Research that secures the future:
providing life-changing solutions to complex world challenges.
Research and Innovation at Murdoch

We acknowledge the Whadjuk people of the Noongar nation as the traditional custodians of this country and its waters and that Murdoch University stands on Noongar country.

We pay our respects to Noongar elders past and present, and acknowledge their wisdom and advice in our teaching and cultural knowledge activities.
Western Australia shares a time zone with 30% of the global population, boasts unique and internationally recognised biodiversity and is home to the world’s oldest civilization. It enjoys magnificent weather, pristine beaches and close ties to the increasingly influential Asian economies.

It’s an incredible place to live, work and study.

Murdoch University’s main campus was opened in Perth, the capital of Western Australia, in 1975. Boasting a vast expanse of natural bushland teeming with unique wildlife, the 2.27 square kilometre campus is Australia’s largest and fosters a deep connection with nature, while maintaining world-class facilities.

Murdoch University has also established Australian campuses in Mandurah and Rockingham, and offshore campuses in Singapore, Dubai and Myanmar, all focused on equipping graduates with both high scholarly and “real world” experience.

One hundred percent of our science disciplines including mathematical sciences, physical sciences, environmental sciences, biological sciences, agricultural and veterinary sciences, medical and health sciences, engineering and psychology, and technology research all rated above world standard in Australia’s national research evaluation framework (ERA) 2018.
This represents a significant improvement over 2015 assessment. In the past six years, Murdoch has almost doubled its research outputs and in the last four years doubled its research income from all sources.

With more than 25,000 students and 1,700 staff from over 100 different countries, we are proud of the impact that our graduates, life-changing research, and innovative campuses and industry developments have made—both in Western Australia and around the world.

From its beginning, Murdoch was created as an alternative to sandstone universities. Since that time, we have fostered a reputation as a translational university that works with local and international communities and cherishes equity of opportunity, diversity and inclusiveness.

Our more than 80,000 graduates, distributed around the world, have influenced free thinking on a global scale. We have been and continue to be a creative force for current and future generations. The pursuit of excellence is never ending.

We continue to invest in state-of-the-art facilities for both teaching and research. Recent examples of this include the Australian National Phenome Centre and a new Student Hub. Murdoch is committed to the delivery of a new academic building set to become one of the largest mass engineered timber buildings constructed in Western Australia and a state-of-the-art environmental education and research centre.

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Research with real world impact

Murdoch University is a member of the Innovative Research Universities group of Australia, a network of comprehensive universities conducting research of national and international standing. Vice-Chancellor of Murdoch University Professor Eeva Leinonen is Chair of the group.

How do we feed and keep healthy a growing human population without sacrificing the environment, animal health, economic progress and development?

This fundamental question is driving Murdoch’s world-renowned scientists to seek answers through outstanding translational research that supports improvements in industry practices.

Built around three major research institutes - Food Futures, the Harry Butler Institute for Sustainable Development, and Health Futures – all components of Murdoch’s research portfolio focus on delivering practical “real world” solutions for seemingly intractable challenges.

Indeed, translating research into tangible outcomes is one of Murdoch’s great strengths. Our corporate, industry and government research partnerships make a crucial contribution to the University research story and the strength of these collaborations is reflected in the doubling of research income in the past four years alone.

The quality of Murdoch’s scientific research is also independently assessed as world-leading. In the most recent Australian Research Council Excellence in Research Australia (ERA) Evaluations, for example, our performance in physical chemistry, environmental science and management, zoology, agricultural biotechnology, clinical sciences and microbiology achieved the highest possible ratings.

In 2019, the University opened the Australian National Phenome Centre – Australia’s first and the world’s most advanced centre
for the study of human health in the total environment. Such is the
breadth of the centre’s capabilities, it is serving as an important
new platform for research across all three Murdoch Research
Institutes focussing on health, food and the environment.

We have also put in place new foundations to supercharge
creative thinking and problem solving, with a two-college
model embedded across the University’s teaching and learning
programs. Both are intimately linked into the research institutes
and designed to foster cross-disciplinary collaboration.

While it is science that will unlock the answers to some of our
greatest challenges in maintaining good health, supported
by nutritious and safe food produced in a clean environment,
its conception and translation is facilitated by the policies,
behavioural strategies, and rigorous debate gifted to us by the
arts, humanities and social sciences.

I invite you to read more about Murdoch’s research with “real
world” impact in the pages ahead.

Professor Eeva Leinonen
VICE CHANCELLOR,
MURDOCH UNIVERSITY
Murdoch University is well placed to build upon its strength as a world-class research institution.

Our researchers regularly engage with significant social and scientific challenges, adding to the existing body of knowledge across a range of disciplines. A number of projects have also been applied practically for the benefit of both the local and global community.

Indeed, translating research into tangible outcomes is one of Murdoch’s great strengths. Our research teams have impact and, in some cases, add significant economic value.

Our agriculture researchers are collectively worth over $2 billion annually to the Australian economy. Others have discovered new drugs that have been approved in treatments for crippling diseases globally. While others have changed clinical practice on a global scale and are estimated to have saved 10 million lives in the past decade.

Corporate, industry and government research partnerships make a crucial contribution to our research story and these collaborations are growing in strength through joint centre agreements and joint appointments with international universities and multinational corporations. New Cooperative Research Centres (CRCs) in battery technologies and industries as well as future food systems are but two examples.

Our research effort continues to focus on key areas that reflect national and international priorities—with Institutes established to focus on food, health and the environment—ensuring we play a part as global citizens.

As part of Murdoch’s strategic vision for the future, we are looking to embed research further into the culture of all parts of the University and embed the important contribution of arts humanities and social sciences into our major research foci. They have been and will continue to be more important in the process of translating new knowledge into practice.

Research skills are an important part of the curriculum; they future proof our students’ qualifications, while our staff development and recruitment practices enable us to continually build a research workforce that is globally relevant. In short, we deliver research-led teaching and evidence-based practice right across the campus in ways that secures the future for our next generations.

Whether you are a student, academic or potential collaborator, you will find opportunities to achieve research excellence at Murdoch University.

Professor David Morrison
DEPUTY VICE CHANCELLOR, RESEARCH AND INNOVATION
As the global population grows towards 10 billion over the next 30 years, we are undertaking world-leading translational research to provide innovative approaches and solutions to some of the world’s greatest challenges.

We have established three interdisciplinary research institutes aligned with each of our major research strengths around food, health and the environment. Acknowledging that we can’t live healthy lives without safe and nutritious food, and we can’t have food without a sustainable environment, has shaped this collaborative research ecosystem.

To ensure we have real impact in addressing these challenges, we recognise that our research needs to be undertaken with purpose, integrity and effective planning and management.

The Research and Innovation Office at Murdoch oversees this, in addition to supporting the University’s researchers through Researcher Development and Leadership Programs, fostering research partnerships and through the sourcing and application for research funding.

The Research and Innovation Office is the front door to research at Murdoch University and opens a wealth of collaborative research opportunities. Through our Research Engagement and International Partnerships teams, we work with key corporate, academic, government and community partners to enhance our collective research endeavours and extend the reach and impact of our research findings.

The Murdoch University Mandala captures our major research themes in this mission—food, health and the environment—and we welcome partners to join us in addressing the challenges the world faces in each. We want to work with you.

We can do more together.

Professor Lucy Johnston
PRO VICE CHANCELLOR, RESEARCH AND INNOVATION
Food Futures Institute

Securing and sustaining the food bowls of the future.
Food security is one of the primary challenges of our generation. As one of the most agriculturally-focused universities in Australia, scientists and policy experts at the Food Futures Institute are working to improve the accessibility and availability of sufficient, safe sustainably-produced and nutritious food.

The Institute leads research on the sustainable use of the world’s limited land and water resources to produce food, addressing challenges across the full value chain of primary food production. Researchers are focused on improving the quality and yield of agricultural products by applying innovative science with sound ecological principles, which are economically viable, humane and meet the highest ethical standards.

The Institute’s grain and horticultural programs are supported by Murdoch’s recognised excellence in agricultural biotechnology and in livestock by the only College of Veterinary Medicine in Western Australia.

**Professor Peter Davies**
PRO VICE CHANCELLOR, FOOD FUTURES INSTITUTE

The Food Futures Institute is led by Professor Peter Davies, a renowned agricultural scientist with extensive experience in the management and rehabilitation of water ways.

Professor Davies has published widely in this area, including highly-cited papers in Nature, and developed partnerships and high-performance multidisciplinary research teams to address pressing global challenges in food, water and energy.

Professor Davies was recently the Program Director for Responding to Climate Change in the Worldwide Universities Network and has a strong commitment to research translation, research impact, better industry engagement and training the next generation of researchers.
Centre for Sustainable Farming Systems

With climate variability and population both increasing, research into sustainable farming systems is developing innovative ways to optimise agricultural production, whilst minimising impact on the environment.

Research successes range from better legumes and improved use of infertile lands, and increased production of organic nitrogen, all contributing to more effective long-term agricultural practices.

The development of sustainable farming systems also includes the emerging field of big data, which brings together mathematics, statistics and digital technologies to provide real world analysis and practical management solutions for producers.

John Howieson
DIRECTOR, CENTRE FOR SUSTAINABLE FARMING SYSTEMS

Professor Howieson is an internationally recognised expert in sustainable agriculture, specialising in the nitrogen fixation of legume crops and pastures. His research includes selecting and developing root nodule bacteria as commercial inoculants for agricultural legumes and selecting annual and perennial legumes for sustainable agriculture.
Centre for Crop and Food Innovation

Advancing the capacity and sustainably of Australia’s cropping industries is essential to keeping farmers competitive in the world marketplace and consumers fed.

The Centre for Crop and Food Innovation undertakes research on major broadacre and horticultural crops to improve yield, quality, and enhance tolerance and protection from biological and environmental stresses. This effort is complemented by work on innovative production systems and food security.

The Centre’s emphasis is on translating research outputs to growers, industry and end-users across the food supply chain, to the benefit of both the agricultural industry and consumers.

Michael Jones
DIRECTOR, CENTRE FOR CROP AND FOOD INNOVATION

Professor Jones’ expertise is in the application of biotechnology and New Breeding Technologies to crop improvement (grains, horticultural crops) and its translation to practice. This includes both improving crop production by controlling pests and diseases, and benefits of produce to consumers, leading to reduced Type 2 diabetes, gut health, and reducing acrylamide on frying.

Centre for Animal Production and Health

Animal production and health researchers work across the value chain to support the production of meat, milk and fibre for human consumption and use.

Research spans livestock health, welfare, nutrition, reproduction efficiency and growth, with an emphasis on meat science, consumer sensory analysis and carcase imaging technologies.

The research team in place is also at the cutting edge of certification programs with expertise that covers the main production animals—beef and dairy cattle, sheep for meat and wool, pigs, goats and chickens.

David Pethick
DIRECTOR, CENTRE FOR ANIMAL PRODUCTION AND HEALTH

Professor Pethick is one of the founders of animal production research at Murdoch, having developed a whole of value chain approach to animal production. Professor Pethick’s research focus is better understanding how everything from on-farm breeding and husbandry to meat processing and cooking could add value to farm-gate profitability.
Australian abattoirs are adopting new technology that accurately measures carcase lean meat yield. Developed at Murdoch by Associate Professor Graham Gardner in consultation with industry, the DEXA (Dual energy x-ray absorptiometry) system is being hailed as a game changer for the meat industry. The DEXA system can determine how much bone, muscle and fat is in a sheep carcase, allowing processors to measure the amount of saleable meat in a carcase and therefore its value in the market.

Carcasses with greater amounts of saleable meat are more valuable while overfat carcases cost farmers in wasted nutrition and are more labour-intensive for abattoirs to process. The shift to value-based pricing of sheep carcases is estimated to return a gross value of up to $420 million annually to the industry by 2035.

The DEXA system also provides farmers with analytics to gain a deeper understanding of which diet and genetic selection will yield the highest quality meat from their livestock. Associate Professor Gardner’s role in developing the DEXA system won an Award for Excellence in Innovation from the Cooperative Research Centres Association.

“As the system is fully rolled out, Australia will set new standards that the international industry will follow.”
Major breakthroughs in grain genetics

The contribution of Murdoch Professor Chengdao Li to the advancement of grain genetics in Australia has been recognised with the 2019 Australian Farmer of the Year Award for Excellence in Agricultural Research. Professor Li, Director of the Western Barley Genetics Alliance, has – along with his team – developed several new and highly profitable barley varieties, much of which is sold into the Asian beer market. His development of acid soil tolerant barley lines is estimated to add $30 million per annum to the WA economy alone. He also led a WA-based group that contributed to the mapping of the barley genome – a major breakthrough in the development of better-quality beer and drought-resistant crops.

Recently, Professor Li’s research has expanded from barley to oat, lupin and pasture crops. He is a national leader of pan-genome research for various crops and his research interests include grain productivity and sustainability, phenology and environmental adaptation, grain and malting quality, healthy food, heat, drought and hostile soil tolerance.

Professor Li’s team is at the frontier of developing genetic solutions for food security under changing climate conditions by integrating genomic breeding, genome editing, artificial intelligence, machine learning and molecular genetics.

Transforming Christmas Island

The economy of Christmas Island and livelihood of its multicultural inhabitants has been sustained by phosphate mining for over 100 years. But what happens to this place of mineral wealth and natural wonder when the resource runs out?

Murdoch researchers, led by Professor John Howieson, have been working with Christmas Island Phosphates and the Commonwealth Government to turn ex-mine sites among the 1200 hectares of cleared land into new food production, research and education opportunities.

To make the mined earth productive again, the team bred a new cultivar of lablab bean that not only fed the local population but made the soil fertile with enough nutrients to grow millet and sorghum. These crops allowed the production of flour, beer and gin, followed by growth of other high value crops such as coffee and yam beans.

The research has delivered a productive and sustainable island that now presents an opportunity for students to research and invent other food production methods and technologies.

Realising the power of food

Professor Catherine Itsiopoulos, the Australian daughter of Greek migrants, has spent her career examining whether the Mediterranean diet can prevent or treat a range of diseases, including fatty liver disease, Type 2 diabetes, heart disease, depression, mood disorders and dementia.

From early research focused on Greek migrants in Melbourne, where food was an important element of culture, Professor Itsiopoulos developed an intervention model using diet to prevent or treat a range of health problems. Her research is underpinned by major clinical trials using the Cretan diet as an intervention model in the prevention and management of chronic disease, including its effect on reducing cardiovascular events, cognitive decline and other dementia risk factors in older Australians.

The traditional Mediterranean model is also being applied to patients with anxiety, clinical depression and diabetes. Professor Itsiopoulos continues to work with the team at the Australian National Phenome Centre to develop effective and sustainable personalised nutrition medicine approaches to illness prevention.
Harry Butler Institute

Proving that community, business and biodiversity can co-exist.
Harry Butler was a pioneer who engineered a means for business and biodiversity to co-exist through effective biosecurity and environmental management. He achieved this through decades of service to Western Australia’s natural environment—and through the Harry Butler Institute, we aspire to continue his work in this field.

As experts in sustainable development, the Institute enables industry to deliver maximum economic value to the community, while simultaneously safeguarding the environment.

The breadth of research programs, ranging from aquatic biology and ecology to biosecurity and climate change adaptation, ensure the continuation of Harry Butler’s outstanding environmental outcomes, based on excellence in both scientific research and industry practice.

Key stakeholders and end users of the Institute’s research include industry partners from the energy, water, mining health, land development, food and tourism sectors, the State Government of Western Australia, the Federal Government and the community.

Professor Simon McKirdy
PRO VICE CHANCELLOR, HARRY BUTLER INSTITUTE

The Harry Butler Institute is led by Professor Simon McKirdy, who has extensive experience in corporate leadership, research management, policy development and the management of biosecurity operations within the government and private sectors.

Professor McKirdy’s career has included the roles of Quarantine Plant Pathologist for the State and Commonwealth governments, Program Manager at Plant Health Australia, eight years as CEO of the Australian Plant Biosecurity Cooperative Research Centre, and Biosecurity Science and Risk Manager at Chevron Australia.

Professor McKirdy is also Chairperson of the Western Australian Biosecurity Council, providing advice to the Western Australian government through the Minister for Agriculture.

RESEARCH CENTRES

Research of the Harry Butler Institute is clustered into four major centres, each true to the value that business and biodiversity can co-exist:

Centre for Water, Energy and Waste

Supplies of water and energy are fundamental to modern life, as is the management of waste.

The Centre for Water, Energy and Waste conducts research in these three related areas, ensuring human endeavours can co-exist with biodiversity and sensitive ecosystems.

Research ranges from new wind and photovoltaic technologies, to wastewater treatment and desalination, to integrated water, energy and waste technologies that enable smart buildings, urban areas and rural communities.

John Ruprecht
DIRECTOR, CENTRE FOR WATER, ENERGY AND WASTE

Associate Professor Ruprecht brings decades of high-level leadership in water resources, agriculture and business development from both private industry and government. Associate Professor Ruprecht’s work spans water management, irrigation, land and water development, sustainable agriculture, urban water management, hydrologic research, mine rehabilitation programs, and regional development.
Centre for Climate Impacted Terrestrial Ecosystems

Environmental science was a foundation area when Murdoch University was established in 1973, and now underpins our world-class environmental and conservation research.

Research in the Centre for Climate Impacted Terrestrial Ecosystems spans restoration ecology, wildlife biology and conservation, urban ecosystems, environmental science and sustainability spaces, climate change adaptation, nature-based tourism, forestry and threatening processes.

This provides fundamental information to regulators and managers for identifying biodiversity processes and threats, understanding conservation science, and protecting ecosystems through increased stewardship.

Trish Fleming
DIRECTOR, CENTRE FOR CLIMATE IMPACTED TERRESTRIAL ECOSYSTEMS

Professor Fleming is a wildlife biologist with a focus on projects that have a practical application, where improving our understanding of animal physiology and behaviour can improve their conservation or welfare. Professor Fleming’s research has tested a wide range of scientific hypotheses using organisms from crickets through to giraffes.
As the world grows smaller, a collaborative approach to research is crucial for the maintenance of unique ecosystems.

The Centre for Biosecurity and One Health recognises the linkages between health, biosecurity and the environment. It comprises research across themes including One Health, antimicrobial resistance, biosecurity of environmental and production systems, vector and water borne diseases, epidemiology, food safety and zoonotic diseases.

Policy, legislation and social science perspectives for each of these areas are a feature of our research outputs, with a transdisciplinary approach taken to address complex problems that relate to the health of animals, wildlife, plants, humans and eco-systems.

Professor Hewitt is an internationally recognised expert in biosecurity, with a focus on how humans have transferred species around the globe, the consequences of those movements in ecological and evolutionary contexts, and the ways that we can predict, prevent or mitigate the impacts of these novel species.
How we are securing the future of the environment

Researchers at the Harry Butler Institute are recognised globally as leaders in translational environmental research that supports sustainable development and the coexistence of business and biodiversity.

Saving critically endangered sawfish

Freshwater sawfish are an iconic fish of Australia’s north, and growing to around seven metres in length puts them amongst the largest living fish. Although sawfish numbers appear to be healthy in some small pockets of northern Australia, they have seen drastic decline globally, ranking them amongst the most endangered fishes worldwide.

An eight-year study into the previously little-known movements of sawfish in the isolated freshwater reaches of Western Australia’s Fitzroy River has identified that deep pools and shallow environments are important habitats for the freshwater sawfish, but that restriction of flow or altering of river pathways could jeopardise these environments.

Working with Indigenous rangers to capture more than 500 individual sawfish, Murdoch researchers led by Associate Professor David Morgan have been working to identify the habitats and conditions that need to be considered in conservation and management decisions for the region to save this critically endangered species.

“...We’re talking about one of largest fish in the ocean, growing up to seven metres, that are fast disappearing. But they still use this river as a nursery and it’s on all of us to protect places like this.”
Mitigating a major threat to native bush

Forest dieback is a major threat to Australia’s native vegetation and dependent wildlife, as well as to many agricultural crops and garden plants, and human activity is responsible for its spread. Murdoch researchers have developed tools to contain and control forest dieback in Western Australia that are now being used to combat it worldwide.

Professor Giles Hardy and his team have developed strategies to limit the spread of dieback since the early 1990s, with a particular focus on minimising its transmission by human activities. Their recommended quarantine, hygiene and work practices are now preventing the transport of infected soil and water across south-west Western Australia, and increasingly worldwide.

Working with major mining companies, the dieback management practices have changed mine planning and operating practice, giving companies access to areas they may not have otherwise been able to mine, improving their rehabilitation record, and helping maintain their social license to operate.

“ The savings to industries across Australia runs into hundreds of millions of dollars, although preserving our healthy ecosystems is priceless. ”

Turning mine closures into new opportunities

There is a wave of mine closures looming across developing countries. How well these closures are handled has the potential to shape the dialogue on the benefits and costs of mining.

Murdoch scientists, led by Associate Professor John Ruprecht, have helped develop a new framework to guide successful mine closures and restoration projects. The framework provides mining companies and regulators like the Environmental Protection Agency with clear examples of how land can be transitioned from mining to development, agriculture or conservation use.

The framework of research informed, road-tested practices for socially, environmentally and economically responsible mine closures is ensuring the mining sector can deliver on sustainable development aspirations that benefit local communities in the long term.

Harnessing artificial intelligence for biosecurity

Researchers are working with technology giant IBM to develop and trial the use of artificial intelligence (AI) technology to fight the spread of invasive species.

Using a cumulative machine learning process referred to as “deep learning”, computer software is trained to recognise images of known species and flag the occurrence of potential biosecurity threats. The project was initiated by Chevron and involved Harry Butler Institute staff training and testing the model, to differentiate the invasive Asian House Gecko from native gecko species, which are protected on Barrow Island.

Time is critical when dealing with a highly mobile animal such as a gecko and the remoteness of the island means formal assessments can take up to three days to complete. Using AI, the team can test and confirm an image within seconds, providing a rapid triage system to activate and maintain biosecurity responses to the highest standards.
Health Futures Institute

Transforming how long and how well people live, not just in Australia, but around the world.
As global populations increase and age, and the climate changes, a holistic focus on the interface between human, animal and environmental health is needed.

The Health Futures Institute, located next to one of the most technologically advanced private and publicly-funded hospital precincts in the southern hemisphere, provides a unique research space to deliver this.

The Institute focuses on clearly defined health-related research areas and pursues those in partnership with local healthcare providers, community groups and international collaborators.

The areas of focus include development of advanced measurement and human health modelling technologies in the Australian National Phenome Centre and their applications in preventive medicine, public health and infectious disease, precision medicine and personalised therapeutics, including genetic disorders and inherited disease, and the community delivery of health services, especially in aged care and Aboriginal health.

**Professor Jeremy Nicholson**  
PRO VICE CHANCELLOR, HEALTH FUTURES INSTITUTE  
DIRECTOR, AUSTRALIAN NATIONAL PHENOME CENTRE

The Health Futures Institute is led by Professor Jeremy Nicholson, an internationally-renowned pioneer in metabolic phenotyping and systems medicine.

Professor Nicholson is a Clarivate Highly Cited Scholar who has published more than 800 peer-reviewed papers on molecular aspects of systems medicine with multiple international prizes and honorary chairs in 12 universities and is an elected Fellow of the UK Academy of Medical Sciences.

Professor Nicholson came to Murdoch from Imperial College London where he was the founding director of the MRC-NIHR National Phenome Centre and the Head of the Department of Surgery and Cancer - one of the world’s largest clinical departments.

**RESEARCH CENTRES**

Research of the Health Futures Institute is clustered into five major areas, each improving how long and how well people live:

**Australian National Phenome Centre**

World-leading researchers at the Australian National Phenome Centre are working to revolutionise the diagnosis, prevention and treatment of serious health challenges like cancer, Alzheimer’s, obesity and Type 2 diabetes.

By analysing the molecular, physical and biochemical characteristics of biological tissue and fluids such as blood and urine, researchers at the ANPC aim to predict the complex genetic, environmental and lifestyle interactions causing disease. The ANPC is a key player in the new 10-year CRC Food Futures program and is currently assembling a Center for Molecular Nutrition associated with strategic industrial alliance partners.

The work of the ANPC supports almost every area of bioscience. It reaches across traditional research silos and fosters a new, more collaborative approach to science. Long-term, the ANPC hopes to build “global atlases” of human disease, providing insights into future health risks which everyone on the planet can benefit from.
The Centre for Computational and Systems Medicine brings scientists and clinicians together in an interdisciplinary environment, building on the academic strengths of individuals in cutting edge analytical chemistry, data science and data visualisation.

The Centre harnesses the capacity of the Australian National Phenome Centre to generate high throughput, deep phenotypic profiles of biological samples that define the metabolic status of an individual and which will contribute understanding of disease risk and aetiology.

Integrating such knowledge with multi-modal data—(including genomic, transcriptomic, proteomic, epigenomic and metagenomic) capturing multiple levels of gene-environment interactions, the Centre provides an engine for data science and analytics that will interface with and support other centres and groups within the Health Futures Institute.

Elaine Holmes
DIRECTOR, CENTRE FOR COMPUTATIONAL AND SYSTEMS MEDICINE

Professor Holmes is a distinguished computational biologist, Australian Laureate Fellow, Clarivate Highly Cited Scholar and WA Premier’s Fellow in Phenomics. Professor Holmes’ current work is progressing research on maternal and infant health, liver and gastrointestinal disease and metabolic diseases such as diabetes and dementia.
Centre For Molecular Medicine and Innovative Therapeutics

A joint venture between Murdoch University and the Perron Institute, the Centre for Molecular Medicine and Innovative Therapeutics brings together researchers and specialist clinicians in a range of rare diseases as well as in rehabilitation.

The Centre has deep focus on precision medicine, which researchers believe has the potential to transform healthcare on a scale equivalent to the way antibiotics transformed the fight against infectious diseases.

Researchers and clinicians at the Centre use the tools of genomics, genetics, epidemiology, immunology, exercise and cognitive sciences to explore the capacity of precision medicine to improve the health and wellbeing of patients.

Steve Wilton
DIRECTOR, CENTRE FOR MOLECULAR MEDICINE AND INNOVATIVE THERAPEUTICS

Professor Wilton’s major research focus has been the development of antisense oligonucleotide-based drugs for the treatment of rare inherited diseases, in particular Duchenne muscular dystrophy. His current work is extending the therapeutic applications of these drugs to other inherited diseases and acquired conditions, including spinal muscular atrophy, motor neuron disease, cystic fibrosis, multiple sclerosis, Alzheimer’s, adult onset Pompe’s disease, Marfan’s, Huntington’s, Parkinson’s and asthma.

“To be healthy we need nutritious food, to produce nutritious food we must look after our environment. Murdoch University’s research on the nexus between human, animal and environmental health is providing a roadmap for addressing complex and unique global challenges.”

- Professor David Morrison

To be healthy we need nutritious food, to produce nutritious food we must look after our environment. Murdoch University’s research on the nexus between human, animal and environmental health is providing a roadmap for addressing complex and unique global challenges.
Centre for Healthy Ageing

In 2030, there will be more people in Australia aged over 65 years than children aged under 14 years. The Centre for Healthy Ageing brings together multi-disciplinary researchers to address research questions relevant to maintaining quality of life in this older population.

The Centre focusses on prevention of disease to improve health-span and intervention mechanisms to delay ageing and encourage high functionality and resilience.

Its location, adjacent to the Murdoch Health and Knowledge precinct, provides a unique environment for the effective and timely engagement with clinicians and key patient groups.

Hamid Sohrabi
DIRECTOR, CENTRE FOR HEALTHY AGEING

Associate Professor Sohrabi has both clinical and academic experience in the fields of psychology and neuroscience, with extensive expertise in coordinating large multi-disciplinary teams. Dr Sohrabi’s current research is focused on preclinical diagnosis of Alzheimer’s disease and preventive interventions for pathological cognitive decline.
Ngangk Yira Aboriginal Health Research Centre

Murdoch University’s Ngangk Yira Research Centre supports the University’s commitment to improving Aboriginal health, wellbeing and social equity through innovative and translational research.

Ngangk Yira’s research takes a connected approach from young adulthood and pregnancy, to parenthood and the transition to older adulthood, recognising the evidence that a strong start in life is fundamental for healthy and resilient children, families and communities.

Its work is already pioneering the practical changes that will change the life course of the next generation of Aboriginal youth and which will inform translatable outcomes to state and national policy, practice and education.

Rhonda Marriott
DIRECTOR, NGANGK YIRA ABORIGINAL HEALTH RESEARCH CENTRE

Professor Marriott is a descendent of Kimberley Nyikina Aboriginal people and has devoted her adult life to nursing and midwifery in both clinical and academic roles. Professor Marriott’s research focusses on translational Aboriginal Health Research that privileges Indigenist methodologies and co-design approaches.
How we are securing the future of health

Researchers at the Health Futures Institute are using some of the most advanced technology in the world to study humans in the total environment—genes, lifestyle and environmental factors—to improve health and prevent disease.

Pioneering treatments for rare diseases

Research led by Professor Steve Wilton and Professor Sue Fletcher has delivered two FDA approved treatments for Duchenne muscular dystrophy. Mainly affecting boys, Duchenne muscular dystrophy (DMD) is a rare inherited disorder that causes progressive muscle weakness and loss of muscle mass.

Both the DMD treatments exploit the cell machinery to trick cells into “skipping” over the disease-causing error, essentially acting as genetic “whiteout” on the gene message. Boys receiving the exon skipping treatment in the United States have maintained the ability to walk into their mid- to late-teens, whereas without treatment, statistics suggest they should be wheelchair bound before the age of 12 years.

Although a rare disease, DMD is the most common and severe of the childhood muscular dystrophies and was long considered untreatable. Collaborative research with Sarepta Therapeutics, the Perron Institute and The University of Western Australia spanning two decades delivered the first approved molecular therapy for DMD in 2016.
Integrating research and clinical care

The Myositis Discovery Program team led by Professor Merrilee Needham have established an innovative model that integrates research with clinical care. The unique facility at Murdoch’s Academic Medical Centre, home to a specialist clinic for patients with inflammatory muscle diseases collectively known as Myositis, is delivering a model of care where clinical appointments are combined with research participation.

During clinic visits, patients are invited to participate in a translational research program, including donating blood samples that go directly to the laboratory for analysis. This direct work-flow from participant to laboratory provides unaltered samples that encapsulate a unique biological snapshot.

The research comes full circle, with the group’s Lead Scientist Dr Jerome Coudert and his team able to identify patients with immune profiles of interest. These participants are invited to donate further blood or muscle samples for more detailed exploration, and in-depth analysis informs future treatment targets or biomarkers that then inform the next clinical trial.

The ANPC is also developing new systems medicine paradigms to augment clinical trial protocols to optimise interventions and predict clinical outcomes in individual patients as part of the development of new personalised medicine strategies.

Improving health outcomes for Aboriginal families

In a study involving 75 Aboriginal women from four generations and 71 midwives, researchers at the Ngangk Yira Aboriginal Health and Social Equity Research Centre considered the cultural needs of Aboriginal mothers during pregnancy and childbirth.

They found Western Australian maternity care systems do not adequately consider the foundations required to support and nourish healthy futures for Aboriginal families. The systems have not been designed in the right way, by the right people, to provide the best start in life for Aboriginal children, resulting in unequal life course health outcomes.

The findings from the research were the basis of three recommendations to inform health policy decisions related to health systems changes, workforce and health professional cultural education, presented to the WA Health Minister for action. The Ngangk Yira team are focused on translating the evidence to the co-design of Culturally Secure Maternity Services for Aboriginal Women.

Safeguarding treatments for HIV sufferers

More than 35 million people have died from HIV-related illnesses and abacavir is the most widely prescribed drug for treatment. However, when first introduced, abacavir caused a potentially lethal hypersensitivity in 5-8% of patients.

Research led by Professor Elizabeth Phillips and Professor Simon Mallal at Murdoch University and Royal Perth Hospital produced: the first confirmation that hypersensitivity was related to a specific gene; reliable genetic testing assays; and the first blinded trial to demonstrate conclusively that abacavir hypersensitivity can be prevented by screening for the gene.

All patients are now screened for the hypersensitivity gene prior to commencing abacavir treatment, which prevented an estimated 125,000 people from experiencing hypersensitivity reactions over a six-year period. This work has provided a roadmap from discovery to translation which the Murdoch team and others continue to apply to personalised medicine.
World-class technologies

Murdoch boasts world-class, state-of-the-art facilities on campus, as well as through partnership arrangements providing access to specialised external facilities. A range of our major technology centres are outlined on the following pages.
The Australian National Phenome Centre is an international centre of expertise in metabolic phenotyping and one of the most significant health research collaborations realised in Western Australia.

Its sophisticated biological analysis technology will transform and optimise disease prevention, diagnosis and personalised health. The Centre’s COVID-19 Critical Research Programme is addressing the world’s greatest health challenge and its major program in food and nutritional science is enabling the study of humans in the total environment.

The work of the ANPC supports almost every area of bioscience. It reaches across traditional research silos and fosters a new, more collaborative approach to science that is critical to solving some of the world’s most challenging problems, including chronic diseases such as diabetes and the many health issues associated with population ageing.

Led by Murdoch University, the ANPC is a powerful resource for researchers, enabling them to examine the complex interaction and influence of genes, the environment and lifestyle on human and animal health. The facility houses the largest collection of mass spectrometers in the Southern Hemisphere, combined with nuclear magnetic resonance spectroscopy and advanced data modelling, to identify the unique metabolic ‘signature’ of individuals and communities.

Supported by the State and Federal governments and the Australian Research Council, the ANPC is a core platform of the Western Australian Health Translation Network (WAHTN) and plays a key role in realising the vision of the Government’s Sustainable Health Review – to position Western Australia’s health system for the future.

Research at the ANPC is connected with work at similar centres across the International Phenome Centre Network, including sites in London, Birmingham, Hong Kong and Singapore, supported by Bruker Biospin and Bruker Daltonics. This collaboration is progressing the global understanding of the effects of diverse environmental and cultural conditions on a range of serious diseases and conditions including type 2 diabetes, cancer and autism.
Anti-microbial Resistance Laboratories

The Antimicrobial Resistance and Infectious Diseases Research Laboratory is a One Health research and antimicrobial resistance surveillance facility. It has a suite of state-of-the-art molecular and non-molecular technologies and is the only reference laboratory in Australia carrying out disease surveillance that covers the emergence of antimicrobial resistance in both humans and animals.

Agricultural Biotechnology Centre

The Agricultural Biotechnology Centre provides platform technologies and world class equipment for research and development in agricultural and veterinary biotechnology. The Centre also supports research in biosecurity, biomedical sciences and environmental biotechnology. Facilities extend across cell and molecular biology, robotics, high throughput agricultural genetic analyses and diagnostics, structural, comparative and functional genomics, proteomics and mass spectrometry, and a full suite of bioinformatics hardware and software.

Genomics Core Research Facility

Murdoch University has the most powerful genomics testing capacity in Western Australia and the largest automation laboratory in health research in Australia, with 15 automation units that can handle thousands of samples at once with a high degree of fidelity. The facility specialises in medical immunogenomics, with a range of technology for research into chronic conditions. This capacity has enabled breakthroughs in individualised medicine and the rapid translation into clinical settings.

The Genomics Core Research Facility applies its technology to prevent and reduce the impact of disease on people and communities around the world, while advancing medical and scientific knowledge in global healthcare. It is a translational research facility that aims to produce clinical practice-altering outcomes for patients with chronic diseases.
Enabling Technologies Centre
The Enabling Technologies Centre supports omics facilities, including high throughput sequencing; structural, comparative and functional genomics; transgenics; small scale metabolomics; supported by biostatistics and bioinformatics services.
Sequencing capacity includes whole genome analysis of viruses, bacteria and targeted regions of the human genome. The Centre also provides proprietary software for the analysis of the copious and complex raw data arising from second generation sequencing platforms.

MindBody Lab
The MindBody Lab is a research and laboratory facility established to further cognitive neuroscience and integrate it with psychology, psychophysiology, exercise science, health and rehabilitation research.
It contains dedicated space and equipment for electrophysiological and psychophysiological testing, cognitive testing and training, exercise and physical activity testing and training, neuromuscular testing, and pain-related research.

Pawsey Supercomputing Centre
The Pawsey Supercomputing Centre is a joint venture between CSIRO, Curtin University, Edith Cowan University, Murdoch University and The University of Western Australia, supported by the Western Australian and Federal Governments.
The Centre is one of two, Tier-1, High Performance Computing facilities in Australia, whose primary function is to accelerate scientific research for the benefit of the nation.

South Metropolitan Grains Research Hub
Murdoch’s major grains research infrastructure includes Physical Containment Level 1 and 2 glasshouses adjacent to 2.8 Ha of irrigated and netted field plots, together with storage and office facilities.
Funded through a partnership between Murdoch University, the Department of Primary Industries and Regional Development, Curtin University, and the Grains Research and Development Corporation, the Hub was established to help boost crop productivity and reduce the impact of disease, while improving crop research in Western Australia.
Partnerships between universities, industry, government and communities they serve are vital to understanding, realising, and tackling the real-life opportunities and challenges facing our world. We can do more together and the shared expertise at Murdoch is helping to solve some of the world’s biggest problems.
We have an extensive network of international collaborations and partnerships that facilitate knowledge exchange, research and impact.

We collaborate with 2,668 academic institutions around the world, having co-authored more than 3,500 publications in the last three years alone, as shown in the Figure above. More than half of all our research publications are co-authored with international collaborators.

International Phenome Centre Network

The Australian National Phenome Centre is connected to a global network of phenomic laboratories. Working in synchrony, laboratories around the world follow identical procedures using similar technologies. This enables experiments conducted in one laboratory to be comparable to testing conducted in another laboratory in the network.

The harmonisation of global research enables researchers to answer complex questions about how the environment can play a role in affecting the development of disease in different parts of the world. The global network is working closely with technology providers to develop a palette of next generation tools for understanding human health, both at a patient and population level.

The network is currently undertaking major research to better understand and mitigate the COVID-19 virus pandemic threat.

China Partnerships

Over the past two decades, Murdoch University has actively engaged with China’s universities and research institutes to establish several joint research centres, and joint-PhD programs, to undertake a variety of projects that are of significance to both Australia and China. An example of this is the Australia-China Centre for Wheat Improvement, which aims to increase Australian wheat marketability in China by improving the quality attributes for producing Chinese domestic food products.

Africa Links

Murdoch University’s trans-disciplinary Africa Research Group have been focused on African research questions for more than three decades. All members have strong ties with African-based researchers and collaborate with African industry, academic institutions, government agencies and non-government organisations (NGOs). They have published more than 200 peer reviewed papers, chapters and books with a distinctive African focus, and receive research funding from AusAID, Australian Centre for International Agricultural Research, the Australian Research Council, the Gates Foundation, and UNICEF.

These partnerships are supported by the University’s Third Commission, an initiative which seeks to strengthen Murdoch’s links with Africa across research and innovation expertise, strategic interest and networking capabilities within Australia, in Africa and globally.
Murdoch remains resolutely focused on two core goals: to educate free thinkers who thrive in society and are sought-after by employers; and to provide transformative solutions to complex world challenges through outstanding translational research and innovative practice.

We have developed an academic model, built around two Colleges, that will help us deliver on these goals. The two-college model is designed to foster cross-disciplinary academic exchange. This model will lead our teaching, learning and research programs and provide flexibility for students who wish to study across different disciplines.

The two colleges are the College of Arts, Business, Law and Social Sciences (College ABLSS) and the College of Science, Health, Engineering and Education (College SHEE).
College of Arts, Business, Law and Social Sciences

Through challenging the status quo and collaborating across multiple disciplines, our students and researchers break down traditional barriers to translate knowledge into impact.

We believe in teaching our students critical thinking skills. As such we model, in all aspects of our work, a flexible, free thinking environment where creativity and innovation work together.

Our disciplines are:

» Creative Media, Arts and Design
» Business
» Global Studies
» Law and Criminology

Working towards our strategic goals, the College continues to maintain strong, collaborative relationships with industry, government, the not for profit sector, the arts community and other research entities.

From influencing the way our leaders recognise the social, political, historical, and economic factors shaping Australia, to developing tools to build resilience and healthy engagement strategies for professionals, our research partnerships are key in helping achieve a sustainable future.

Our activities include close collaboration with the Department of Foreign Affairs and Trade on matters of regional security, working with community legal practitioners to find better solutions for their clients, or with courts and government departments to achieve effective law reform, and working with Australian and international sport organisations to facilitate gender equity and inclusion in sport.

Professor Grant O’Neill
PRO VICE CHANCELLOR - COLLEGE OF ARTS, BUSINESS, LAW AND SOCIAL SCIENCES

College of Science, Health, Engineering and Education

Our unique combination of disciplines and collaborative working practices translates theory into action.

We are guided by our strategic intent—harnessing our creativity to provide innovative solutions for a safe food supply, the health, wellbeing and education of our communities, and a bio-secure and sustainable environment. Through combining our knowledge and expertise in both established and emerging fields, our evidence-based approach enables us to rapidly translate evidence into practice with widespread impact.

Our disciplines:

» Agricultural Sciences
» Chemistry and Physics
» Education
» Engineering and Energy
» Environmental and Conservation Sciences
» Information Technology, Maths and Statistics
» Medical, Molecular and Forensic Sciences
» Nursing
» Psychology, Exercise Science, Counselling and Chiropractic
» Veterinary Medicine

To help achieve the College’s strategic intent, we collaborate with a wide range of partners from various backgrounds. Importantly, this includes elders and other stakeholders from indigenous communities as well as government, industry and those communities more distantly located nationally or overseas in our transnational campuses in Singapore, Dubai and Myanmar.

Be it shaping the next generation of environmental leaders with global energy producer Chevron, or breeding better barley for international markets, to working at the forefront of healthcare delivery of evidence-based practice, our partnerships deliver positive results globally.

Professor Catherine Itsiopoulos
PRO VICE CHANCELLOR - COLLEGE OF SCIENCE, HEALTH, ENGINEERING AND EDUCATION
Postgraduate research at Murdoch

At Murdoch, you will explore new ways of thinking, discover different perspectives and find ways to make a difference at a local, national and global level. Our programs have been designed to meet the needs of industry and bring together cutting-edge theory with real-world practice to fast-track your career.

Master's Degree

A master's degree by research is an advanced postgraduate qualification that allows you to apply research in a specific academic discipline. This degree is awarded following the completion of a major thesis involving independent, original research, under the supervision of a senior academic.

Some of the master's degrees available across Murdoch’s research institutes are below.

Master of Systems Medicine

In this course, you will get a unique opportunity to conduct a real-world clinical research project in a state-of-the art laboratory under the supervision of leading researchers. The research project can be in an area of your choice and aims to address unmet global clinical needs.

This degree is designed to provide you with systematic training in individual components of systems medicine. A strong focus is placed on metabolic phenotyping and computational biology, which will be supported by access to facilities within the Australian National Phenome Centre and Centre for Computational and Systems Medicine.

Master of Biosecurity

In a globally connected world where trade is ever-increasing, and people are moving around the globe at unprecedented rates, the risk of spreading exotic organisms is higher than ever. Biosecurity is fundamental to managing the threat posed by pests and diseases, and is of vital importance to world trade, environmental protection, and agriculture.

Learn how biosecurity measures such as risk analysis, quarantine and surveillance are used to stop the entry and spread of exotic organisms around the world. You’ll gain an in-depth knowledge of rapid emergency response to an exotic incursion, and how to manage pests and diseases if they become permanently established in a new region and start impacting trade.

Doctorate

A doctorate is a program of research and advanced study that may enable you to make a significant contribution to knowledge and practice in your professional context. You may also contribute more generally to scholarship within your discipline or field of study. All doctorates involve independent researching of a specific topic under the guidance of a supervisor, leading to a dissertation.

A Doctoral Degree (Research) gives you the opportunity to explore in depth a research project that you’re passionate about. You will independently research a specific topic under the guidance of a supervisor and produce a thesis no more than 100,000 words. Your research will represent a significant, original contribution to human knowledge.

A Doctoral Degree (Professional) is an intensive course of study which will lead you to a professional doctorate degree. You’ll undertake applied research in an area of your choice, leading to a dissertation.

Discover more at:
murdoch.edu.au/study/courses/research-degrees
International Scholar

Murdoch PhD student Barbara Kachigunda, from Murdoch’s Harry Butler Institute, won a prestigious Fulbright Future Scholarship for her research into the surveillance and monitoring of wheat blast. Thanks to generous support from The Kinghorn Foundation, the Fulbright Future Scholarship provides recipients with a unique opportunity to take part in funded study and research programs that seek to have a positive impact on the health, livelihoods and prosperity of Australians.

The scholarships support projects that advance cutting-edge applied science, kick start innovative business collaborations, or further the development of impact-driven emergent technologies.

Awarded Science Communicator

Murdoch PhD student Valeria Senigaglia was named the WA State Final winner in the annual FameLab competition, which brings together young researchers to tell their science stories in less than three minutes.

FameLab is regarded as the leading science communication competition that seeks to find and mentor young STEM researchers keen to share their stories with the world.

It is run annually in Australia and more than 25 countries across the world. The competition brings bright young minds from across the globe to culturally share their experiences of science and compete for the title of the world’s best science communicator.

Research Pathways

Bachelor’s Degree

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<th>Honours</th>
<th>Master’s by Research</th>
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<td>1 year full-time or part-time equivalent</td>
<td>2 years full-time or part-time equivalent</td>
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Doctorate

3-4 years full-time or part-time equivalent (duration may be reduced if relevant Master’s is completed)

POSTGRADUATE RESEARCH STUDENTS IN 2020

242 INTERNATIONAL
+ 514 DOMESTIC
Our world-class teaching facilities provide students with access to real-world equipment and resources, helping them gain the industry knowledge and experience they need to succeed in their chosen field. Below are some examples.

**IT Innovation Hub**

Students studying one of our degrees in Information Technology get hands-on learning in our IT Innovation Hub, fitted out with industry-grade networking and security infrastructure, mixed and augmented reality equipment and an operational data centre.

**State Agricultural Biotechnology Centre**

When studying agriculture or biotechnology at Murdoch, students have access to our collaborative centre for research and development, with platform technologies and world-class equipment and facilities, including our on-campus farm.

**Media Arts Centre**

Those pursuing media and communication studies have access to our professional equipment and industry-standard facilities. These include fully equipped TV and radio studios, editing suites, a dedicated games computer lab, VR equipment and all the latest media and design software.

**Virtual and simulated classroom**

Murdoch is proud to be the first university in Australia to offer SimLab technology in the context of pre-service education. SimLab is an immersive platform giving students and pre-service educators the opportunity to experience, practice and improve their teaching techniques with virtual avatars controlled by professional actors.
Perth’s most modern Moot Court
Law students at Murdoch have the opportunity to try simulated cases based on reality in a court environment and compete with other law schools around the world using video satellite technology.

World-famous veterinary facilities
Murdoch vet students gain essential experience in real-world environments. Our Perth campus is home to a working farm, a vet clinic open to the public, a fully equipped veterinary hospital complete with cancer and dermatology clinics, a pet emergency centre and an Equine Centre with equine operating theatres.

Engineering plant
Murdoch engineering students make use of our $10 million Bayer Pilot, known as the engineers’ playground. Featuring real-world engineering plant and equipment relevant to many engineering specialities, our plant is the only one of its kind in Perth.

Exercise physiology laboratory
Murdoch exercise science students learn practical skills in our purpose-built state-of-the-art facilities including an exercise physiology laboratory complete with a climate and altitude chamber, a rehabilitation, strength and conditioning laboratory, and a performance laboratory with a motion capture system and 50-metre running track.

The Chiropractic Clinic
Chiropractic students are able to work with registered chiropractors on clients in our onsite commercial clinic, which features 11 consulting rooms and a fully equipped gym.
Murdoch University has always been a translational research university and it remains so today. We continue to extend the impact of our research by working with distinguished collaborators and industry partners within Australia and around the world.

Murdoch’s innovative research environment and unique location makes ours an attractive environment to host industry collaborators and incubate new businesses by providing access to expert teams and state-of-art digital platforms.

Our research expertise can be engaged and supported in several ways and we are committed to establishing a partnership model that works for you.

We invite enquiries and proposals from all corners of the globe. Whether you are looking to expand your knowledge through further study, take your career to new heights or make new discoveries, Murdoch can help you reach your full potential.

Partnerships may encompass:

- **Consultancy**
  Access our renowned expertise, innovations and facilities.

- **Contract research**
  Leverage our research capabilities to develop leading edge solutions to your big challenge.

- **Collaborative research**
  Pool your knowledge and expertise with our researchers and work collaboratively to create value and change.

- **Higher degree research sponsorship**
  Support a higher degree (PhD or Masters) student in a research area aligned with your industry.

Contact [PVCRIQ@murdoch.edu.au](mailto:PVCRIQ@murdoch.edu.au) to discuss your Murdoch research partnership.