems, testing observational and data-searching techniques which can then be used in the future Square Kilometre Array. These telescopes are top-level science infrastructure priorities of the 2016-2025 Australian Astronomy Decadal Plan, and this project is a low-cost way to expand the capabilities of existing investments, and make Australia a leader in this entirely new field of study, which is now an international hot topic. The novel astronomical discoveries we aim for will enhance international collaboration and, building on the proponents' already significant public outreach portfolio in television, radio, print and public events, further inspire public enthusiasm for STEM.							
DP250102068 Jones, Dr Tod S	**The new classic Indonesian arts: its emergence and exclusion** This project will document how local engagement with colonial and postcolonial heritage generated local knowledges and skilled local production of Hindu-Buddhist Dharmic arts in archaeologically rich locations across Indonesia. Despite the skillsets and knowledge within these communities, museums and archaeologists often miscast residents as unengaged and local artists as counterfeiters who undermine the provenance of classic Indonesian artefacts. This international action-research project will work with Indonesia’s new classic artists, their communities and heritage institutions and researchers to reposition local knowledges and arts industries as important contributors to Asian heritage and arts.	51,781.50	120,275.50	132,361.00	63,867.00	0.00	0.00	368,285.00
	National Interest Test Statement This research project challenges and updates conceptions of Asian heritage through connecting Australian institutions and people with the contemporary Indonesian communities producing artefacts. This project addresses the negative attitudes past collection practices generate towards Asian archaeological collections in Australia through careful collaborative work with Indonesian artisans to find practical ways for them to benefit from stronger alignments with heritage institutions in Indonesia and Australia. We will promote heritage methods and concepts that work in cross-cultural collaborations to inform and improve Australia’s international heritage initiatives through publicly available protocols. Undertaking this research addresses an ongoing colonial injustice, builds goodwill towards Australia, fosters international research collaboration between the two countries and generates engagement opportunities. Indonesian artisans will have the opportunity to share their art and knowledge, through an exhibition, a further exhibition proposal and co-authored publications, with Australian heritage institutions and the Australians who visit them.							
DP250102563	**Single-molecule electrostatics: low-power diodes and powerful sensors** The project aims to develop a technology that moves beyond the recent science	103,220.00	137,046.00	67,152.00	33,326.00	0.00	0.00	340,744.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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Darwish, A/Prof Nadim	of merging molecular and silicon electronics for a new class of low-power-consumption electronic components. These components will enable a platform for creating advanced electronics, such as energy-efficient microprocessors and ultrasensitive electroanalytical devices for chemical and biochemical analysis. The conceptual innovation is to integrate the electrical properties of semiconductors with the chemical and electrochemical diversity of organic molecules, using a carefully engineered combination of single-molecule electrical and electrochemical spectroscopy, with molecular electrochemistry, and silicon surface chemistry. **National Interest Test Statement** Electrostatic forces underlie the silicon-based technology which is the foundation of our digitised society, and interactions between charged molecules are fundamental to all of chemistry and biology. This project will develop the science of single-molecule electrostatics: harvesting interactions between the electric field of a molecule and that of a silicon surface to create new electronic functionalities. Through innovation in single-molecule science, electrochemistry, microscopy and surface science the project will revolutionise electronic components for integrated circuits and diagnostic devices. Technological challenges addressed by this project include the high-energy consumption of current all-silicon electronics and the lack of point-of-care sensors capable of detecting rare but physiologically relevant biological molecules. Outcomes include building the instruments and the surface chemistry tools necessary to accurately orient molecules with respect to semiconductor electric fields, and will lead to the first room-temperature silicon-based superconducting diode as well as miniature health monitors capable of detecting trace-level hormones. These innovations will benefit the Australian electronics, bioelectronics and biotechnology industries.							
DP250102568 Schmitt, Prof Dr Axel K	**It’s about time: critical minerals in carbonatite systems** Meeting global demand for critical minerals requires identifying fertile rock bodies, but this is hampered by not knowing the exact timing and processes of their formation. This project aims to close this gap by investigating Laacher See as one of the world's youngest carbonatites. Through accessory mineral uranium series dating and geochemical-microtextural analysis, it can be revealed at unprecedented precision when and how critical minerals including the rare earth elements are enriched during carbonatite evolution. Applying this knowledge to past episodes of carbonatite formation within Australia's crust improves assessing their resource potential. Detrital accessory mineral properties can then be better used to trace hidden resources. **National Interest Test Statement** This project aims to explore the resource potential of carbonatites, a rare type of magmatic rock often associated with economically significant deposits of critical minerals, notably rare earth elements. Rare earth elements are in increasing demand as crucial components in electric motors and generators, and are thus vital for Australia's net zero emission transformation. Discovering new carbonatite-hosted deposits within Australia’s continental crust is essential for securing future supplies. Understanding how and where these deposits form requires precise knowledge of the age of carbonatite magmatism. This project will employ innovative approaches in geochemistry and geochronology to investigate carbonatite minerals at the micro- to nanoscale. Through this, the timing and origin of carbonatite magmatism and associated mineralisations can be determined with unmatched accuracy and precision. Advancing knowledge on carbonatite magmatism is important for resource companies to devise new exploration strategies for hidden rare earth element deposits. These advancements hold particular economic and environmental significance for Australia, given its substantial mineral resources, leading mining technology sector, and commitment to green and renewable energy sources. Findings will be shared with industry stakeholders through conferences and internships with mining companies, facilitated by the Resources Technology and Critical Minerals Trailblazer programme at Curtin University.	41,471.00	94,057.00	103,472.00	50,886.00	0.00	0.00	289,886.00
DP250103686 Viscarra Rossel, Prof Raphael A	**Unlocking the biodiverse recarbonising potential of Australian soils** This project aims to innovate the coupling of native plant diversity and carbon (C) sequestration to recarbonise degraded Australian soils. By combining an interdisciplinary experimental approach, modern analytical methods, and modelling, we expect to generate new knowledge about the effects of native plant diversity on soil C dynamics and stabilisation. Expected outcomes include identifying the biodiverse recarbonising potential of degraded Australian soils, improving soil and ecosystem health and functionality, climate adaptation, and resilience. Data generated from the project will show how native biodiversity and soil C sequestration offer a synergistic approach for conservation and nature-	166,923.50	277,528.50	239,341.50	234,267.50	151,215.00	45,684.00	1,114,960.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	positive programs to benefit all Australians. **National Interest Test Statement** Our project investigates how native biodiversity, soil, microorganisms, and the environment interact in Australia's semi-arid regions to enhance soil carbon storage. We aim to fill critical gaps in understanding how biodiverse ecosystems help cycle and store soil carbon, which is essential for sustainable land management and ecosystem resilience. This research offers significant benefits. Economically, it supports the Carbon Credit Unit scheme with a method to increase soil carbon storage through biodiversity, creating new commercial opportunities in soil health, ecological restoration, and climate change mitigation. Socially and culturally, it fosters community participation in landscape restoration, engaging Indigenous communities and deepening cultural connections to the land. Environmentally, the project aligns with national efforts like the National Soil Action and Nature Positive Plans, the Biodiversity Conservation Strategy, and climate mitigation initiatives. We will collaborate with Natural Resource Management groups and agricultural stakeholders to ensure a broader impact, integrating our findings into practical land management practices. We will promote our research through workshops, policy briefs, and digital platforms to achieve widespread understanding and adoption locally, nationally, and globally. This will ensure the project's benefits are realised across various sectors, contributing to a healthier, more sustainable future for Australians and the planet.							
DP250104303 Shao, Prof Dr Zongping	**All-perovskite inorganic anion exchange membrane water electrolysis** This project aims to develop anion exchange membrane water electrolysers using all inorganic perovskite oxides as both the electrode and membrane components for the generation of green hydrogen. This project expects to generate new knowledge in understanding the structure-property relationships of perovskite oxide electrocatalysts and the hydroxide ionic conduction behaviours of perovskite oxide membranes under practical operating conditions, which are key to the water electrolysis technologies. This project is expected to improve the utilisation of renewable energy and promote the development of hydrogen research in Australia. This should provide significant benefits to achieve energy sustainability and carbon neutrality for Australia.	115,408.00	234,703.00	236,060.00	116,765.00	0.00	0.00	702,936.00
	National Interest Test Statement To expedite Australia's transition to a competitive, carbon-neutral economy, developing advanced energy technologies with minimal carbon emissions is crucial. Hydrogen energy is particularly important for Australia's clean energy future. While water electrolysis can produce hydrogen using renewable electricity from sources like solar and wind, it faces challenges due to the low efficiency, poor stability, and high costs of key materials. This project aims to overcome these challenges by developing advanced water electrolysis technologies using novel electrolyser devices made of a type of inorganic materials called perovskite oxides, which act as both electrode and electrolyte. These materials can be produced using non-noble metals abundant in Australia, benefiting the manufacturing and chemical industries. The project will fill critical research gaps by enhancing our understanding of how these perovskite materials perform under practical water electrolysis conditions, which is essential for advancing the technology and maximising the use of renewable energy in Australia. The success of this project is expected to position Australia as a key player in the global hydrogen market, opening new export opportunities. To maximise the impact, we will share our findings with industry stakeholders, policymakers, and the public through workshops, seminars, and partnerships, ensuring broad understanding and adoption of the technology.							
	Curtin University	578,910.50	1,069,456.00	997,988.00	612,973.50	151,215.00	45,684.00	3,456,227.00
Edith Cowan University								
DP250102379 Green, Prof Lelia R	**Teen-informed strategies to counter sexual image abuse and sextortion** Coming of age has never been so fraught. Many teens use sexts to consensually explore emerging sexual citizenship. Yet this is prohibited, and teens-who-sext may experience gender-linked sexual shaming and victimisation, including by adults. This cultural studies project gathers teens' perspectives upon and remedies for peer-perpetrated and peer-magnified image-based sexual harassment and abuse. Reports of sextortion, sexualised deepfakes and blackmail of teens by adult predators are rising, even as teens worry that reporting such abuse might see them, as victim, accused of creating child exploitation material. Project outcomes align with a Rights of the Child approach and will mitigate risk, reducing harm while supporting vulnerable peers.	42,744.00	102,365.50	111,936.00	52,314.50	0.00	0.00	309,360.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement							
	Our project investigates teenagers' opinions and activities around sexting, recommending improved responses that minimise harm. Unlike Australian adults, teens can face severe legal consequences for consensual sharing of sexual images. As well as legal implications, teens risk shaming, blackmail, school expulsion and psycho-emotional distress. 'Don't sext' is not working: 87% of 14-18-year-old Australian school students say they receive sexts; 70% send them. We will also respond to newer threats to teens' intimate communications - sextortion and AI-facilitated deepfake porn - collecting an evidence base for legal change and filling the evidence gap created by a reluctance to take seriously the fact that teens sext. Our UK co-investigator will share novel research methods underpinning emerging British strategies to teach teens respectful, consensual approaches to sexting. Economically, we aim to reduce direct and indirect emotional, health and legal costs to teens and families affected by the failure of current sexting policy settings. Social and cultural benefits include supporting an engaged conversation with and about teens as emerging digital and sexual citizens. We aim to impact public awareness and the law, better serving teens and sharing their views through policy submissions and media engagement. Connecting with policymakers and media, in addition to teens, will ensure our findings reach a wide audience, supporting the adoption of effective responses to teen sexting.							
DP250104390	**HyperGraph Classes, Robust Fitting and Clustering**	85,914.00	168,120.00	171,010.00	88,804.00	0.00	0.00	513,848.00
Suter, Prof David	Much of AI, particularly within computer vision, relies on robust fitting. More generally, clustering data (i.e., this part of the image relates to a table top, that part relates to the legs of the table) in a manner that is robust to outliers (data that arises from measurement errors, irrelevant data for the task, or interfering components). A scientific approach tries to understand what makes such tasks hard or easy (to carry out reliably). What characteristics of the data mean that a more simple approach will be successful, or what characteristics mean a more sophisticated approach is required? Indeed, when is the data too noisy to expect any approach to work reliably? This project aims to increase our understanding of these issues.							
	National Interest Test Statement							
	Fitting data (robustly) to models, and clustering data: these are both fundamental and ubiquitous tasks in engineering, science (even social science) and economics. This proposal has a particular inclination towards application in Artificial Intelligence and Machine Learning. Adding to the basic knowledge in these areas, and the number of people skilled in these areas, is core to Australian competitiveness and national welfare.							
	Edith Cowan University	128,658.00	270,485.50	282,946.00	141,118.50	0.00	0.00	823,208.00
The University of Western Australia								
DP250100738	**Molecular Engineering of Locally Concentrated Ionic Liquid Electrolytes**	103,363.50	227,657.00	250,837.00	126,543.50	0.00	0.00	708,401.00
Atkin, Prof Rob	This project aims to discover new locally concentrated ionic liquid electrolytes, which have enhanced performance compared to current electrolytes, from mixtures of metal salts, ionic liquids, and diluent molecules. This project expects to use cutting-edge techniques to understand the arrangements and dynamics of ionic liquids, metal ions, and diluent molecules, in the bulk and at electrodes. Expected outcomes of this project include new knowledge that will enable molecular scale engineering of high performing, low viscosity, locally concentrated ionic liquid electrolytes. This should provide benefits via new batteries with superior energy storage capacity and durability which are crucial for integrating renewable energy sources.							
	National Interest Test Statement							
	Batteries and other electrical energy storage devices are crucial for powering our modern world, but their performance is often limited by the thick, viscous liquid electrolytes they contain, which slow down ion movement and reduce efficiency. This project aims to develop improved electrolytes by combining metal salts, ionic liquids, and diluting molecules to create less viscous, more conductive mixtures while maintaining high ion concentrations in specific areas. We will study the arrangement and movement of ions, ionic liquids, and diluent molecules within the electrolyte using advanced techniques. This molecular-level understanding will help engineer superior electrolytes, leading to batteries with higher energy storage capacity and longer lifetimes. Developing high-performance batteries is crucial for adopting renewable energy sources in both stationary and mobile applications. Longer-lasting batteries will also reduce the environmental impact associated with battery production and disposal. Project outcomes will be communicated to industry via articles and presentations, maximizing understanding and future							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	adoption of this potentially transformative technology. The electrolytes discovered in this project generate new opportunities for local manufacturing and benefit Australian industry, creating opportunities for economic growth and job creation.							
DP250101080	**Non-local PDE approach to moving fronts and bushfires**	85,000.00	172,500.00	182,500.00	95,000.00	0.00	0.00	535,000.00
Dipierro, Prof Serena	Advancing our knowledge of bushfire propagation is of paramount importance for Australia, from an economic, environmental, biological, and social point of view. The main aim of this project is introducing a new mathematical model to describe moving fronts in bushfires, that relies on a deep understanding of far-away interactions responsible for fronts propagation, in light of geometric flows and partial differential equations. From the theoretical standpoint, this novel approach will produce significant progress in terms of mathematical knowledge, since, along the way, new and innovative mathematical ideas will be introduced and challening questions will be addressed, providing a great potential impact on the mathematical community.							
	National Interest Test Statement							
	This project expands our knowledge of bushfire propagation, which is of paramount importance for Australia, from an economic, environmental, biological, and social point of view. The use of advanced mathematical methods will allow us to understand the generation and spread of fires and their impact on biological groups. Presently, there is a fundamental need to deepen our understanding of bushfires and to provide models which are, on the one hand, simple enough to allow for a rigorous and quantitative analysis and the coding of software that can be used in real-time in case of an emergency, and, on the other hand, profound enough to capture the essential features of the complicated structures involved in a bushfire. This project aims at closing this gap, leveraging the experience and creativity of two groups of researchers engaging on a new collaboration to share their complementary sets of skills to tackle the severe difficulties presented by this arduous task of paramount importance. Along the way, the project will also produce significant progress in terms of mathematical knowledge, thanks to the innovative approach and brand-new ideas that will have a significant impact on the mathematical community.							
DP250101740	**A Unified Computational Model of How Humans Use Automated Advice**	74,060.00	202,505.50	255,118.00	259,593.50	132,921.00	0.00	924,198.00
Loft, Prof Shayne D	In modern critical workplaces (e.g., defence, cyber-security, aviation, manufacturing, health care, mining, oil/gas) humans are increasingly required to work with automated advice to make decisions. The project aims to produce a unified computational model that provides lawful explanations and quantitative predictions for how humans use automated advice, including in task contexts with increased risk of automation-use error. Project outcomes are expected to guide the design and evaluation of automated systems and inform work design and training. The project will provide training for early-career researchers and students, expanding Australia's capability at the increasingly critical intersection of Human Factors and Mathematical Psychology.							
	National Interest Test Statement							
	As modern workplaces become more cognitively complex (e.g., defence, cyber-security, aviation, manufacturing, healthcare, process control), Australia's economic productivity and public safety increasingly depends upon humans working alongside automated technologies. However, adopting automation in work systems without understanding its effects on human decision-making poses risks, particularly in safety-critical workplaces. This project will develop a unified computational model that provides lawful explanations and quantitative predictions regarding the psychological processes by which humans use automated advice. This unified model can then be used to inform the design and evaluation of current and future automated decision aids. It can also inform how human operators in modern-work task contexts are trained to work with decision aids. By advancing our understanding of the psychological processes underlying how humans use automated advice, the project outcomes can deliver a competitive advantage to critical modern work sectors, and further Australia's reputation for cutting-edge research that extends basic science to applied work domains. This project will also provide first-class training for early career researchers, expanding Australia's future research capability in applying mathematical psychology to addressing a range of human factors challenges in the modern workplace.							
DP250102383	**Rotation sensors for 6-component seismology**	123,250.50	246,438.00	238,808.50	138,601.00	22,980.00	0.00	770,078.00
Ju, Prof Li	This project aims to fill a major gap in seismology by creating and characterising the first high-sensitivity field-deployable six-component seismometer that can replace large expensive arrays of conventional seismometers. Made possible by							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	the spectacular properties of newly invented amorphous zirconium alloys combined with quantum limited optical rotation sensors, the new seismometer will allow directional seismic imaging in places where arrays are not feasible or too expensive, such as the sea-floor and volcanos, and for monitoring fault movements, intruders and military activity. It will generate valuable intellectual property as well as training students in areas of ultrasensitive instrumentation and six-component seismology. **National Interest Test Statement** Seismology is a critical technology for discovering minerals as well as environmental monitoring, transport monitoring, planetary studies, security monitoring and explosion detection. Conventional seismometers can only measure 3 of the 6 components of seismic waves, which means that they cannot determine the wave directions and determine where the signals are coming from. This limitation is normally overcome by using tens to hundreds of seismometers in a huge array. If the three missing components are measured, a single seismic station can “see” where seismic waves are coming from using simple algorithms that convert the data into source maps. The concept has been proven, but there are no PORTABLE rotation sensors with sufficient sensitivity to measure the missing components. This project will fill this gap, creating instruments that include high-sensitivity rotation sensors that will allow a single instrument station to replace the huge arrays of seismometers currently used. The instrument itself will be of significant commercial value, while its applications in Australia are enormous. Introducing rotational seismology will disrupt conventional seismology by providing a dramatic new tool that will improve all aspects of seismology and make it much easier to apply, thereby benefiting all the current seismic applications and opening up new ones. It will pave the way for a harvest of new knowledge in all branches of seismology.							
DP250103047 Bond, Prof Charles S	**Molecular "safety catches" for controlled modification of RNA** Synthetic biology is yielding novel tools that allow the modification of RNA in cells, to alter traits in agricultural, environmental and medically-relevant backgrounds. However, poorly-controlled modification of RNA is dangerous: off-target modifications can be fatal. We will uncover how pentatricopeptide repeat sequence-specific RNA editing and nuclease proteins are able to structurally couple binding to the correct RNA sequence with enzyme activity. These mechanisms prevent off-target effects. We will then design and test protein fusions with other editing and nuclease proteins, and will build regulated, safe-to-use, versions of these proteins, testing their activity both in vitro and in planta, ready for use in agrobiotech. **National Interest Test Statement** The ability to alter the genetic information within a living cell is major step towards solving many of the challenges facing biologists, such as improving food production from crops or treating human genetic diseases. One form of this genetic information is ribonucleic acid (RNA), an essential intermediate between the heritable instructions in the genome and the proteins that carry out the functions needed in every living cell. Cells have molecular systems which can modify the RNA instructions, and we seek to develop ways to control such modifications using biotechnology. A key issue is how cells ensure that modifications happen only in the correct message. This project aims to understand how cells use ensure only the correct information is altered, and to adapt that knowledge to develop further biotechnological tools that controlling gene expression. This can be used, for example, in the production of hybrid crops or in the production of high-value products such as drugs or vaccines. RNA editing is also a potential treatment for genetic diseases such as cystic fibrosis. These technical advances will be based on highly original discoveries in the basic science of RNA processing that will reinforce Australia's pre-eminent reputation in this area of research.	125,000.00	252,943.50	252,943.50	125,000.00	0.00	0.00	755,887.00
DP250103324 Cumming, Prof Graeme S	**Understanding social-ecological feedbacks in protected area resilience** The project aims to describe, quantify and understand feedbacks between societies and ecosystems, both in and adjacent to protected areas. Using the Coupled Infrastructure Systems Framework to describe and quantify system structure, it will collect empirical data from 40 protected areas and progress from statistical analysis to empirical simulation models of feedbacks. Models of feedbacks will be used to clarify influences on protected area resilience. The project will improve understanding of how to efficiently monitor social-ecological dynamics and enhance protected area resilience to climate change and other shocks. Insights resulting from the analysis will support protected area governance and management in Australia and South Africa.	64,653.00	140,013.00	166,035.50	168,451.50	110,382.00	32,606.00	682,141.00

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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	National Interest Test Statement The project asks how protected areas operate and how feedbacks between people and nature influence conservation success and sustainability. It will collect data about people, ecosystems, infrastructure, and governance across >20 protected areas in Western Australia. This information will be used to develop generic social-ecological models of protected area management, based on a well-developed theoretical framework. The analysis and modelling will address important gaps in our knowledge of how feedbacks between people and protected areas arise, are managed, and can influence the sustainability of conservation efforts. It will also guide decisions about what should be monitored to understand and respond to change in protected areas. The research will benefit Australians by providing a deeper understanding of the social and economic issues that influence biodiversity conservation, and by mobilising this knowledge for improved management and resilience of protected areas (that in turn provide numerous benefits to Australians). Our four-pronged communication plan promotes knowledge sharing with academics, practitioners and implementers, policy makers, and the general public respectively through targeted communications. The engagement of managers and traditional owners throughout the process will facilitate learning and knowledge transfer direct to the most relevant groups and stakeholders. We will also prepare policy briefs and focused summaries for high-level policy makers.							
DP250103594 Dyskin, Prof Arcady V	**Controllable spallation** This project aims to develop theoretical foundations of controllable spallation in rocks as an alternative to the conventional drilling and data-driven AI monitoring methods. Conventional rock drilling is expensive and not environmentally friendly. Thermal spallation drilling is a viable alternative to the conventional drilling which mitigates its shortcomings. The absence of the theory which gives optimal controlling parameters – flame temperature and direction, area of heat application and hot gas pressure – restricts the use of the technology in the industry. Thermal spallation drilling will bring considerable economic and environmental benefits to this country and thus contributing to the advancement of Australian industry.	98,787.50	205,625.00	203,667.00	96,829.50	0.00	0.00	604,909.00
	National Interest Test Statement Thermal spallation drilling of wellbores for resource and energy extraction is cheaper, more flexible and environmentally friendly than the conventional mechanical drilling. For instance, it reduces the CO2 emission associated with the drill bit manufacturing. The project will address the gap in the methods of control of thermal spallation drilling associated with the lack of understanding of the mechanics of the spallation drilling. This gap prevents the industrial use of the technology. The project will develop mechanical foundations and monitoring methods of controllable spallation in rocks as an alternative to the conventional drilling. Artificial intelligence (AI) will be trained for optimising the thermal spallation parameters and ensure the maximum drilling speed under the existing geomechanics conditions. Given the size of the industry and the market growth, the economic benefit for Australia is estimated $66-$88M for oil and mineral exploration alone. We plan to create a demonstration prototype controlled by artificial intelligence. The prototype will be used for promotion of the thermal spallation drilling method to end-users, general public and school leavers. The prototype will also be used for teaching in Mechanical Engineering, Mining Engineering and Petroleum.							
DP250103954 Yeo, Prof Gillian B	**Can sharing the "mental load" close the leadership gender gap?** The mental load is the thinking work required to achieve goals for others. At home (thinking for family), it is disproportionately shouldered by women. At work (thinking for colleagues), our data show the same pattern. In parallel, women are underrepresented in leadership positions, with little sign of closing this gap. We connect these problems, suggesting the mental load stunts the emergence of female leaders, especially if they take on high load at home and work, or if the load is unfairly shared with their male partner/colleagues. We test predictions in field studies (eg leader development programs). Results will inform policies aimed at ensuring gender equity in the mental load with implications for closing the leadership gender gap.	79,667.50	166,940.00	178,115.00	90,842.50	0.00	0.00	515,565.00
	National Interest Test Statement This project connects two problems—the “mental load” and leadership gender gaps—to offer scientifically-informed solutions to closing this gap via equitable distribution of the mental load at home and work. The mental load is thinking work required to achieve goals for others (at home or work) and is usually shouldered by women. It is topical in the press, with belief that it stunts women’s careers. But research is inconclusive—we do not know when or why the mental load helps vs hinders leadership progression. Gender equality is an Australian strategic priority and a United Nations Sustainable Development Goal. But reports show that these goals are not being met. Gender Equity Insights (WGEA, 2023) and Women in the Workplace (McKinsey & Company, 2023) reports highlight the underrepresentation of women in management and its detrimental impact on the leadership pipeline and business performance. Currently considered factors that contribute to leadership gender gaps are not sufficient to explain or address it. The mental load, as the thinking work in relation to communal goals done mostly by women, has direct relevance to leadership gender gaps. Connecting these problems therefore promises not just to advance knowledge of the mental load and leadership gender gaps; but our field-interventions and stakeholder engagement promise scientifically-informed policy change and interventions aimed at increasing gender equity in the mental load and closing the leadership gender gap.							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250104145	**Understanding the Future of the Great Southern Reef**	100,798.00	200,196.00	193,296.00	93,898.00	0.00	0.00	588,188.00
Wernberg, Prof Thomas	I will integrate long-term ecological field data, field experiments and comparative analyses of ecosystem functions of projected replacement habitats, to uncover the resilience, mechanisms of change and consequences of climate-driven transformation of kelp forests on the Great Southern Reef (GSR). This will generate new knowledge critical to understanding future trajectories for the GSR, and their implications for ecosystem services to Australia. This project will help secure the legacy of the GSR, a global biodiversity hotspot and sentinel of climate-driven change for the world's kelp forests, one of the largest, most unique and valuable, but consistently overlooked, ecosystems in Australia.							
	National Interest Test Statement							
	This project will expose new information on how the Great Southern Reef (GSR) has changed in structure and function over the past two decades. Focused on kelp forests, climate change and marine heatwaves, the research aims to reveal community-level shifts in this biodiversity hotspot in response to our changing oceans. The project will use ecological surveys, experiments, and models to better understand future trajectories of the GSR, including identifying areas displaying resistance to climate and human-driven impacts, and the quantifying the consequences of transformations to replacement habitats on the functioning of this valuable temperate ecosystem. The project will build capacity by training new marine biologists and by consolidating extensive, long-term data sets covering over 1000 kilometers, a vital baseline and resource for future research. The new understanding generated by the project will open opportunities for conservation and sustainable management, not only for the GSR but for kelp forests more broadly. The project's significance is underscored by the GSRs economical, ecological and cultural importance: it contributes >$10 billion/yr to the economy, >70% of its species are found nowhere else on Earth, and it connects over 50 indigenous nations. To this end, the project will help secure an overlooked, yet invaluable temperate marine ecosystem in Australia.							
DP250104147	**Life on the rocks: rapid adaptation in the wild**	122,185.50	246,653.50	193,744.50	69,276.50	0.00	0.00	631,860.00
LeBas, Dr Natasha R	This project aims to determine the genomic parameters that facilitate rapid adaptation in the wild. Wild populations are becoming smaller and more isolated, compromising their capacity to adapt to a changing environment. This project combines advanced genomic analysis with nearly three decades of field data on a species whose habitat drastically changes colour where land clearing occurs. Intricately camouflaged lizards become conspicuous, yet numerous independent populations appear to show adaptative colour change. The project expects to provide advancement by utilizing powerful population-level replication to determine the genomic parameters that underpin rapid adaptation, significantly benefiting the management of vulnerable biodiversity.							
	National Interest Test Statement							
	The environment is changing rapidly, and wild populations are often no longer suited to their surroundings. The best chance of survival for these populations is to adapt to their new environment. Unfortunately, there are very few natural systems with the population replication needed to inform us on what helps this process. Here we use a wild lizard that has hundreds of discrete populations to identify the key factors in the wild that help species adapt to a changing environment. The lizards live on granite outcrops that have persisted through land clearing, but now have a drastically altered surface colour. We have observed population declines and extinction, but also numerous populations where lizards have seemingly changed colour to match this new environment. By determining the genetic and environmental factors that facilitated this rapid change and promote population persistence, we can advise conservation managers on the parameters best prioritised in their management of vulnerable populations. In so doing we will help realise the federal government's 10-year plan for a zero extinctions target for Australian species and to support species resilience. Potential benefits will be translated outside of academia via communications with stakeholders in conservation agencies, government and natural resource management. The proposed research will also continue to build a long-term field model system of value to Australian science over-and-above the immediate benefits outlined.							
DP250104212	**Income Inequality, Asset Returns, and the Capital Share in Australia**	19,870.00	44,414.00	52,005.50	55,785.00	54,447.00	26,123.50	252,645.00
Madsen, Prof Jakob B	We aim to show that income inequality measured by income shares is currently mis-measured due to omission of several important sources of capital income, such as depreciation allowances, imputed rent, and capital gains. To address this, the project aims to develop an analytical framework equipped to construct corrected measures of income shares that include the omitted capital income and cover a much longer period than previous inequality measures for Australia, the							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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		2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)
	US, UK, Germany, and Scandinavia. We expect that inequality has followed a trajectory that is quite different from conventional measures of the functional income distribution. This has implications for several strands of macroeconomic analysis and economic policy. **National Interest Test Statement** The income distribution between capital and labour plays an important role in the assessment of inequality and macroeconomic analysis. Although routinely used, the income shares estimated by standard national accounts are often misleading measures of inequality because they omit depreciation allowances, capital gains on fixed capital, and capital income/loss on domestic government debt. Furthermore, implicit rental income on housing is markedly underestimated because capital gains on real estate is omitted and, therefore, theory inconsistent. The project has several implications for policy: 1) The generated productivity data will show whether wages have been growing too fast or too slow; 2) the inflationary impact of income shares can be assessed; 3) the productivity advances in Australia can be better accessed than with previous data; and 4) a much improved measure of income inequality will give insight into the evolution of income shares.							
DP250104554 Modecki, Prof Kathryn L	**Cracking the Code: Parent Influences on Adolescent Daily Coping with Stress** This project aims to answer vital questions scientists and parents face as adolescents turn to a modern digital toolbox to cope with growing challenges. By advancing a novel theory-based framework, the project expects to generate new knowledge for parents, helping teens to make the most of opportunities and reduce risk. The project combines a nationwide survey of parents with high-resolution insights into parent and teen daily life via novel data collected from smartphones. Expected outcomes include advancement of a new theory of parenting to support teens and refined methods for addressing parent and teen daily experiences. This should provide significant benefits to building health and wellbeing of Australian adolescents and caregivers. **National Interest Test Statement** Over 1/3 of Australian adolescents feel that they cannot cope effectively with their stress. At the same time, teens are increasingly turning to digital tools, platforms, and social media in an attempt to cope with their stressors (for example, going online to connect with supports or find information to better respond to a stressor); yet parents report feeling ill-equipped to support them in this endeavour. Despite the magnitude of these issues, research is yet to identity how parents can best support their adolescent's coping success and safety in this digital arena. This project addresses a critical gap in science and policy and will directly benefit Australian teenagers and their families by (a) identifying the optimal digital strategies adolescents can use in the face of stress, as well as (b) the modifiable behaviours that parents can adopt to support their teen's healthy digital coping to enhance teen's wellbeing and buffer them from mental health problems. These strategies will be communicated through community feedback sessions, media, and incorporated into existing and new parenting interventions and supports. Findings will have direct relevance to informing national policy discussions around adolescents' use of digital platforms including on reducing harms (i.e. social media bans for teens) and mental health policy aiming to reduce burden of mental health in Australia.	73,493.00	148,138.00	126,872.50	52,227.50	0.00	0.00	400,731.00
DP250104611 Davies, Dr Luke J	**Looks aren't everything - the coevolution of galaxy structure & environment** Galaxies have immense diversity in their visual appearance. Interestingly, their looks are strongly correlated with where they live - galaxies in over-dense environments appear very different to those in isolated regions. This suggests that a galaxy's local environment impacts its appearance. Hidden in these looks is a wealth of information about how the galaxy formed and evolved - with different visual structures having different evolutionary paths. Extracting this information is problematic and requires high resolution (space-telescope) imaging, sophisticated software and robust environmental measurements. In this project we will use state-of-the-art data and software to determine how galaxy environments shape their visual appearance. **National Interest Test Statement** This project leverages state-of-the-art datasets and facilities in Australia, overseas and in space combined to study the process that shape galaxies - one of the most pressing questions in galaxy evolution science. Australia has	86,237.50	174,425.00	176,375.00	88,187.50	0.00	0.00	525,225.00

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	invested a huge amount of resources and time into the realisation of the data that will be used in this project, e.g. GAMA and DEVILS were undertaken on the Anglo-Australian Telescope (AAT - where a consortium of 13 Universities committed over $20M), WAVES will be undertaken on the 4m Multi-Object Spectrograph Telescope (where Australia has invested ~$3M), space-telescope-data from Euclid, Hubble Space Telescope (HST) and James Webb Space Telescope (JWST) represents billions of dollars of investment world-wide, and the software and techniques used here were developed as the result of both CI-s successful ARC-funded Future Fellowships. This project will strongly maximise return on these investments. It will create unique science that will raise the international profile of Australian astronomy, and attract and train young scientists in modern astronomy surveys and analysis. This will lead to highly desirable and transferable skills, which will benefit the Australian economy. The science topics are ideal for captivating the Australian public in STEM, in which the lead-CI has a strong history.							
DP250104711 Mitrou, A/Prof Francis G	**How Australian fathers shape the trajectory of their children's wellbeing** This project aims to examine how father involvement, and the factors that shape it, influence the long-term wellbeing trajectories of Australian children across developmental stages. By leveraging Australia's highly regarded longitudinal survey assets, we address a current lack of national and contemporary knowledge about the patterns, moderators, and longitudinal impact of father involvement across life. The research will advance Australia's position toward promoting equitable parenting, while the new knowledge from this project could inform the development of innovative and targeted policies or interventions optimising father involvement and promoting improved developmental outcomes for Australian children.	162,932.50	331,853.00	343,089.50	339,516.00	165,347.00	0.00	1,342,738.00
	National Interest Test Statement The importance of caregiving on children's outcomes are generally well understood by Australian governments, service organisations, and communities. However, Australia lacks the evidence about the impact of fathers and male caregivers on children's long-term development outcomes. This project will (1) describe the impact that male caregivers have on the growth and development of their children's wellbeing across time and how this may predict wellbeing in later life, (2) identify the differing patterns of male caregiver involvement with their children across time and how this may predict wellbeing in later life, (3) identify the practical constraints and limitations within the family home and workplace that impact on how male caregivers contribute to their children's mental health and wellbeing, and (4) utilise these findings to produce policy and service recommendations needed by governments, services, communities, and families. This project will deliver evidence to support Australian child and family policies (e.g., National Children's Mental Health and Wellbeing Strategy) around the engagement of fathers and male caregivers in their children's lives, thereby maximising benefits to children's long-term wellbeing and developmental outcomes. This work will be guided by the input of community partners and build the nation's capacity for ongoing research excellence through supporting early and mid-career researchers.							
DP250104787 Sun, Prof Hongqi	**Photothermal catalysis-based chemical manufacture for space exploration** This project aims to address future chemical manufacture in space exploration and settlement by conceptualising solar refinery panels to conduct novel catalysis. It expects to generate new knowledge in the area of future-oriented, space and/or Mars chemistry and engineering using interdisciplinary approaches. Expected outcomes of this project include theory development for photothermal catalysis and design strategies for building solar-driven, zero-emission, green chemical manufacture bases in space or on Mars. This should provide significant benefits such as intellectual properties of space chemical manufacture and infrastructure, as well as new theories and disciplines for the interstellar future of Australia and whole human beings.	106,137.00	287,050.50	291,656.50	210,469.00	236,931.00	137,205.00	1,269,449.00
	National Interest Test Statement This pioneering project seeks to utilise solar energy for the transformation of greenhouse gases, such as carbon dioxide and methane, into fuels and fine chemicals through cutting-edge catalytic processes. The novel process of photothermal catalysis efficiently leverages both the photon energy and heating effect of solar radiation. The reactor design and three crucial chemical reactions, i.e., dry reforming of methane, syngas to methanol, and methanol to olefins, will be optimised to accommodate space operation and Mars settlement. The project will tackle several research gaps, including a solar-driven flow reactor, high-performance photothermal catalyst materials, scalable photothermal catalytic conversion, and the development of strategies for space and Mars applications. The reactor and catalysts developed in this project have the potential to become commercial products, generating economic benefits. The short-term goal of the project is to contribute to decarbonisation efforts, resulting in environmental benefits. This project will be promoted for mid- and long-term objectives that provide insights into the future of human settlement in space and on Mars, offering a sense of security and potential social and cultural benefits for humanity. The research outcomes will be used to engage with industries and government to inform and align with space exploration and settlement strategies. This project may usher in an era of preparing chemical manufacturing for space and Mars.							
	A NEW PHASE OF OFFSHORE RENEWABLE ENERGY HYDRODYNAMICS							

Minister's Approval for Discovery Projects for Funding Commencing in 2025 Schedule

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DP250104899 Wolgamot, Dr Hugh A	Vast oceanic resources of wave and wind energy (mostly in deep water) will power the global energy transition, with Australia particularly blessed. Floating offshore wind turbines and wave energy converters are new classes of structures whose performance and motion in waves depend on how they are controlled. Such complexity drives cost. This project will develop a new approach for explicit quantification and isolation of critical hydrodynamic loads and responses. The clarity of hydrodynamic understanding delivered using this method will enable simpler approaches to optimal design and control of floating offshore renewable energy structures. Such optimisation will deliver lowered costs for industry, unlocking investment and jobs. **National Interest Test Statement** Wave energy converters (WECs) and floating offshore wind turbines (FOWTs) are structures which float in the ocean while converting waves and winds into electricity. The way they oscillate in response to wave loads depends on the mechanical and electrical settings given by their operators, and can therefore change from day to day. In this respect, they are very different to traditional floating platforms, which behave in the same manner across time. Understanding the nature of the wave loading on WECs and FOWTs is essential to bring down their cost, and thus increase the speed of the transition to net zero. In this project, we will develop a new method to better understand wave loads on these structures. This method will involve testing WECs and FOWTs in the lab across a carefully chosen range of settings, with waves made by a wave paddle and motions imposed by an actuator. By systematically combining the results from a range of tests we can break the loading down into more easily understood pieces to enable cheaper design and more efficient operation. Because Australia has the best wave energy resource in the world, and one of the best for offshore wind, we stand to benefit significantly from development of these new industries. In addition, our region is hungry for new offshore solutions that Australian ingenuity can provide. Our methods can be widely adopted by offshore engineering industries and the team conducting this research has many links to this industry.	96,037.00	216,863.00	223,222.00	102,396.00	0.00	0.00	638,518.00
	The University of Western Australia	1,521,472.50	3,264,215.00	3,328,286.00	2,112,617.00	723,008.00	195,934.50	11,145,533.00
	Western Australia	2,229,041.00	4,604,156.50	4,609,220.00	2,866,709.00	874,223.00	241,618.50	15,424,968.00
		52,394,300.00	**109,690,381.50**	**111,277,176.50**	**60,740,668.50**	**7,412,768.00**	**653,194.50**	**342,168,489.00**