WESTERN SYDNEY
UNIVERSITY

RESEARCH MAKERS

WORLD LEADING RESEARCH.
WORLD CHANGING IMPACT.

ABOUT

Western Sydney University is a large, student-centred, research-led university, embracing Australia's global city, Sydney. Established in 1989, the University proudly traces its history to 1891 through the Hawkesbury Agricultural College. Today the University has more than 180,000 alumni, 45,000 students and 3,300 staff.

The University is now ranked in all major global university ranking systems and is in the top two per cent of universities worldwide. Through investment in its academic strengths and facilities, the University continues to build its profile as a research leader in Australia and is nurturing the next generation of researchers.

Western Sydney University graduates go on to take up rewarding careers that make real contributions to societal change, lifting the pride of students, staff and the community. A guiding principle for the University is that there is no limit to potential success for those with drive, talent, confidence and ambition.

westernsydney.edu.au

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FOREWORD

We are delighted to present to you Western Sydney University's first edition of Research Makers. Inside we offer a celebration of Western's research journey and an insight into the research and research impact delivered by Western's Research Institutes. Detailing the work of the Hawkesbury Institute for the Environment (HIE), the Institute for Culture and Society (ICS), MARCS Institute for Brain, Behaviour and Development, the NICM Health Research Institute and the Translational Health Research Institute (THRI), Research Makers reflects the boon to research which consolidating cohorts of research excellence enables.

Western's Research Institutes draw on expertise from across the University – bringing many minds and collective knowledge together to tackle local, national and global issues. The success of Western's approach is evidenced by our standing as one of the world leaders for research in fields such as complementary and alternative medicine, soil sciences, ecology, plant biology, environmental sciences, biological sciences, agricultural sciences, medical health sciences, pharmacology and pharmaceutical sciences, oncology and carcinogenesis, human geography, psychology, cultural studies and literary studies. The research and outcomes that flow from Western's Research Institutes is cross disciplinary and engaged. Western's research benefits from the input of our industry and government partners and our research end users. Our Research Institutes each boast longstanding and productive relationships – nationally and internationally.

At Western we recognise the importance of partnering with end users, those for whom our research makes a difference – a difference to their work, a difference to their lives. Our partners are invested in our outcomes. Partnering at Western is more than supporting the work of our researchers, it is being part of that research – designing research, performing research. With our partners as part of our research teams we deliver impact to industry and communities locally, nationally and globally.

This model has prompted the next step in Western's research journey. Building on the experience of success realised through our Research Institutes, Western is launching three new Strategic Research Initiatives. These new consolidations of research strength draw on researchers and their research partners from across Western's existing Schools and Research Institutes. Confronting sometimes global and often wicked problems, Western's Strategic Research Initiatives bring a cross disciplinary focus to important issues to arrive at solutions that can be translated into real life actions – actions through policy, practice, economic change, health advances – actions that make a difference beyond our University's gates.

We are confident that these new initiatives will produce meaningful outcomes. We are excited by the prospect of the end results, what these could mean for Western Sydney, what these could mean nationally and internationally. Western's new Strategic Research Initiatives are tackling big issues – the start to life, developing resilience in youth and solving the problems of the modern age through technological innovations inspired by biology.

Transforming early Education And Child Health (TeEACH) addresses the wicked problems impacting the early years of children's health and learning, such as poverty and inequalities. The Young and Resilient Research Centre will research and develop technology-based products, services and policies that strengthen the resilience of young people and their communities. Our International Centre for Neuromorphic Systems (ICNS), develops neuromorphic sensors, algorithms, and processing hardware, applying these to solve a multitude of global problems from monitoring space junk to controlling neuroprosthetics devices.

We are proud of the research and the impact that has been and will continue to be produced by the researchers at Western, and we invite you to share in the stories of our collective excellence.

Professor Barney Glover AO
Vice-Chancellor and President

Professor Deborah Sweeney,
Deputy Vice-Chancellor

PACE project Hawkesbury (Investigation of drought tolerance in grass species)

THE **MARCS** INSTITUTE FOR BRAIN, BEHAVIOUR AND DEVELOPMENT

OPTIMISING HUMAN INTERACTION, WELLBEING AND DEVELOPMENT

The MARCS Institute for Brain, Behaviour and Development studies human communication, from neural networks to language acquisition and our interaction with robots.

Understanding the scientific bases of how humans interact and communicate with each other and the world around them holds the key to answering problems such as predicting and preventing language delay, the benefits of bilingualism, managing cognitive changes as we age, and coding autonomous systems we can trust.

Over the last 20 years, the MARCS Institute for Brain, Behaviour and Development has become Australia's leading centre for the study of how humans interact with each other, their environment, and with technology.

Director, Professor Kate Stevens, says activities range from basic research, for example, the mechanics of language acquisition, creativity, and emotion recognition, to translational, cocreated research that aims to improve wellbeing and development across the lifespan.

The MARCS Institute's work has informed policy and practice around early learning, newborn infant hearing tests, rehabilitation for people with sensory or cognitive impairment, and the development of biomedical devices and wearables, she says.

'Our research responds to real-life questions in our hospitals, schools and community – across the lifespan and across cultures,' she says.

The MARCS Institute now boasts more than 120 researchers from a broad range of disciplines including psychology, cognitive neuroscience, software, electronic and biomedical engineering, speech, and music science. Their expertise in brain sciences and engineering is vital as healthcare, transport, security and services become digital, automated, robotic, autonomous, augmented or virtual.

Researchers engage with the community through BabyLab research facilities, which are visited by 1,000 infants and their caregivers each year, Kinderling radio podcasts, outreach events such as the Music in the Brain (MITB) initiative, as well as collaborative research projects with not-for-profits, government and industry, nationally and internationally.

EXCELLENCE

- More than 120 researchers
- Competitive grant and research income in excess of $25M since 2010
- Ranked Above World Standard: Linguistics, Psychology, and Electrical and Electronic Engineering
- Node of the Australian Research Council Centre of Excellence for the Dynamics of Hearing (CoEDL)
- Member of the HEARing Cooperative Research Centre
- 11 specialist laboratories with equipment assets exceeding $5M, housed in an area of over 3,000m²

FACILITIES

- BabyLab
- Transcranial Magnetic Stimulation, TDCS and fNIRS systems
- High performance computing cluster
- Optotrak and Vicon motion tracking and XR-Unity VR systems
- Eye-tracking apparatus
- Electroencephalography for infants and adults
- Psychophysiological recording hardware and software
- Performance studio with high end musical keyboards, spatial audio and recording facilities
- Bioelectronics and neuromorphic engineering labs

A T-SHIRT THAT CAN MONITOR HEALTH WHILE YOU SLEEP

A wearable, electrodeless T-shirt developed by MARCS Institute researchers Dr Gaetano Gargiulo and Dr Paul Breen is currently being commercialised for people with sleep apnoea.

VitalCore monitors breathing and heart rate by tracking tiny chest movements via highly sensitive embedded sensors. The technology also has applications for foetal monitoring, sport, and for people who have dementia and other comorbidities.

'Noncompliance of sleep apnoea devices is a serious problem,' says Dr Breen.

'At the moment there is no means of providing an ongoing optimisation of treatment and, in addition, current devices are expensive and uncomfortable, so patients do not adhere to the therapy. Our technology will be used to address these issues by using a tailored suite of devices that suit the needs of the individual.'

The VitalCore T-shirt is funded by a Cooperative Research Centre project in collaboration with Oventus Medical, Medical Monitoring Solutions, CSIRO, Western Sydney University and Neuroscience Research Australia..

HOW TO MAKE ROBOTS MORE TRUSTWORTHY

Even with the most advanced autonomous technology – robots – there is invariably still a human in the loop. MARCS Institute's research is helping industry and defence to understand the best ways of ensuring human operators trust the software.

With applications ranging from drone operation to supporting recovery from traumatic brain injury, the research into the interface between human users and technology is providing some fascinating insights into our interactions with an increasingly automated world.

For example, one research project by roboticist Dr Chris Stanton found that women, but not men, are less likely to trust humanoid robots that stare at them.

In his study, women became noticeably uncomfortable and did not do what the robot suggested during constant gaze, unlike men, for whom the robot's frequent eye gaze appeared to have little effect.

'These study findings are important because we have demonstrated variations in how males and females respond to and interact with AI. In turn, this can inform adapting humanoid robot designs to differing contexts and users,' Dr Stanton said.

BABYLAB SHED LIGHT ON THE DETERMINANTS OF DYSLEXIA

The MARCS Institute's BabyLab is paving the way for early intervention to prevent dyslexia in at-risk infants.

The BabyLab is a large speech and language research facility that studies a variety of aspects of language, cognitive and social development.

A longitudinal study has found that babies who have one parent with dyslexia are less able to discriminate (hear) subtle changes in sound. The home environment and 'infant-directed speech', which we know is crucial for learning to perceive and produce language, may also differ.

The study may lead in future to interventions that support parent-infant interaction, as well as early intervention for children identified to be at risk of dyslexia well before they start school.

LESSONS FROM THE HUMAN BRAIN

HELPING BUILD MORE EFFICIENT COMPUTERS

The International Centre For Neuromorphic Systems (ICNS) at Western Sydney University is the only dedicated neuromorphic laboratory in Australia and is on track to becoming the leading group in the world.

> **We are offering an innovative and changing way of sensing and processing that's basically inspired by biology. It is changing the way we approach problems.**
>
> DR GREG COHEN

The human body, says Dr Greg Cohen, is surprisingly good at processing information. Our brains are faster, more robust and more efficient than even the most advanced technology, and we process information using very little energy.

Applying biological principles of signal processing to electronic devices is a burgeoning research field called neuromorphic engineering. It promises the ability to increase the speed and reduce the power consumption of machine learning, and lends itself to the development of sensors, algorithms and processing hardware to solve a range of industry and defence problems.

Research into neuromorphic engineering has exploded internationally in the last decade as it becomes clear that we have reached the physical limits for how small transistors can go.

'It's recognised that alternative approaches are needed to keep improving the performance of electronic devices,' says Dr Cohen.

'We are offering an innovative and changing way of sensing and processing that's basically inspired by biology. It is changing the way we approach problems.'

Western has invested strategically in this opportunity with the announcement of the International Centre for Neuromorphic Systems (ICNS), the largest research group of its kind and the only dedicated neuromorphic laboratory in Australia.

ICNS has grown out of an existing research stream of the MARCS Institute for Brain, Behaviour and Development, and is on track to become the leading academic neuromorphic engineering research group in the world. Led by neuromorphic engineering pioneer, Professor André van Schaik, the Centre is set to double in size in 2019.

Research is conducted in three streams, investigating perception via sensors that mimic the human senses of sight, hearing and touch; processing to make computers more efficient; and designing algorithms to process data from the sensors.

One exciting application already being developed is Space Situational Awareness (SSA), which consists of biologically-inspired sensors to track satellites, space junk, and other low-earth-orbit objects.

Unlike cameras, which capture images in frames, these sensors mimic aspects of the receptors in the human eye, gathering data only on what has changed in the sky and dismissing information that is redundant. The sensors are able to track satellites continuously, including during daylight. They are highly cost effective and use very low power.

SSA has shown it can achieve measurements that cannot be taken with other available technology. For example, is has observed the International Space Station from a ground-based telescope during bright daylight. The project is being funded by the Royal Australian Air Force and US Air Force Office of Scientific Research.

Another potential use of neuromorphic engineering is to design algorithms for Machine Learning.

'Artificial Intelligence and Machine Learning have become the hottest topic of research in the world – but they use hardware based on traditional computer technology, which is very power hungry,' Dr Cohen says.

'Neuromorphic engineering promises to develop hardware that is significantly more energy efficient.'

RESPONDING TO GLOBAL CHANGE

The Hawkesbury Institute for the Environment is an Australian leader in providing scientific evidence on the best ways to respond to climate change.

The changing climate, rising carbon dioxide levels and changing management and technology in agriculture are all having a greater impact on the world's ecosystems than at any time in history.

How we respond to these changes – and even take advantages of the opportunities they bring – is a crucial question that will impact both the natural environment and cultivated land for future generations.

The Hawkesbury Institute for the Environment's (HIE) research into the effects of the multiple drivers of global change on living organisms and the ecosystems they form has informed agriculture, forestry and environmental decision making both in Australia and internationally.

HIE's Director of Research, Professor Ben Smith, says the institute is emerging as an international leader in the environmental sciences and their application to sustainability.

'We are unique in that we have a broad range of researchers all looking at different angles within the same research question – we bring their expertise together with the latest technology and facilities to try to solve these problems in an innovative way,' he says.

More than 60 HIE researchers and 80 postgraduate research students represent a broad range of disciplines, with expertise including global change biology to terrestrial ecology, plant physiology, animal and microbial ecology and soil science.

They work collaboratively using world-leading experimental facilities and technology to address large-scale research questions ranging from the effects of global changes on microbes and genes to the modelling and analysis of vast ecosystems around the world.

Their important findings include field-based evidence that Australian trees will be able to store less carbon than expected under the elevated carbon dioxide levels that are expected in coming decades – unlike what has been suggested in previous laboratory-based studies. They have also found that there are only 500 dominant types of bacteria in the soil around the world, and that soil biodiversity is crucial in protecting human health.

The research has informed decision-making around land use management, bushfire risk and wildlife care. HIE has produced models to predict the likely effects of changes in atmospheric carbon dioxide, temperature and rainfall on vegetation. This research has shown the effects of heatwaves on trees, and identified characteristics that could enable agricultural crop and forestry species to thrive in a rapidly-changing world.

EXCELLENCE

- → Five research fields ranked well above world standard
- → Leading node for Australian and international collaboration on global change ecosystem science
- → $6 million in government and industry research funding

FACILITIES

- → EucFACE – unique facility for studying the impacts of elevated CO_2 effects on mature forest ecosystems
- → Whole Tree Chambers – for creating controlled environments to assess the functioning of trees up to 9m in height
- → Large Rainout Shelters – large structures that impose drought conditions on trees up to 6m in height by excluding rainfall and allowing sunlight and wind
- → Hawkesbury Forest Experiment – a plantation-style stand of mature eucalypts that aims to measure connections between forest nutrition, irrigation methods and long-term productivity
- → DRI-GRASS – an experiment of 48 small rainfall exclusion shelters that tests the role of below-ground root herbivores on grassland productivity under varied drought and rainfall patterns
- → Pastures and Climate Extremes Facility – six rainfall exclusion tunnels to impose drought conditions on mixes of grass and legume species used in grazing and dairy applications
- → Cumberland Plain Observatory – a tower that observes the background functioning of the Cumberland Plain Woodland for monitoring how the ecosystems cycles water and gases
- → Greenhouses & Insectary – a range of controlled-environment greenhouses for applying heat, drought and growth experiments on potted experiments.
- → Labs & Growth Chambers – world-class laboratory and controlled-growth chambers for environmental and science research
- → National Vegetable Protected Cropping Centre – the new 1,800 m² glasshouse built with the best available glasshouse control systems, designed to provide training, education and research for glasshouse specialists

HOW RISING CO_2 WILL AFFECT AUSTRALIA'S NATIVE FORESTS

Rising carbon dioxide concentrations in the air are driving climate change – but they are also good news for plants because they promote photosynthesis.

However, we don't know what increased carbon dioxide will mean for species growing in the natural environment. This is an unusually challenging question to answer because carbon dioxide levels are the same the world over, meaning it's impossible to study one site compared to another.

Towering over the Cumberland Plain forest, the massive EucFACE facility is providing the infrastructure to study increased carbon dioxide in the real world.

EucFACE uses an open-air system and advanced computer-engineering controllers to elevate carbon dioxide concentrations within a Cumberland Plain forest red gum stand so researchers can test the effects on the entire forest ecosystem. It's the only field-based experiment in the world to study the effects on trees of rising carbon dioxide combined with lack of water and phosphorus – a common problem in Australian soils.

Among its most significant findings are that, although elevated carbon dioxide concentrations lead to increased photosynthesis, this doesn't translate into faster growth in trees in Australia. This was unexpected, and is not seen in comparable studies of temperate forests in the northern hemisphere.

The problem in Australia is a lack of phosphorus in the soil to enable the trees to grow. When the soil is enriched with phosphorus, the trees grew 35 per cent more.

'The implications of this research are that, in a forestry context, or in the tropics where there is low phosphorus, you may need to fertilise the soil to take advantage of rising carbon dioxide concentrations,' Professor Smith says.

DATA TO DRIVE A NEW INDUSTRY STANDARD ON NURSERY TREES

HIE has worked with industry and Standards Australia to develop a new quality standard for landscape trees sold in nurseries, based on Australian-first data on how trees grow in different climates.

The institute was commissioned by the nursery industry to develop a dataset of 14,000 trees in nurseries around the country. The researchers found there was considerable variation in quality and recommended that a far wider range of trees could be suitable for planting in different environments.

Supported by the industry, this information was used by Standards Australia to re-release AS2303:2018 Tree stock for landscape use standard in December 2018. This will create a significant opportunity for the industry to demonstrate compliance and quality at the point of purchase, with data-driven evidence to support the suitability for sale of a much greater number of standard-compliant trees.

AN INTEGRATED APPROACH TO HEALTH RESEARCH

The Translational Health Research Institute brings together leading researchers with a mission to translate basic research into community health services and policy.

Greater Western Sydney has Australia's fastest growing and most culturally and ethnically diverse urban population. It's basically a 'living lab' that is providing research insights with international relevance, says Director of the Translational Health Research Institute (THRI), Professor Janette Perz.

The patient cohort is extremely multicultural and multi-ethnic, with a high concentration of chronic diseases, mental illness and addiction, she says.

Research conducted to address these health challenges on the University's doorstep is providing new treatments and strategies to improve the health and wellbeing of similar communities worldwide.

'Our work in Western Sydney is a good test tube for what needs to be done nationally and internationally,' Professor Perz says. 'There is considerable interest from national and international consortia in what we are doing.'

THRI was established as an umbrella research institute for Western's health and medical research – to act as a bridge between researchers, policy makers, clinicians and patients to ensure discoveries are translated more quickly to real-world outcomes.

Its aim is to integrate world-class research into policy and practice. 'It's providing a new model of health research that focuses on the community and takes into account carers and families, the local economy and the environment,' says Professor Perz.

Research conducted under the THRI umbrella spans from medical and clinical science to public and population health, health services, mental health and allied health research. Much of this work is conducted in partnership with health practitioners, hospitals, local health districts, primary health networks and consumers.

Research impact has included policy change, the launch of clinical trials and the clinical adoption of new treatments.

DR GENEVIEVE STEINER

ADDRESSING THE CULTURAL DRIVERS OF DIABETES IN WESTERN SYDNEY

Type 2 diabetes has a greater impact in Western Sydney than other parts of Sydney, with almost twice the number of hospitalisations and more than half the population overweight or obese.

Professor David Simmons and his team are working with clinicians from hospitals and general practices to try to lower rates of diabetes through initiatives to prevent obesity, diabetes and associated complications.

Their work goes beyond metabolic and public health research to consider the cultural drivers of diabetes in Western Sydney.

One project, Reducing the Impact of Diabetes in the Samoan Community, involves working with the Samoan community's church network, local health districts and primary health networks to find effective ways of preventing and managing diabetes in this community.

EXCELLENCE

- → World-class health and medical research
- → Partnerships with health professionals, hospitals, local health districts, primary health networks and patients
- → Over 120 academic researchers across 6 schools and 2 institutes/40 HDR students

SEXUALITY, INTIMACY AND FERTILITY AFTER CANCER

Some of the most distressing experiences reported by people who have survived cancer treatment are related to sexuality and intimacy. A research program at Western is breaking new ground in understanding how gender affects cancer survivorship, says Jane Ussher, Professor of Women's Health Psychology.

Professor Ussher's research has investigated what happens to intimate relationships after cancer, and the things that bother men and women at different ages and with different types of cancer.

'We have found that women and men have very different ways of coping with cancer,' she says. 'Whether you're looking at the importance of couple relationships, carers or partners, there is always a gendered perspective.'

These findings have been widely translated into resources for patients, their partners and clinicians, including targeted information and support for gay and bisexual men with prostate cancer, guidelines and a booklet on sexual wellbeing after breast cancer, and psycho-educational material on sexuality, fertility and the needs of carers distributed by Cancer Council NSW and CanTeen.

A NEW MODEL OF CARE FOR PEOPLE WITH DEMENTIA

THRI researchers are working with local health professionals and consumers to establish a region-first multidisciplinary Memory Clinic to help provide early diagnosis and local care solutions for families affected by dementia.

The clinic will offer a new model of dementia care developed by Western's researchers, offering improved diagnosis, coordinated care, and strong links to community-based services and primary health care.

Based at Macarthur in South West Sydney, a region predicted to experience up to 460% rise in dementia over the next generation, the clinic will serve as a hub for dementia research, education and coordinated care for outpatients.

Dr Genevieve Steiner, an NHMRC-ARC Dementia Research Development Fellow, says the new model provides a major shift in treating patients on the 'memory illness journey'.

'At the moment, dementia care is largely reactive and crisis-driven, and the coordination between GPs, hospitals, and community-based services is fragmented,' Dr Steiner says.

'Our new model of care will work with GPs and the community to give patients access to a one-stop-shop at the first sign of cognitive impairment. Here they will have access to leading clinicians including neurologists, geriatricians, and allied health workers – enabling a fast, accurate diagnosis, access to treatments and new clinical trials, and importantly, coordinated care to help them navigate through the system on their dementia journey,' she says.

UNDERSTANDING PRACTICE TO ACHIEVE CHANGE

IN THE EARLY CHILDHOOD YEARS

The mission of the new **Transforming Early Education a+nd Child Health Research Centre** is that no child should have their potential limited by the settings into which they are born and live.

Pre-pregnancy, pregnancy and the early years of a child's life are critical periods when the future determinants of children's health and wellbeing are set. It's when they form attachments, learn language and engage with education.

Yet, even in Australia, almost a third of Australian children experience some form of disadvantage that can have a lasting impact on their development. Western has a proud tradition of achieving change for these vulnerable children. Researchers from fields as diverse as paediatrics, physiotherapy, public health, education and social work have been involved in providing the evidence for early childhood interventions.

Western is also well known for training health professionals including midwives and child and family health nurses and early education professionals.

Now, the new research centre, Transforming early Education and Child Health (TeEACH), will bring together researchers across the University who are working on early years translational and implementation research to take a collaborative approach to some of the most intractable problems facing young children.

'Its focus is on implementation – understanding practice to achieve change,' says Professor Virginia Schmied, Deputy Dean, Research and Engagement in the School of Nursing and Midwifery.

'We are trying to create something really new. Our absolute difference is that we are very practice focused,' she says.

TeEACH builds on two significant bodies of work that are internationally recognised and have had impact around the world.

The first, led by Distinguished Professor Lynn Kemp, is the Maternal Early Childhood Sustained Home visiting (MECSH) program, which identifies at-risk families during pregnancy and supports them with evidence-based programs through the first two years of a child's life. MECSH has been proven to have positive impacts on children and has reached over 6,000 families in the United Kingdom, the United States, South Korea and Australia.

The second body of work is by Associate Professor Christine Woodrow in early years education. This initiative has spread from 35 preschools, schools and early learning centres in Chile to 26 pre-schools and early childhood centres in Western Sydney. More than 5,000 children and their families, and 500 educators have experienced the benefits of family and community engagement in education, including dramatic increases in language and maths performance.

The national and international collaborations fostered through these programs are positioning TeEACH as the go-to centre for research and evaluation around vulnerable families, early childhood and translational and implementation research, says Professor Schmied.

TeEACH's research will include national work on the redesign of the universal maternal, child and family health service system, infant feeding, perinatal mental health research, assessment of language development, innovative early education practice in vulnerable communities and a randomised trial of volunteer home visiting.

The aim is to bring service sectors together to work more closely to give vulnerable children the best possible start in life, whether that be through better communication, enhanced family relationships, early learning or improved maternal health.

'These are wicked problems and will need radical innovations. We are hoping that TeEACH will foster the types of transdisciplinary and cross-industry collaborations that will drive change,' says Professor Schmied.

A STRONG EVIDENCE BASE FOR INTEGRATIVE MEDICINE

With a $22mil new facility, 50 researchers and students as well as a number of strategic international collaborations, **The NICM Health Research Institute** is leading Australia in the study of the science of integrative medicine.

'Providing the evidence base for integrative medicine – how it can improve health and wellbeing, and when it can't – has never been more important,' says Professor Alan Bensoussan, Director of the NICM Health Research Institute.

'Australians are among the highest users of integrative medicines in the world, with annual expenditure predicted to grow to $4.4 billion in the next few years,' he says.

'With such high use and growth, there is an ethical and scientific need to conduct independent research to help Australian consumers and health professionals choose safe and effective integrative medicines.'

With a recent move to the Westmead precinct, NICM has grown from a handful of researchers at its establishment in 2007 into a thriving research facility whose work is having global impact.

The new facilities include new basic science labs, an on-site integrative medicine clinic and Chinese medicine dispensary. The clinical and laboratory research focuses on how herbal medicines work in the body, including chemical analysis of products for quality assurance.

There is also a comprehensive clinical trials program that has provided the evidence behind a range of integrative approaches to cardiovascular disease, mental health, exercise and nutrition, and yoga. Newer focus areas include Indigenous bush medicine and medicinal cannabis.

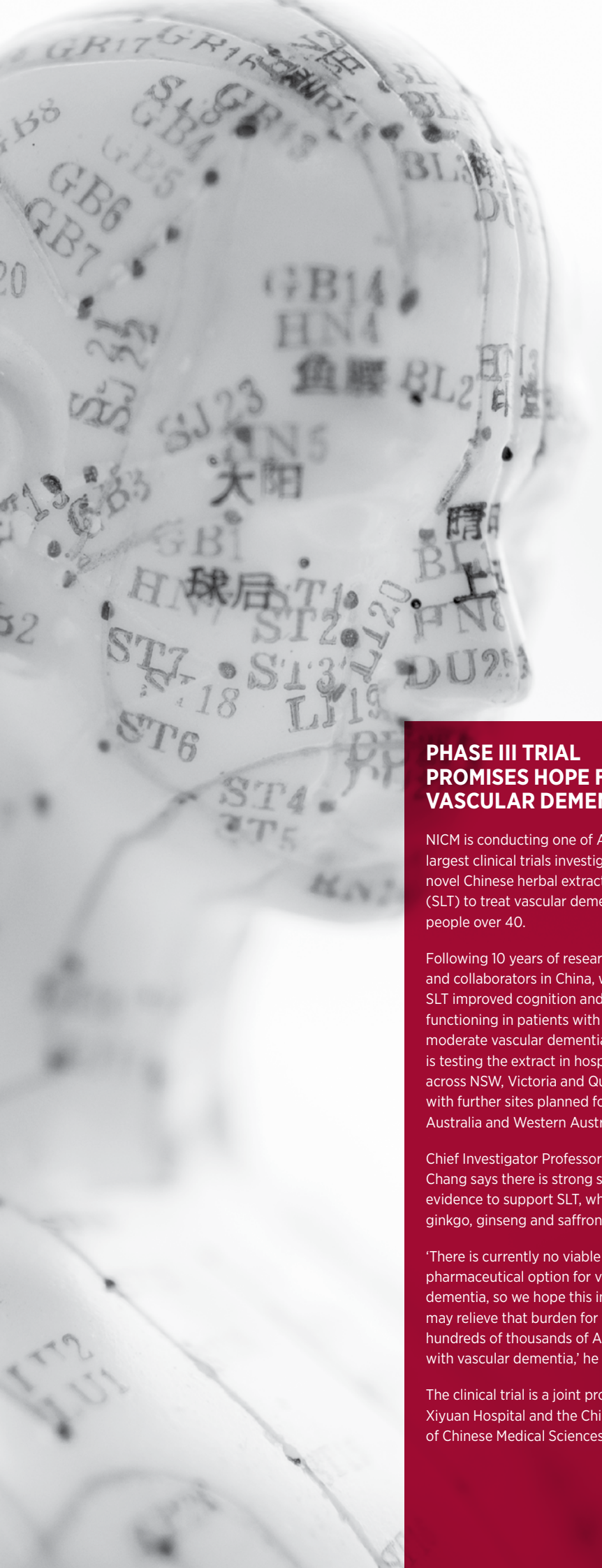
An important part of NICM's work is to support Australia's complementary medicine industry, for example by making the economic case for integrative medicine and capacity building in the sector. 'With our new facilities, world-class cross-disciplinary research, some of the best and brightest researchers and students, and our collaborations around the world, we are making an important contribution to clinical practice and consumer healthcare choices,' says Professor Bensoussan.

FACILITIES

- → Neuro clinical lab
- → Cardiac assessment lab
- → TGA Licenced lab
- → Medicinal cannabis lab
- → On-site integrative medicine clinic
- → Chinese medicine dispensary
- → PC2 Pharmacology lab

EXCELLENCE

- → Ranked well above world class
- → Globally recognised for research and innovations in integrative and complementary medicine
- → International collaboration with other international leaders



PHASE III TRIAL PROMISES HOPE FOR VASCULAR DEMENTIA

NICM is conducting one of Australia's largest clinical trials investigating a novel Chinese herbal extract Sailuotong (SLT) to treat vascular dementia in people over 40.

Following 10 years of research by NICM and collaborators in China, which found SLT improved cognition and daily functioning in patients with mild to moderate vascular dementia, the trial is testing the extract in hospital sites across NSW, Victoria and Queensland, with further sites planned for South Australia and Western Australia.

Chief Investigator Professor Dennis Chang says there is strong scientific evidence to support SLT, which contains ginkgo, ginseng and saffron.

'There is currently no viable pharmaceutical option for vascular dementia, so we hope this intervention may relieve that burden for the hundreds of thousands of Australians with vascular dementia,' he says.

The clinical trial is a joint project with Xiyuan Hospital and the China Academy of Chinese Medical Sciences in Beijing.

EVIDENCE ON EXERCISE LEAD TO NEW GUIDELINES ON MENTAL HEALTH

Based on strong evidence that structured exercise can reduce symptoms in people suffering from major depression and schizophrenia, the European Psychiatric Association (EPA) has issued new guidelines to promote physical activity as a key additional treatment for severe mental illness.

NICM's Senior Postdoctoral Research Fellow, Dr Joseph Firth, was on the team of global researchers who conducted a meta-analysis into the role of exercise in treating major depressive disorder, schizophrenia-spectrum disorders and bipolar disorder.

They found exercise had effects comparable to treatment with antidepressants and psychotherapy in depression, and reduced psychiatric symptoms in people with schizophrenia. They found the best outcomes were achieved with supervised aerobic exercise and/or resistance training at moderate to vigorous intensity, two or three times per week for a total of 150 minutes.

Dr Firth says that, despite evidence for the benefit of exercise for people with mental illness, its use in psychiatric care has been limited due to the lack of consensus for exercise treatments by international psychiatry associations.

'So, the recent guidelines produced for the European Psychiatric Association represent a huge step forward for the field, finally giving exercise the formal acknowledgement it requires to become recognised as a core aspect of mental healthcare,' he says.

FINDING MEANING IN AN UNSETTLED WORLD

The Institute For Culture And Society has Australia's largest concentration of humanities and social science researchers dedicated to researching transformations in culture and society in the context of a globalising digital age.

The Institute for Culture and Society (ICS) conducts interdisciplinary, engaged research into social transformation as the world experiences unprecedented upheaval.

It works with partners and communities around the world to address the challenges posed by globalisation, technology, climate change, geopolitical movements, tensions between civilisations and urbanisation – always seeking alternative pathways to a flourishing future.

'We look at how social meaning wraps around people's lives – at how we live in this world,' says ICS Director, Professor Paul James.

'ICS is one of the few research institutes in Australia whose work spans high theory to practical on-the-ground engagement – and that's really quite rare.'

In recent years, ICS has become the largest research institute of its kind in Australia, with a team of more than 50 dedicated researchers working collaboratively on existential questions facing societies and cultures, including ways of understanding knowledge, questions of identity and social meaning.

Through engagement with communities in Australia and internationally, the theoretical work has been translated to achieve real-world, practical impact.

For example, theories of sustainable urban development have impacted local practice about precinct development, while understanding about sovereignty and theories of land-use has led to alternative models of Aboriginal housing.

ICS engages with the world's largest cities around sustainability, as well as with schools in Sydney on questions of multiculturalism – research that has had a significant impact on education policy in NSW.

The institute's research spans a broad range of fields including cultural studies, sociology, media and communication studies, human geography, anthropology, heritage studies and urban studies.

NOT JUST STUDYING THE WORLD – BUT CHANGING IT

ICS researchers, Professor Katherine Gibson and Dr Stephen Healy, are influencing economic development in the United States, Australia and the Asia-Pacific by understanding how people contribute to economies in ways that are not often recognised, documented or even valued.

Their work has engaged communities in the US, Australia, the Philippines, Hong Kong, the Solomon Islands and Papua New Guinea, where, as a result, communities are undertaking new, co-operative and community-based approaches to development.

In Worcester in the US, for example, Dr Healy has worked with cooperative worker-owned enterprises that are addressing social and ecological problems such as unemployment, poverty and toxic waste through an organisation called Worcester Roots.

This approach to economic development has been instrumental in the success of Brazil's solidarity economy and has contributed to the growth of a global movement via the creation of the Community Economies Research Network (CERN), which has more than 130 international members.

'We have shown how businesses like this can reconcile commercial success with civic engagement, constituting a different model and approach to economic development,' Dr Healy says.

'Impact is built into these projects by design. The point isn't just to study the world, but to change it.'

EXCELLENCE

- → Partnerships in Australia, Chile, Germany, and throughout Europe and Asia
- → Transforming cities through collaboratively developed principles and methods
- → Working with young people to navigate the complexity of digital relations

REASSESSING MULTICULTURAL EDUCATION

An ICS project studying how schools are adapting to Australia's cultural diversity has directly impacted hundreds of teachers, parents and students in schools across NSW.

Researchers Associate Professor Megan Watkins and Professor Greg Noble joined with the School of Social Sciences and Psychology, the NSW Department of Education and Board of Studies Teaching and Educational Standards to survey the attitudes of teachers, students, parents and staff to cultural diversity and practices of multicultural education in schools.

They found there was a need for more intensive professional learning around multiculturalism in schools. The project then trained teams of teachers in 14 schools to undertake action research into areas of need, leading to significant change around parent and community engagement, academic literacy for English as an additional language and dialect students, critical literacy, and inclusive curricula.

Many of these schools have continued with implementation beyond the project and have since been identified by the Department of Education as exemplars in their field.

TOWARDS AN AFFORDABLE HOUSING SECTOR IN AUSTRALIA

Dr Louise Crabtree's research into affordable housing options in the form of Community Land Trusts (CLTs) led to the development of a toolkit to provide the emerging sector in Australia with the resources it needs to implement new affordable housing models in Australia.

The Australian Community Land Trust Manual provides resources to address the operational, legal and financial issues and decisions facing potential CLTs in Australia.

The team has also developed two models for affordable housing in Australia: long-term leasehold and shared equity of both house and land.

Organisations are now starting to implement material from the manual and apply affordable housing options, potentially leading to a new housing sector in Australia in future.

DR STEPHEN HEALY

STRATEGIC RESEARCH INITIATIVE

BETTER TOGETHER...

FOSTERING THE RESILIENCE OF YOUNG PEOPLE AND THEIR COMMUNITIES

With 99 per cent of Australian young people online every day, the **Young and Resilient Research Centre** is finding ways of leveraging technology to improve young people's health and wellbeing

While today's globalised world offers many opportunities, it can also be tough for young people. They are faced with rising levels of unemployment and under employment, housing stress and mental illness – and these challenges are acutely felt in Western Sydney.

At the same time, technology is playing an increasing role in young people's lives, but it can also exacerbate existing problems.

Leveraging an established network of more than 100 stakeholders, including non-profits, big business, government and young people themselves, Western's new Strategic Research Initiative will undertake co-research and design to find holistic, technology-based strategies to support intergenerational resilience. It will enable young people and their communities to address some of the critical challenges of contemporary life.

The Young and Resilient Research Centre (Y&RRC), a collaboration between six schools and two institutes at Western Sydney University, will map young people's engagement with digital technologies, identify how to support the resilience of marginalised young people using technology-based and intergenerational strategies, and refine ways of translating high-quality evidence into policy and practice.

Co-director, Associate Professor Amanda Third, says most existing research in this area focuses on individuals' capacity for resilience. 'But what we've found from our work with young people is that, actually, the difference between a young person who can be resilient and one who can't often boils down to how they are networked socially with their peers and community,' she says.

The establishment of Y&RRC follows 10 years of engaged research by Associate Professor Third, her colleague, Associate Professor Philippa Collin, and their team at the Institute for Culture and Society. They have used innovative methods to gather data about and intervene in challenges to resilience, with a focus on the role of the digital, both for gathering data and for intervening in young people's lives.

'One of the key challenges is generating accessible, actionable research with young people, policy and practice partners so that we can understand what works and how to translate strategies to different contexts and sectors,' says Associate Professor Collin. 'Most importantly, we need to amplify the spaces for genuine intergenerational work – in which young people actively contribute and where adults are responsive to their views and visions.'

Their work has already had a significant impact on policy and practice internationally. It has led to new interventions for young people, has influenced national digital inclusion policy, resulted in the first grant of a social good Cooperative Research Centre, and has been cited by the United Nations General Committee on the Rights of the Child.

Underpinning the research – and providing the engine room for the new Strategic Research Initiative – is the Intergener8 Living Lab, a thriving collaboration with large corporates including Google and Telstra, global research, policy and funding agencies including UNICEF, national service providers including Navitas English, the Alannah and Madeline Foundation and Raising Children Network, national and state statutory authorities, local and state government, and various peak bodies.

The group comes together in regular workshops with young people to identify challenges and possible solutions. Western researchers then co-design projects and interventions with the group, which can be delivered with the community.

It's the connections and opportunities generated in this unique collaboration that have led to some of the greatest impacts to date, says Associate Professor Third.

'We have 100 organisations all taking the work they are doing and feeding their thinking to other organisations. The energy of this community has all kinds of positive impacts; it's generated a collective spirit that has led to policy change or different linkages,' she says.

'When we bring together large numbers of really dynamic individuals and organisations with an investment in real-world change, it becomes more than a research project, it becomes a social movement.'

> **When we bring together large numbers of really dynamic individuals and organisations with an investment in real-world change, it becomes more than a research project, it becomes a social movement.**

ASSOCIATE PROFESSOR AMANDA THIRD

ASSOCIATE PROFESSOR PHILIPPA COLLIN
YOUNG AND RESILIENT RESEARCH CENTRE

RESEARCH WITH GLOBAL IMPACT

Our research ethos is underpinned by a commitment to make positive change – putting you close to world-leading research that is changing lives in the communities we serve across Western Sydney, Australia and the world.

DEEP RESEARCH CAPACITY

Western Sydney University has created deep research capacity through strategic investments in our six research institutes, and is launching three new research initiatives:

- → Hawkesbury Institute for the Environment
- → Institute for Culture and Society
- → MARCS Institute for Brain, Behaviour and Development
- → Australia-China Institute for Arts and Culture
- → Translational Health Research Institute
- → NICM Health Research Institute
- → International Centre for Neuromorphic Systems
- → Transforming Early Education and Child Health Research Centre
- → Young and Resilient Research Centre.

LEADERSHIP IN ONE OF AUSTRALIA'S FASTEST GROWING REGIONS

Western Sydney is Australia's third largest and fastest growing economy. With a large multicultural population and expanding international reach, we are uniquely placed to help researchers tap into a global mindset.

A REPUTATION FOR EXCELLENCE

Western Sydney University is ranked amongst the top two per cent of universities in the world, with a growing international reputation as an impact-driven, research-led University.

LEADING RESEARCH FACILITIES

Attracting researchers from around the world, our leading research institutes and state-of-the-art facilities provide a research-intensive environment with vibrant, well resourced hubs for research.

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