THE UNIVERSITY OF ADELAIDE
AUSTRALIA

Making an impact on the world: University of Adelaide **RESEARCH**

GROUP OF EIGHT MEMBER

INTRODUCTION

PROFESSOR JAMES MCWHA, VICE-CHANCELLOR

In January 2010, I attended the official opening of the new Plant Accelerator at the Waite Campus. This 'super greenhouse' is the largest and most sophisticated public facility of its type in the world. The facility will allow continuous measurements of the physical attributes of up to 160,000 plants each year, enabling researchers to respond faster to market needs, increase the productivity and robustness of crops, and accelerate the transfer of these advances to benefit industry.

While this is just one example of the truly exciting research developments occurring across the University in the last year, I feel it is a great symbol of the research culture at the University of Adelaide. Building on a long tradition of research with cutting-edge facilities, and innovative and collaborative approaches by great people, we are delivering outcomes for the entire community, which we closely align to state, national and international research priorities.

We continue to enhance our research performance by investing in excellence, attracting high quality researchers, providing training and opportunities for a new generation of researchers. This Research Report provides a brief overview of our achievements.

PROFESSOR MIKE BROOKS, DEPUTY VICE-CHANCELLOR (RESEARCH)

The research environment is always challenging, competitive, exciting and full of opportunities; and the last 12-18 months have been no different. In looking back, one of the major changes in the University was the establishment of five, new, multi-disciplinary Research Institutes. This is an excellent way of bringing together researchers from diverse areas to work on some of the big challenges facing the world, such as food security, the sustainable management of our natural resources, developing new energy sources, genetic developments in health, reproductive health and the use of new lasers and optical systems for environmental monitoring.

However, it is our researchers who continually amaze me with the innovation of their projects. For example, some of our researchers recently brought back to life the primary component of Siberian mammoth blood, using DNA preserved in bones over 25,000 years old, to show how mammoths survived the extreme Arctic cold. In another part of the University, a team of scientists is developing tiny optical probes for use as an "early warning system" for winemakers who want to check wine maturity without opening the barrel. Meanwhile, our medical researchers have developed a genetic test that can predict which pregnancies are at risk of complications long before symptoms arise.

With such talented and dedicated staff, there is every reason to be optimistic and excited about the future of research at the University of Adelaide.

AT A GLANCE

5
World class University Research Institutes

44
University Research centres

Over **1,300**
Research staff

Over **1,800**
Research students

No. **81**
in THES World Universities Ranking (2009)

Member of the **Go8**
research-intensive universities

$250 million
in 2009 invested in research

Awarded **78%** of **NHMRC**
funding to SA in 2009

2 out of the 5 Scopus Young Researcher of the Year 2010 National Award winners

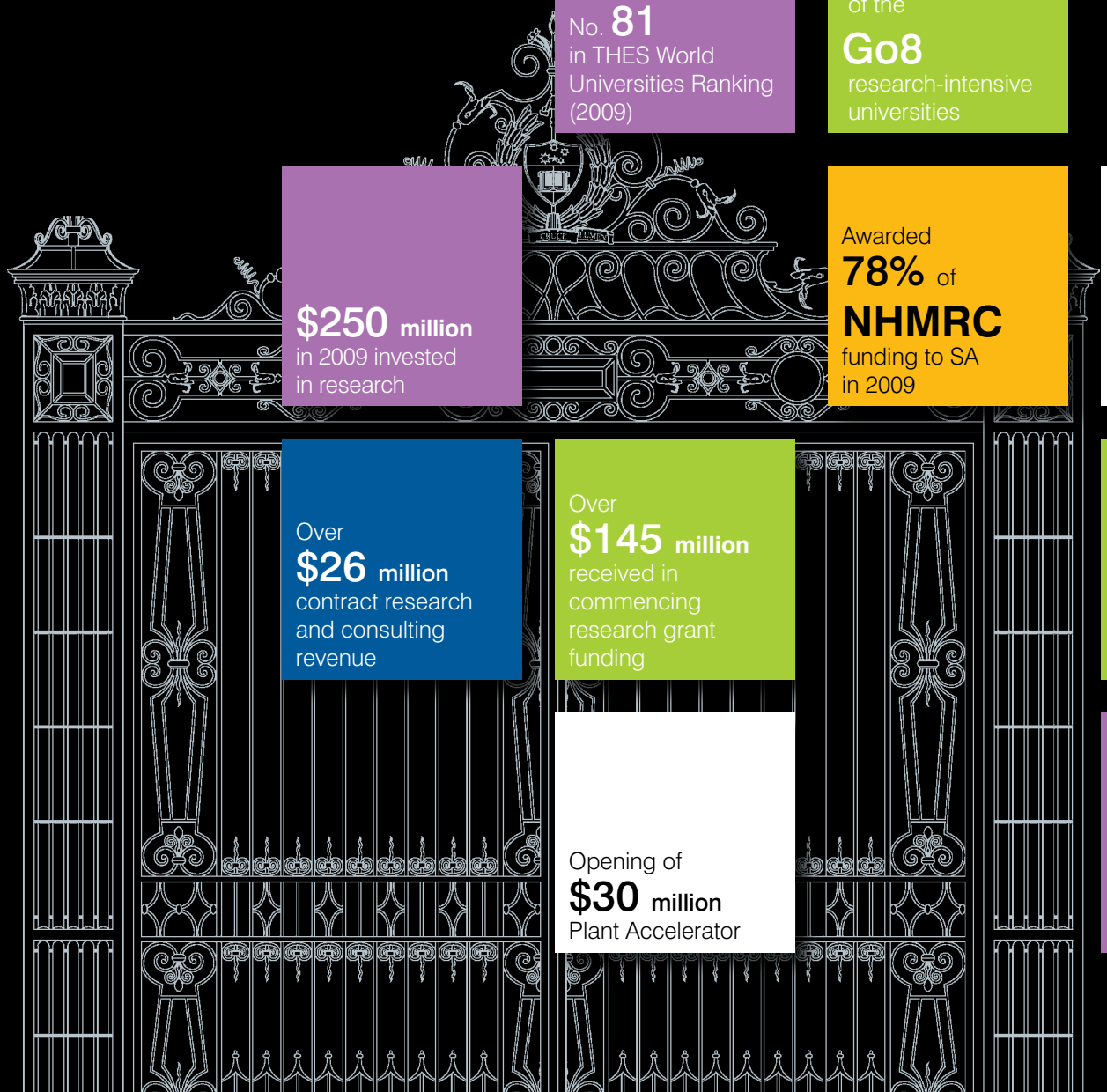
Over **$26 million**
contract research and consulting revenue

Over **$145 million**
received in commencing research grant funding

6
Super Science Fellowships in 2010

Opening of **$30 million**
Plant Accelerator

4
Adelaide graduates receive Fulbright Scholarships in 2009



11
Research Tuesday events sharing research with the community

No.**1**
university in the State for research in collaboration with industry

5
South Australian of the Year Awards 2009

Completion of
260
research-postgraduate qualifications in 2009

247 Australian Postgraduate Awards and **310** New Divisional Research Scholarships awarded since January 2009

5 Faculties
27 Schools

RESEARCH AT THE UNIVERSITY OF ADELAIDE

At the heart of the University of Adelaide's vision is our commitment to excellence, our sense that a focus on the experience of the student is fundamental, and our belief that research intensity and innovative, high quality teaching have a symbiotic relationship that underpins and characterises the finest universities in the world. Since its establishment in 1874, the University has developed a reputation for excellence in research and today the University of Adelaide is one of the top research universities in Australia.

The University has a distinguished track record and is a destination of choice for highly talented researchers and academics with major strengths in Agriculture, Environment, Social Innovation, Mineral & Energy Resources, Health & Biomedical Science, Sensing & Computation, and the Fundamental & Enabling Disciplines. We are expanding our research performance by investing in excellence, and by exploring new, innovative ways of collaborating that will ensure we generate high quality research outcomes closely aligned to state, national and international research priorities. The University has recently established five world-class research institutes, a number of these in partnership with government and industry. The Institutes, comprising a research community of over 1,200 staff and students, bring together world leading researchers, supported by modern infrastructure and an innovative culture to tackle grand challenges and research priorities.

Relevance and quality are the ongoing drivers of the University of Adelaide's research initiatives, aimed at delivering real results which contribute to both Australian and international social, economic, cultural and environmental wellbeing. Our research performance is fundamental to an outstanding research training environment, producing highly skilled graduates who will be future leaders in their chosen field.

MISSION

To be recognised internationally as a Great Research University and an Australian leader in research and teaching excellence, committed to the positive impact we can have on the lives of our students, staff and alumni as well as the local, national and international communities.

VISION

The University of Adelaide will build upon its tradition of innovation through high-impact research and excellent teaching across a broad range of disciplines and professions. It will be a growing, internationally focussed and financially sustainable institution, enterprising in its approach to new opportunities as they arise, and clear and consistent in its essential directions. It will provide a vibrant intellectual environment that will be satisfying for staff, rewarding for students, and engaging of the community, engendering a sense of pride in our contribution to contemporary society.

RESEARCH INSTITUTES

The University of Adelaide is committed to expanding its research output and has established a number of world-class research institutes in partnership with government and industry. The Institutes are charged with attending to national, state and global priorities, tackling grand challenges of critical value to society, operating across multiple disciplinary boundaries and working with key sections of the community.

THE ROBINSON INSTITUTE

The Robinson Institute brings together over 300 research staff and students and four leading research centres at the University of Adelaide. By focusing on the earliest stages of life, the Robinson Institute is looking at preventing disease and promoting health in children and adults across generations. The Institute bridges the gap between research discoveries and medical practice, with many of the Institute's senior researchers also being leading clinicians in their fields. This enables a strong translation of research discoveries which provides immeasurable benefits to society and for future generations.

In 2010, the University of Adelaide launched the Robinson Foundation to support the life-giving research of the Robinson Institute.

PROFESSOR ROBERT NORMAN BSc (Hons), MBChB(Hons) MD, FRANZCOG, FRCPA, FRCPath, FRCOG, CREI

Professor Robert Norman, Director of the Robinson Institute and Principal Research Director in the Discipline of Obstetrics and Gynaecology at the University of Adelaide, leads research focused on Assisted Reproductive Technology and reproductive endocrinology, particularly Polycystic Ovarian Syndrome (PCOS) and the effect of lifestyle on reproductive outcomes and periconception medicine. In 2009 he was the South Australian Scientist of the Year, as well as the recipient of the SA Great Awards for both Science and Health. He has also been President of the Androgen Excess Society, the major international society for PCOS and has served on the editorial board of Human Reproduction, Human Reproduction Update, RBM Online and Fertility and Sterility.

www.adelaide.edu.au/robinson-institute

FOCUS

Reproductive health, stem cell research and health across generations.

KEY RESEARCH CENTRES

Research Centre for Reproductive Health

Research Centre for Early Origins of Health and Disease

Centre for Stem Cell Research

Australian Research Centre for Health of Women & Babies

FOCUS

Optical fibres, lasers, luminescence, surface chemistry, proteomics and virology.

KEY RESEARCH CENTRES

Centre of Expertise in Photonics

THE INSTITUTE FOR PHOTONICS AND ADVANCED SENSING

The Institute for Photonics and Advanced Sensing (IPAS) has been founded on the success of the Centre of Excellence in Photonics, a joint centre of the University of Adelaide and DSTO, and the recognition of the importance that new forms of Advanced Sensing will play in the world.

IPAS brings together physicists, chemists and biologists to pursue a new transdisciplinary approach to science. The Institute is developing novel photonic, sensing and measurement technologies that will change the way science is done within traditional discipline areas, stimulating the creation of new industries, and inspiring a new generation of scientists to be engaged in solving real-world problems. IPAS research targets applications in four key market areas: defence and national security, environmental monitoring, preventative health, and food and wine.

PROFESSOR TANYA MONRO BSc(Hons), PhD

Professor Tanya Monro is an ARC Federation Fellow, Director of the Institute for Photonics & Advanced Sensing (IPAS) and the Director of the Centre of Expertise in Photonics (CoEP) within the School of Chemistry & Physics at the University of Adelaide. She is a member of the South Australian Premier's Science & Research Council, and regularly serves on a range of committees for the Australian Research Council (ARC) and other key national bodies in the area of science policy and the evaluation of science. She recently served as part of a consultation panel for the Defence White Paper (2009). Tanya Monro has published over 300 papers in journals and refereed conference proceedings.

www.adelaide.edu.au/ipas

THE INSTITUTE FOR MINERAL AND ENERGY RESOURCES

The Institute for Mineral and Energy Resources (IMER) is one of Australia's first interdisciplinary research institutes specifically designed to address one of the biggest challenges facing Australia – to continue to grow the economically critical mineral and energy resources industries in a technically, economically, socially and environmentally sustainable manner.

IMER addresses the complex research challenges faced by the mineral and energy sectors by providing integrated research, education, professional development and consulting services across all aspects of the mineral and energy resources industries, from exploration through processing to international trade. The University of Adelaide is unique within Australia in having strong research and teaching groups in geology and geophysics, petroleum engineering and mining engineering.

PROFESSOR STEPHEN GRANO
BEng(Metallurgical)(Hons), MSc, PhD

Professor Stephen Grano is the Director of the Institute for Mineral and Energy Resources and an internationally recognized Metallurgical Engineer with nearly 30 years of postgraduate experience. He gained extensive industrial experience in the field of mineral processing working in both copper and lead/zinc streams at Mount Isa Mines Limited. He has held Project Leader and Chief Investigator positions with the Ian Wark Research Institute where his team attracted funding of over $10M from industry and government research councils. Stephen has extensive leadership experience and the capacity to shape large scale and innovative research initiatives involving multiple relationships, which are both internal and external to the university environment. With a current research focus of reducing energy costs and consumption in mineral discovery and production, and increasing the value of mineral concentrates, Stephen will be developing long term alliances with industry and research partners.

www.adelaide.edu.au/imer

FOCUS

Petroleum engineering, mining engineering, petroleum and minerals, geoscience and geothermal energy, energy technologies.

KEY RESEARCH CENTRES

Centre for Energy Technology

Centre for Tectonics Resource and Exploration

Centre for Geothermal Energy

THE ENVIRONMENT INSTITUTE

The University of Adelaide has established the Environment Institute to tackle some of the most serious environmental challenges facing Australia and the world. Research undertaken within the Institute delivers know-how and understanding that will underpin a step change improvement in the management of natural resources such as water, soil, land and native flora and fauna, particularly under changing climate and economic conditions.

The Institute brings together leading research groups at the University of Adelaide in the fields of science, engineering and economics relating to the management and use of natural resources and infrastructure.

PROFESSOR MIKE YOUNG

Professor Mike Young is Executive Director of the University of Adelaide's Environment Institute, holds a Research Chair in Water Economics and Management at the University, is a fellow of the Academy of Social Sciences in Australia and a Distinguished Fellow of the Australian Agricultural and Resource Economics Society. Prior to joining the University of Adelaide, Mike spent 30 years with CSIRO and holds Adjunct Professorships with the University of New England and Charles Sturt University. In 2003, Mike was awarded a Centenary Medal "for outstanding service through environmental economics." The Canberra Times recognised him as "Green Australian of the Year" in 2005, and in 2006 listed him as one of the 10 most influential people in water policy reform. A Member of the Wentworth Group of Concerned Scientists, Mike was awarded the Land and Water Australia Eureka Award for Water Research in 2006. In 2008 Mike was nominated in the 50 most influential South Australians, the person with the "power to change the place we all live in" and South Australian of the Year in the Environment Category.

www.adelaide.edu.au/environment

FOCUS

Management of natural resources under changing climate and economic conditions.

KEY RESEARCH CENTRES

Australian Centre for Ancient DNA

Centre for Energy Technology

Australian Centre for Evolutionary Biology and Biodiversity

Water Research Centre

Marine Biology Program

Landscape Futures Program

Climate & Ecology

THE WAITE RESEARCH INSTITUTE

The Waite Research Institute brings together researchers from a range of disciplines including plant biology, genetics, soil sciences, agronomy and agricultural economics. Research undertaken with the Institute aims to find solutions to global problems including the challenge of ensuring global food security, and ensuring Australia's agricultural, wine and food industries remain competitive by providing innovative research-led developments.

PROFESSOR ROGER LEIGH

Professor Roger Leigh is the Head of the School of Agriculture, Food and Wine and the Director of the Waite Research Institute at the University of Adelaide. Professor Leigh joined the University in October 2006, and was formerly Professor of Botany at the University of Cambridge and Professorial Fellow at Girton College, Cambridge. Prior to these appointments, Professor Leigh worked at Rothamsted Experimental Station in the UK, rising to the post of Deputy Director. Professor Leigh's research interests lie in the area of nutrient transport in plants. He has published widely and is a well-known expert in this area. He is immediate Past President of the Australian Council of Deans of Agriculture and has been President of the Society for Experimental Biology in the UK.

www.adelaide.edu.au/wri

FOCUS

Plant and animal sciences, viticulture and oenology, agronomy, soil science and agricultural economics, food and nutrition.

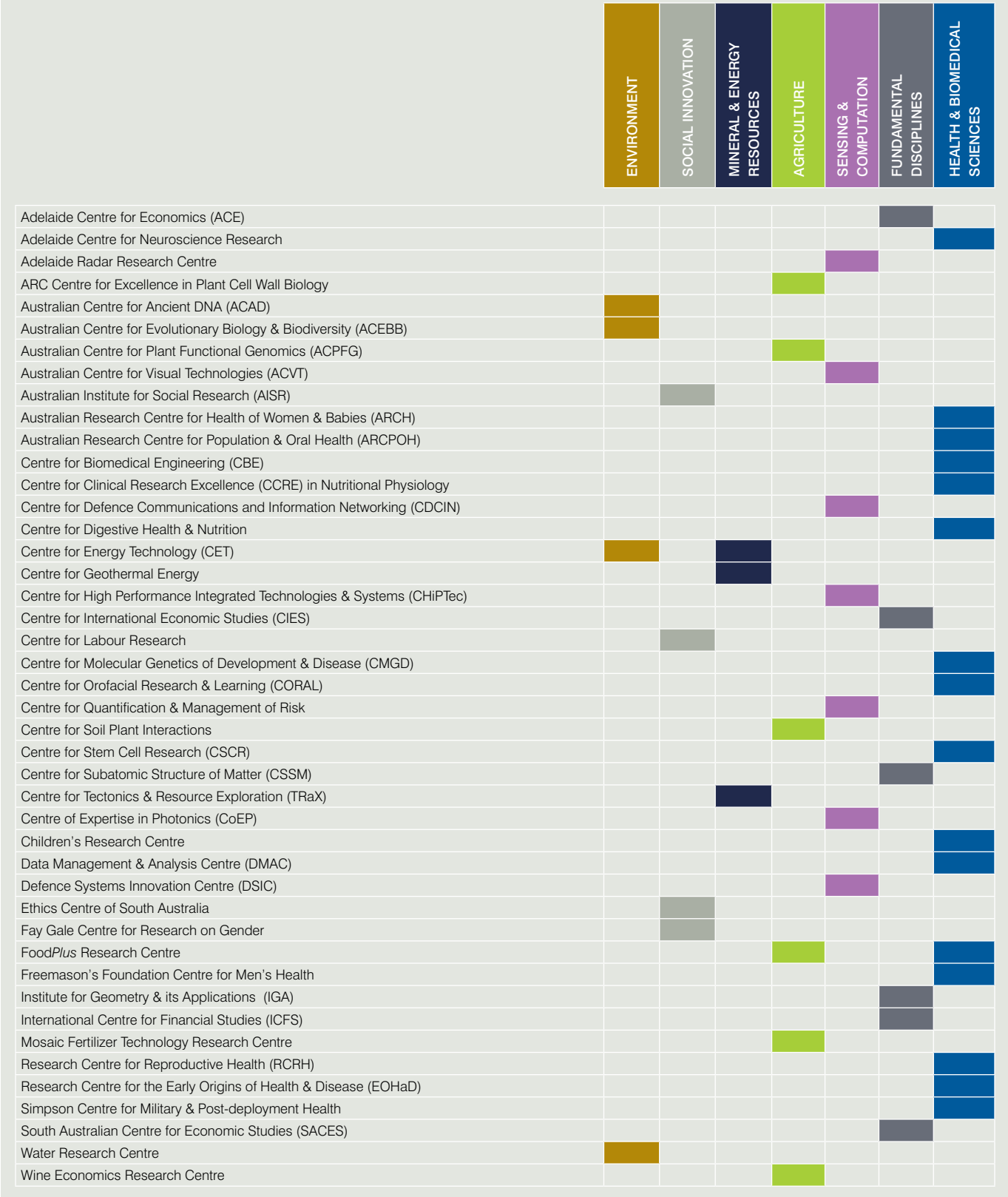
KEY RESEARCH CENTRES

Centre for Soil Plant Interactions

Australian Centre for Plant Functional Genomics

FOOD*plus*

RESEARCH CENTRES



RESEARCH STRENGTHS

AGRICULTURE

The University of Adelaide is the site of the southern hemisphere's largest concentration of expertise in sustainable agriculture, cereal breeding, plant and animal biotechnology and dryland farming, distributed across the Waite and Roseworthy Campuses.

STRENGTHS Plant Science & Genomics; Food Security; Oenology & Viticulture; Animal Sciences; Soil & Land Systems

EMERGING STRENGTHS Veterinary Sciences

ENVIRONMENT

Understanding our place within the environment, and our impact upon it, is vital for the creation and maintenance of sustainable communities. The need to invest further in research in this area has been brought into stark reality by water shortages, climate change and reductions in biodiversity.

STRENGTHS Monitoring, Restoration & Recovery; Evolutionary Biology & Biodiversity; Climate Change and Adaption; Water Quality & Engineering; Natural Resource Management

EMERGING STRENGTHS Marine Sciences; Antarctic Sciences

SOCIAL INNOVATION

Demographic shifts, migration, the impacts of ageing, the position of the more disadvantaged in our societies, social inclusion and exclusion are all key themes for many developed countries, not least Australia.

STRENGTHS Gender, Politics & Social Inclusion; Population & Migration Studies; Philosophy & Ethics; Creative & Performing Arts

EMERGING STRENGTHS Workforce Development

MINERAL & ENERGY RESOURCES

The University of Adelaide will help South Australia and the nation face significant challenges in continuing to grow the mineral energy resources industries, addressing major technical, economic, environmental and social issues through research and education.

STRENGTHS Tectonics & Resource Exploration; Mining & Petroleum Engineering; Fluids & Combustion; Energy Technologies

HEALTH & BIOMEDICAL SCIENCES

The University of Adelaide's research expertise in health and medicine encompass a broad spectrum of interests, from laboratory based biochemical research to clinical research and the study of broader populations.

STRENGTHS Reproductive Health; Childhood Development; Population Health & Primary Care; Oral Health; Molecular Genetics; Infectious Diseases; Cancer; Nutrition; Neuroscience & Cognition

EMERGING STRENGTHS Men's Health; Cardiovascular Health

SENSING & COMPUTATION

Researchers at the University are developing novel sensing and computation technologies, stimulating the creation of new industries, and inspiring a new generation of researchers to be engaged in solving real-world problems.

STRENGTHS Photonics & Applied Optics; Computer Vision & Signal Processing; Acoustics & Vibration; Modelling & Optimisation

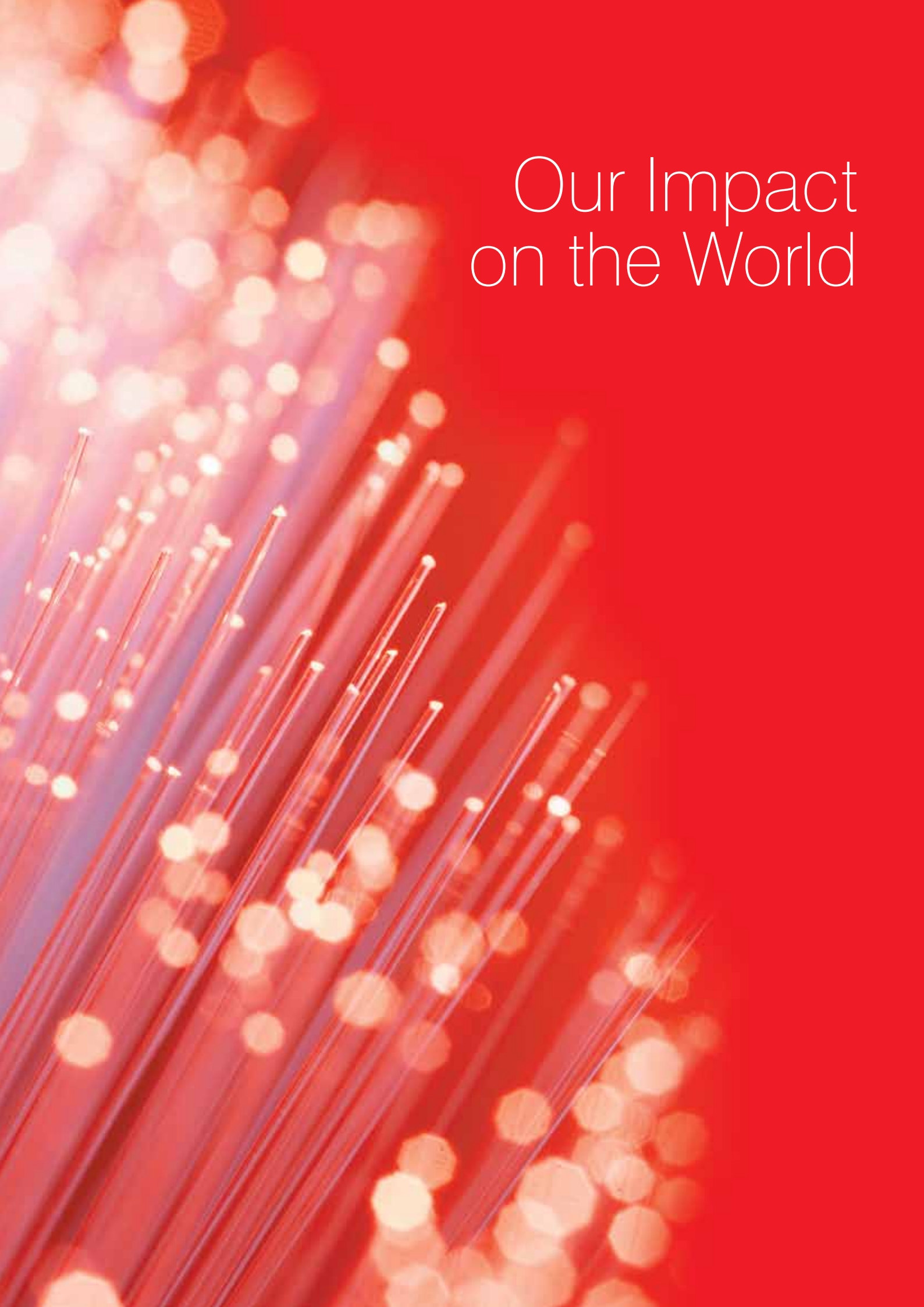
EMERGING STRENGTHS Networks & Communications

FUNDAMENTAL & ENABLING DISCIPLINES

Much of our multi-disciplinary and cutting-edge research is underpinned by strengths in fundamental areas of knowledge. University research is bringing together broad-ranging and cutting-edge research in the fundamental and enabling areas.

STRENGTHS Physics; Chemistry; Mathematics; Economics; Law

EMERGING STRENGTHS Smart Materials; International Trade; Finance; Marketing



Our Impact on the World

World Breakthrough in Treating Premature Babies

Adelaide researchers have made a world breakthrough in treating premature babies at risk of developmental disorders.

A 6 year study led by Professor Maria Makrides (Women's and Children's Health Research Institute & University of Adelaide) and Professor Bob Gibson (University of Adelaide) has demonstrated that high doses of fatty acids administered to pre-term infants via their mother's breast milk or infant formula can help their mental development.

They found that a major lipid in the brain – the omega-3 fatty acid known as Docosahexaenoic acid (DHA) – is not developed sufficiently in babies born before 33 weeks' gestation, leading to possible impaired mental development. To counter this, increased doses of DHA (1000mg per day) were administered to lactating mothers with pre-term infants, in the form of tuna oil capsules. If required, infants were given supplementary formula with matching DHA levels.

Premature girls in particular, who were exposed to DHA-rich diets, showed much better mental development than girls fed the low DHA diet. Premature male babies – who are more susceptible to cognitive problems – did not respond to the same extent, with no obvious differences in mental development between the control group and those administered high doses of DHA.

Infants weighing less than 1250gm (about a third of a full-term baby's weight) who were fed a high-DHA diet also scored better on the mental development scale, with a 40% reduction in the incidence of mild mental delay.

Of 657 premature babies tested in a trial involving five Australian hospitals, about 50% fewer infants on high-DHA diets had significantly delayed mental development compared with low DHA diets.

> "In the largest nutrition intervention trial involving preterm infants, we have shown that developmental delay at 18 months corrected age can be reduced by 30-50% as a result of feeding high dose DHA in the neonatal period."

Establishing a World-Class Centre for Geothermal Energy Research

South Australia is uniquely positioned to be at the forefront of Australia's geothermal industry. It is home to the majority of geothermal licences in Australia and to the most advanced geothermal projects. The University of Adelaide has been awarded $1.6 million from the State Government to establish a new, world-class Centre for Geothermal Energy Research.

This is the first project to be funded by the State Government's Renewable Energy Fund, and will enable the University to establish a world-class centre that will play a key role in helping to deliver a geothermal energy future for South Australia.

The University's expertise in geothermal energy is broad and deep with strong industry links, and close collaboration with the State Government through PIRSA (Primary Industries and Resources South Australia).

This new centre will conduct research into enhanced geothermal systems, and in power systems that provide an economically and environmentally viable delivery of geothermal energy.

The centre will enable South Australia to remain at the forefront of research and development in geothermal energy, and its work will result in major benefits for industry, the community and the environment. This new centre will be vitally important in helping the State to achieve its renewable energy production target of 33% by 2020.

> "It is an honour that the State Government has chosen the University's new Geothermal Energy Centre as the first project to be funded by the Renewable Energy Fund."

Pushing Light Beyond Its Known Limits

Researchers in the University's Institute for Photonics & Advanced Sensing (IPAS) have discovered that light within optical fibres can be squeezed into much tighter spaces than was previously believed possible, a breakthrough that could change the world's thinking on the full capability of light.

Optical fibres usually act like pipes for light, with the light bouncing around inside the pipe. As you shrink down the size of the fibre, the light becomes more and more confined, until you reach the ultimate limit – the point beyond which light cannot be squeezed any smaller. This ultimate point occurs when the strand of glass is just a few hundred nanometres in diameter, about one thousandth of the size of a human hair. If you go smaller than this, light begins to spread out again, and the fibres effectively become "rails" for light. This gives us the opportunity of using them as a powerful new platform for interacting light with materials and creating transformational new devices for sensing.

University researchers have discovered they can now push beyond that limit by at least a factor of two. They can do this due to new breakthroughs in the theoretical understanding of how light behaves at the nanoscale made by IPAS Research Fellow Dr Shahraam Afshar, and the use of a new generation of nanoscale optical fibres being developed at the Institute by Associate Professor Heike Ebendorff-Heidepriem. This discovery is expected to lead to more efficient tools for optical data processing in telecommunications networks and optical computing, as well as new light sources and sensing tools.

By being able to use our optical fibres as sensors we are developing tools to detect viruses such as flu in real time and help IVF specialists to determine which egg should be chosen for fertilisation; or gauge the safety of drinking water; or alert maintenance crews to corrosion occurring in the structure of an aircraft.

Professor Tanya Monro, ARC Federation Fellow at the University of Adelaide and Director of IPAS, says we are doing pioneering research that is pushing the boundaries of how we can control light, and creating platform technologies to allow us to investigate our world in new ways.

> "This will enable us to study the applications of light at much smaller scales than we've ever thought possible. It will help us to better understand and probe our world in ever smaller dimensions."

$30M Super Greenhouse to Help Sustain Global Agriculture

The University of Adelaide has launched one of the world's most sophisticated plant research facilities, set to make huge advances in international agricultural sustainability and deliver significant benefits to Australia's agriculture and horticulture industries.

Based at the University of Adelaide's Waite Campus, the $30 million facility known as The Plant Accelerator is the largest and most advanced public facility of its type in the world. The facility will lead critical research into the yield and quality of crops that can tolerate drought, salinity and disease.

The "super greenhouse" features a series of 50 high-tech glasshouses and laboratories housing more than 1km of conveyor systems that will deliver plants automatically to state-of-the-art imaging, robotic and computing equipment. This will allow continual measurement of the physical attributes (the phenotype) of up to 160,000 plants a year. The accelerator mode of this facility will come from its ability to identify more rapidly those varieties that will be successful, and therefore reduce the time between the breeding of new varieties and their delivery to agricultural producers.

The University of Adelaide's Waite Campus is the pre-eminent plant science research site in Australia, with a critical mass of 1200 researchers from at least eight organisations on one campus. The Plant Accelerator is an Australian first and will improve international efforts to cultivate sustainable crops, as well as providing a competitive edge for Australia's $28 billion annual agriculture export industry.

Ultimately, this facility will enable researchers to respond faster to market needs, and give Australia a head start in a field of research that will deliver practical benefits to Australian primary producers.

> "We are confident that research conducted using this facility will lead to major discoveries that hold the key to solving some of the world's greatest problems in food production and hence food security, particularly in the face of climate change."

Dance that Sparked a Cultural Revolution

The recently completed ARC-funded Linkage project 'The Ballets Russes in Australia: Our Cultural Revolution' brought together the University of Adelaide, The Australian Ballet and the National Library of Australia in a partnership that was unique in Australian performing arts research. The project explored the impact and legacy of tours to Australia and New Zealand by the renowned Ballets Russes (Russian Ballet) companies during the 1930s.

The tours afforded Australian audiences the rare opportunity to experience contemporary high art of the kind seldom seen here previously, including choreographies by Massine, music by Stravinsky and decors by Picasso.

Over its four year span the Linkage project yielded celebrated performances by The Australian Ballet, art exhibitions, scholarly publications, a symposium, and national radio and television coverage - the latter including A Thousand Encores: The Ballets Russes in Australia, which screened nationally on ABC TV in November 2009. A collection of essays by national and international scholars, entitled The Ballets Russes in Australia and Beyond, is currently in production at Wakefield Press and will be published in late 2010.

> Such was the impact of the Ballet Russes tours on artists and audiences alike that they left a significant and ongoing legacy on the Australian cultural landscape.

Making Herbal Medicines Safer

A University of Adelaide forensic pathologist, Professor Roger Byard, has sounded a worldwide warning of the potential lethal dangers of herbal medicines if taken in large quantities, injected, or combined with prescription drugs.

There's a false perception that herbal remedies are safer than manufactured medicines, when in fact many contain potentially lethal concentrations of arsenic, mercury and lead. These substances may cause serious illnesses, exacerbate pre-existing health problems or result in death, particularly if taken in excess or injected rather than ingested. Professor Byard says there can also be fatal consequences when some herbal medicines interact with prescription drugs.

An analysis of 251 Asian herbal products found in United States stores identified arsenic in 36 of them, mercury in 35 and lead in 24 of the products. As access to such products is largely unrestricted and many people do not tell their doctor they are taking herbal medicines for fear of ridicule, their contribution to death may not be fully appreciated during a standard autopsy.

Herbal medicines are frequently mixed with standard drugs, presumably to make them more effective. This can also have devastating results as some herbal medicines may also have a variety of effects on standard drugs. St John's Wort can reduce the effects of warfarin and cause intermenstrual bleeding in women taking the oral contraceptive pill. Gingko and garlic also increase the risk of bleeding with anticoagulants and certain herbal remedies such as Borage Oil and Evening Primrose Oil lower the seizure threshold in epileptics.

Professor Byard says the American Society of Anaesthesiologists has recommended its patients discontinue using herbal medicines at least two weeks before surgery because of the risks of herbal and drug interaction, including an increased chance of haemorrhaging.

Herbal medicines have become increasingly popular in western countries in recent years, with an estimated 30% of United States citizens using them, often without their doctor's knowledge.

"Forensic pathologists the world over need to become more aware of the contribution that herbal medicines are playing in a range of deaths, that is not currently recognised," Professor Byard says.

> "Our research outlines the highly toxic nature of many herbal substances, which a large percentage of users around the world mistakenly believe are safe."

Environmental Impact

A new study led by the University's Environment Institute Director of Ecological Modelling, Professor Corey Bradshaw, has ranked most of the world's countries for their environmental impact.

The research uses seven indicators of environmental degradation to form two rankings – a proportional environmental impact index, where impact is measured against total resource availability, and an absolute environmental impact index measuring total environmental degradation at a global scale. The indicators used were natural forest loss, habitat conversion, fisheries and other marine captures, fertiliser use, water pollution, carbon emissions from land use and species threat.

Professor Bradshaw said these indices were robust and comprehensive and, unlike existing rankings, deliberately avoided including human health and economic data – measuring environmental impact only.

The study, in collaboration with the National University of Singapore and Princeton University, found that the total wealth of a country (measured by gross national income) was the most important driver of environmental impact. Researchers correlated rankings against three socio-economic variables (human population size, gross national income and governance quality) and found that total wealth was the most important explanatory variable – the richer a country, the greater its average environmental impact. There was no evidence to support the popular idea that environmental degradation plateaus or declines past a certain threshold of per capital wealth (known as the Kuznets curve hypothesis).

The world's 10 worst environmental performers according to the proportional environmental impact index (relative to resource availability) are: Singapore, Korea, Qatar, Kuwait, Japan, Thailand, Bahrain, Malaysia, Philippines and the Netherlands.

In absolute global terms, the 10 countries with the worst environmental impact are (in order, worst first): Brazil, USA, China, Indonesia, Japan, Mexico, India, Russia, Australia and Peru.

> "The environmental crises currently gripping the planet are the corollary of excessive human consumption of natural resources. There is considerable and mounting evidence that elevated degradation and loss of habitats and species are compromising ecosystems that sustain the quality of life for billions of people worldwide."

Bringing Mammoth Blood Back to Life

A team of international researchers has brought the primary component of mammoth blood back to life using ancient DNA preserved in bones from Siberian specimens 25,000 to 43,000 years old.

Professor Alan Cooper, Australian Research Council Future Fellow, Director of the Australian Centre for Ancient DNA and a member of the University's Environment Institute was part of a team of scientists who have resurrected mammoth haemoglobin.

The Adelaide group extracted and deciphered the genetic instructions for haemoglobin from mammoth bones preserved in Siberian permafrost.

The team managed to uncover physiological attributes of an animal that hasn't existed for thousands of years. The approach opens the way to studying the biomolecular and physiological characteristics of extinct species, even for features that leave no trace in the fossil record.

Researchers converted the mammoth haemoglobin DNA sequences into RNA and inserted them into modern-day E. coli bacteria, which then manufactured the authentic mammoth protein. Using modern scientific physiological tests and chemical modelling the team characterised the biochemical properties that confer mammoths with physiological cold tolerance. The resulting haemoglobin molecules are no different than 'going back in time' and taking a blood sample from a real mammoth.

Studies of the recreated mammoth haemoglobin reveal special evolutionary adaptations that allowed the mammoth to cool its extremities down in harsh Arctic conditions to minimise heat loss.

> This is true palaeobiology as we can study and measure how these animals functioned as if they were alive today.

Three highly unusual changes in the protein sequence allowed the mammoth's blood to deliver oxygen to cells even at very low temperatures, something that indicates adaptation to the Arctic environment.

It has been remarkable to bring a complex protein from an extinct species, such as the mammoth, back to life, and researchers can now apply similar approaches to other extinct species.

RESEARCH AND COMMERCIALISATION

Adelaide Research & Innovation (ARI) offers resources, support and commercial funding pathways to the researchers of the University of Adelaide, and provides a point of access for government and business to engage with academics on research, development and innovation.

CONNECT

ARI is South Australia's premier commercial research hub, facilitating access to the research and expertise of the University of Adelaide.

COLLABORATE

Contract research provides an opportunity to apply research expertise to real-world problems, translating knowledge into benefits for the community in Australia and around the world.

CREATE

Outstanding ideas come from universities and ARI aims to put more of the University's research discoveries on the path to commercialisation.

2009 HIGHLIGHTS

Over **$26 million** contract research and consulting revenue

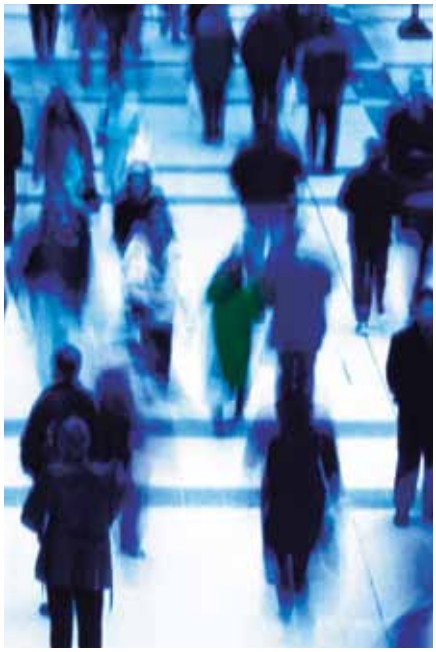
$1.7 million royalty and licensing returns, predominately from wheat and barley varieties

More than **450** commercial agreements with government and industry partners

$1.5 million funding to date from the Commercial Accelerator Scheme into the development of eight early stage technologies

$500,000 investment secured from the Trans Tasman Commercialisation Fund into new University spin out company, SNAP Video Surveillance (Australian Centre for Visual Technologies)

www.adelaide.edu.au/aripl



SOLVING SECURITY PROBLEMS IS A SNAP

Sophisticated network surveillance technology will help solve a security dilemma currently facing airports, casinos, CBDs, shopping malls and large sporting and entertainment venues around the world, including the 2012 London Olympics. New software will automatically integrate data from thousands of security cameras in a video surveillance network into a single sensor, eliminating problems with huge information overloads.

Developed at the University's Australian Centre for Visual Technologies (ACVT), the software is being commercialised by Snap Network Video Surveillance, a University spin-out company funded with a major investment from the Trans Tasman Commercialisation Fund (TTCF). Snap will receive equity funding of $500,000 from the TTCF, a $30 million venture collaboration of SA's three public universities, Monash University (Vic) and the University of Auckland (NZ) with capital funding from WA-based industry superannuation fund, Westscheme.

This patented technology will provide significant benefits to large-scale surveillance applications in Australia and internationally, saving security companies time, resources and money, as well as boosting the chance of security staff spotting potentially harmful events. Snap is the first South Australian spin-out company to receive equity funding from TTCF, reinforcing the University of Adelaide's reputation as a hub of world-class research and innovation.

ACCELERATING THE TRANSFER OF INNOVATIONS TO A GLOBAL MARKET

Several new technologies are now a step closer to market after being awarded funding from ARI's Commercial Accelerator Scheme. The projects funded range from video surveillance technology, to anti-infective agents and an international program to establish a bio data-bank addressing pregnancy disease diagnostics.

The Scheme has also supported development of a wound dressing that improves healing, controls bleeding and prevents excess scar tissue from forming after sinus surgery, which is good news for both surgeons and patients. The invention is the result of Dr Theodore Athanasiadis' PhD project under the supervision of Professor Wormald, an internationally renowned ENT surgeon and Professor of Otorhinolaryngology at the University of Adelaide. The new invention is considered superior to other technologies in this area and commercial interest has been shown by several biosurgical companies around the world.

The Commercial Accelerator Scheme is bridging the funding gap known as the 'valley of death' between traditional research funding and venture capital. Through the Commercial Accelerator Scheme we hope to be able to continue to increase the number of successful commercial ventures at the University.

$23.5 MILLION BOOST TO BARLEY BREEDING

The University is currently engaged in a five-year, $23.5 million research program with industry and government to develop new barley varieties, expected to be worth billions of dollars to domestic export markets. The University of Adelaide leads the southern node of the nationally coordinated barley breeding venture, Barley Breeding Australia (BBA), with the research at our Waite Campus recognised as among the best in the world. The agreement with Viterra (formerly ABB Grain) ensures that the University's breeding program will remain at the forefront of agricultural research and development in Australia, for the benefit of industry and the community.

Commercialisation of varieties developed through the southern node of BBA will be conducted by Viterra, who also play a critical role in evaluating new malting varieties through its wholly owned subsidiary, Joe White Maltings, and conducting export market development. Our links with government at State and Federal levels are also important, with germplasm from departments of primary industry in New South Wales and Victoria contributing to the development of new varieties.

Researcher Awards and Achievements

University of Adelaide researchers and affiliates won many prestigious awards and were recognised for their outstanding commitments and hard work.

SCOPUS YOUNG RESEARCHER OF THE YEAR AWARDS

University of Adelaide researchers won two of five Scopus National Young Researcher of the Year Awards 2010, having been selected for their research impact, output, esteem contribution and their impact on the lives of everyday Australians.

- **Professor Corey Bradshaw** was awarded the Life Sciences and Biological Sciences category.
- **Professor Prash Sanders** was awarded the Medicine and Medical Sciences category.

SOUTH AUSTRALIAN OF THE YEAR AWARDS 2009

University of Adelaide staff and graduates received five of the prestigious 2009 South Australian of the Year Awards, including the two top awards.

- **Associate Professor Bill Griggs** AM ASM was the recipient of the prestigious South Australian of the Year Award.
- **Professor Robert Norman** was named winner in both the Health and Science categories.
- University of Adelaide engineering graduate **Julian O'Shea** was named Young South Australian of the Year.
- University of Adelaide music graduate **Timothy Sexton** won the Arts category of the South Australian of the Year Awards.

SOUTH AUSTRALIAN SCIENCE EXCELLENCE AWARDS 2009

- **Professor Rob Norman**, Director of the University's Robinson Institute, was awarded 2009 SA Scientist of the Year.
- **Professor Alastair MacLennan**, Head of the University's Discipline of Obstetrics and Gynaecology and member of The Robinson Institute, won the Excellence in Research for Public Good Award.
- **Healthy Development Adelaide (HDA)**, won the Excellence in Research Collaboration Award.
- **Professor Holger Maier**, Professor of Integrated Water Systems Engineering in the School of Civil, Environmental & Mining Engineering won the Tertiary Science Educator of the Year.
- **Dr Alice Rumbold**, Senior Research Fellow in the Discipline of Obstetrics and Gynaecology and Robinson Institute, was announced as the South Australian Young Tall Poppy of the Year.

THE WEEKEND AUSTRALIAN MAGAZINE'S NEXT 100 EMERGING LEADERS SERIES IN THE SCIENCE CATEGORY

Professor Tanya Monro, Director of the University's Institute for Photonics and Advanced Sensing, was the winner of the "Next 100 Emerging Leaders" series in the Science category.

The University had 3 of its scientists in the list of 10 Emerging Leaders in Science with **Associate Professor Sarah Robertson**, Co-Director of the Research Centre for Reproductive Health, and **Professor Mark Tester**, Federation Fellow at the Australian Centre for Plant Functional Genomics.

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL (NHMRC) 10 OF THE BEST

A research project undertaken by neurophysiologist **Dr Julia Pitcher** and her team from the Robinson Institute was named among the Top 10 health and medical research projects in Australia. Dr Pitcher's 4-year NHMRC funded research project found evidence that even mild prematurity alters normal development of the motor cortex area of the brain that controls movement.

AUSTRALIAN DIABETES SOCIETY KELLION AWARD

Professor Michael Horowitz, in the School of Medicine, received Australia's premier award for research into diabetes and his contribution to diabetes research over the past 27 years.

FULBRIGHT SCHOLARS

University of Adelaide graduates **Matthew Lee, Lewis Tunstall and Simon Gamble**, and University affiliate **Steven Lapidge**, were among 25 Australians announced as the latest recipients of the prestigious Fulbright scholarships to study in the US. They will conduct research on water regulation, particle physics, renewable energy technology and the control of feral pigs.

FELLOWS

Three staff members and 3 affiliates were among 22 new Fellows elected to the Australian Academy of the Humanities:

- **Associate Professor Han Baltussen**, Associate Professor in Classics and Ancient Thought
- **Professor Garrett Cullity**, Hughes Professor of Philosophy
- **Professor David Lemmings**, former Head of School of History and Politics
- **Professor Peter Hambly**, Visiting Research Fellow in European Studies
- **Professor Rosemary Lloyd**, Adjunct Professor of French
- **Associate Professor Peter Davis**, Visiting Research Fellow in Classics

Professor Pascale Quester, Executive Dean of the Faculty of the Professions, was made a Fellow of the Australian and New Zealand Marketing Academy (ANZMAC).

Professor Tanya Monro, Director of the Institute for Photonics & Advanced Sensing (IPAS), was made a Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE).

Dr Mike McLaughlin, Chief Research Scientist, CSIRO Land and Water, and Professor, University of Adelaide's School of Earth & Environmental Sciences, was also made a Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE).

NHMRC Research Fellowships were awarded to:

- **Dr Michael Beard**, Molecular and Biomedical Sciences
- **Associate Professor Christine Feinle-Bisset**, Medicine
- **Associate Professor Jeremy Thompson**, Obstetrics and Gynaecology
- **Associate Professor Kenneth McLaughlin**, Obstetrics and Gynaecology
- **Associate Professor Sarah Robertson**, Obstetrics and Gynaecology
- **Dr Jodie Dodd**, Obstetrics and Gynaecology

ARC AUSTRALIAN LAUREATE FELLOWSHIP

A prestigious Australian Laureate Fellowship was awarded to internationally renowned physicist **Professor Anthony Thomas FAA**, former Chief Scientist and Associate Director for Theoretical and Computational Physics at Jefferson Lab, the US Department of Energy's Thomas Jefferson National Accelerator Facility in Virginia, USA.

Professor Thomas will lead a new Research Centre for Complex Systems and the Structure of Matter.

CAREER DEVELOPMENT AWARDS

The University of Adelaide was awarded six NHMRC Career Development Awards:

- **Dr Michele Grimbaldeston** for research into skin pathology and inflammation
- **Dr Quenten Schwartz** for work in neural crest stem cell development
- **Dr Grant Buchanan** for research into prostate cancer
- **Associate Professor Andreas Evdokiou** for research into the treatment of skeletal malignancies
- **Associate Professor Karen Jones** for research into postprandial hypotension in the elderly
- **Associate Professor David Brennan** for research into the use of services and oral health outcomes

YOUNG INVESTIGATOR AWARD

Alison Care was named the 2009 winner of the prestigious Children, Youth and Women's Health Service Young Investigator Award.

Her research has examined the role of a type of immune cells known as macrophages (white blood cells) within the ovary, which are found in abundance around developing eggs and in hormone-producing structures within the ovary.

Alison is a PhD student in the University of Adelaide's Discipline of Obstetrics and Gynaecology, in the Research Centre for Reproductive Health, Robinson Institute.

SHARING GREAT RESEARCH

Research Tuesdays profile the University of Adelaide as the premier research university in South Australia. The monthly presentation series shares some of our University researchers' most fascinating discoveries with members of Government, industry and local communities, and addresses key state, national and global priorities while expanding general knowledge of specific research topics.

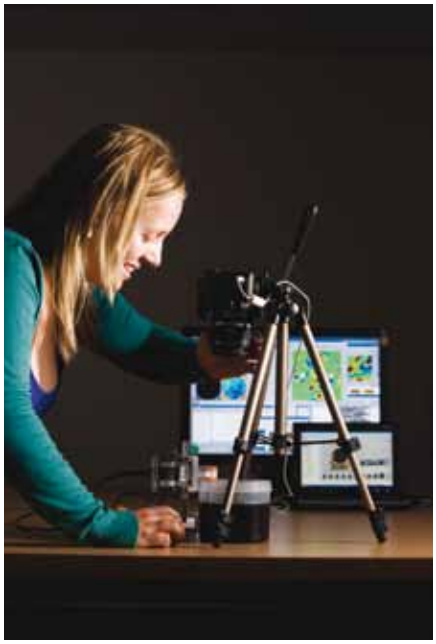
Some of the exciting topics covered over the past year include:

- Feeding Anxiety – The World Food Crisis Forum
- A World of Hurt. The true global death count of environmental degradation
- Defrosting Gondwana – How electromagnetic "eyes" are piercing the Antarctic ice to reveal a former supercontinents' deepest secrets
- Who's the Boss? An exploration of the ongoing tug-of-war between fairness and flexibility in the Australian workplace
- Commanding Health. How controlling the movement of cells can lead the fight against cancer, infection and autoimmune disease
- Generating Hope. With research showing stem cells can generate brain repair, could stroke damage soon be reversed?
- Easier Pills to Swallow Natural digestive system medicines are emerging with a previously elusive ingredient - evidence
- Hard Sell – The Ethics of Marketing
- The ethical requirements that apply to groups, and what they mean for us as individuals
- Rising to Global Power How Australia could supply the whole world's energy needs
- Where have the birds gone. Why replacing our native habitat is vital to saving species from extinction

All presentations can be found at:
www.adelaide.edu.au/researchtuesdays

RESEARCH STUDENTS – SHAPING OUR FUTURE

The University of Adelaide is committed to providing high quality education and training to our students, so that they have the necessary skills and opportunities to fulfil their potential and achieve their goals. With such a strong focus on teaching and professional development, our students are highly successful and go on to gain employment in a wide variety of areas both within Australia and overseas. Using the knowledge they have gained during their time at the University, many students have gone to have successful careers in research and academia, while others have pursued careers in a range of government and industry positions.



WHY UNDERTAKE YOUR RESEARCH DEGREE AT THE UNIVERSITY OF ADELAIDE?

As one of Australia's leading Group of Eight research intensive universities, the University of Adelaide contributes significantly to the wealth and well-being of the nation. We have a long tradition of exemplary scholarship, influential graduates, innovation and groundbreaking research.

The strong focus on research creates an exciting and stimulating environment for our postgraduate students. You will be working with staff who are among the world's best in their fields, mixing with other postgraduates from all areas of the globe, and benefiting from high-quality facilities.

Your decision to undertake postgraduate research at the University of Adelaide is a decision to further your career in an environment which pursues excellence, values creativity, and gives its graduates the opportunity to make an impact on the world.

www.adelaide.edu.au/research-degrees

OUR STUDENTS

MICHAEL LING, PHD IN DEVELOPMENTAL NEUROGENETICS

"The University of Adelaide provides a resourceful and supportive environment for conducting rigorous and high quality doctoral research, while broadening my global network. My PhD will provide excellent career prospects beyond academia and my existing role as a scientist."

PETER CHAMBERLAIN,
COMBINED MASTER OF PSYCHOLOGY (CLINICAL)/PHD

"The opportunity to complete a Masters and PhD has provided me with research skills that I would otherwise have had difficulty acquiring, and has widened my career options considerably for the future. The support has been extraordinary."

MEREDITH COLEMAN, PHD IN EDUCATION

"While further developing my professional qualifications in teaching, studying at the University of Adelaide has extended my career path and allowed me to change directions. I've also enjoyed the opportunity to pursue my sporting ambitions and represent the University overseas."

SUSAN PEARCE, PHD IN MECHANICAL ENGINEERING

"My doctorate in engineering has given me the potential to pursue research and solve problems for organisations all over the world – I hope to become involved with materials research for the space program."

MARK SOSNOWSKI, PHD IN PLANT PATHOLOGY

"Completing a PhD at Adelaide led to my Research Scientist role. I now develop viticulture management strategies for optimal wine quality, and undertake biosecurity research to better prepare the Australian viticulture industry for potential outbreaks of exotic diseases."

JESSICA LAURENCE, PHD IN OBSTETRICS AND GYNAECOLOGY

"In my Honours year I found the University of Adelaide provided support, expert research supervision, resources and networking opportunities. Doing my PhD with the University will allow me to become a leader in community health research."

SONIA PAKNIYAT, MASTERS IN ART HISTORY

"The program has taken me through a journey of visual experience – which taught me critical ways of thinking as well as the ability to write about works of art."

RESEARCH APPOINTMENTS

The University has an established reputation for excellence in research, an accolade achieved through the quality of its research output and research staff. It brings together world-leading researchers supported by modern infrastructure and an innovative culture, uniting a community of more than 1,300 researchers.

Do you want to be part of a world leading research team, central to the University's strategy to tackle both Australian and global research challenges and priorities?

www.adelaide.edu.au/jobs

CONTACTS

OFFICE OF THE DEPUTY VICE-CHANCELLOR & VICE-PRESIDENT (RESEARCH)

The role of the Deputy Vice-Chancellor and Vice-President (Research) is to provide leadership and vision in achieving the University's strategic goals, particularly in relation to research and research training policy across the University.

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ADELAIDE GRADUATE CENTRE

The Adelaide Graduate Centre oversees the management and awarding of Higher Degree by Research (HDRs), the provision of researcher education programs and the development of Higher Degree by Research policy at the University of Adelaide. The Centre's responsibilities for Higher Degree by Research students include scholarships, domestic admissions, enrolments, administration of candidature, and examinations. Helpful and friendly staff are always on hand to offer advice and assistance.

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RESEARCH BRANCH

The Research Branch supports the University's research endeavour and performance, by providing services to the University's research community in relation to external competitive research grants and postdoctoral fellowships, pre- and post-award. The Branch oversees the HERDC research publications data collection on behalf of the University, and supports research compliance related activities including Human Research Ethics, Animal Ethics, Gene Technology regulation (Institutional Biosafety Committee) and Quarantine. The Research Branch also provides advice on relevant University research policies.

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ADELAIDE RESEARCH & INNOVATION

Adelaide Research & Innovation manages all the University's commercial research and consultancy partnerships, forms new business ventures based on University research, and develops the University's intellectual property estate. Their mission is to apply the research and expertise of the University to client needs and business opportunities, enabling organisations based on new knowledge to grow, expand the University's research capability and benefit the broader community.

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GIVING TO UNIVERSITY OF ADELAIDE RESEARCH

The University of Adelaide is renowned for its education and research excellence. To maintain and build on our excellence, we need to invest in new scholarships, staff appointments, academic courses, research facilities and other vitally important resources.

www.alumni.adelaide.edu.au/giving

www.adelaide.edu.au/research