WORLD-CLASS RESEARCH AT ECU

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ECU is committed to reconciliation and recognises and respects the significance of Aboriginal and Torres Strait Islander peoples' communities, cultures and histories. ECU acknowledges and respects the Aboriginal and Torres Strait Islander peoples as the traditional custodians of the land. ECU acknowledges and respects its continuing association with Nyoongar people, the traditional custodians of the land upon which its campuses stand.

WELCOME TO ECU

Edith Cowan University (ECU) is a young and progressive university with a strong reputation for excellence in teaching, research and state-of-the-art facilities. Our dedicated researchers and teachers develop and impart knowledge that transforms the lives of people in communities around the world.

Established in 1991, ECU has grown rapidly into a quality university with internationally recognised research and an excellent student experience.

ECU has been named in the top 500 in the Times Higher Education World University Rankings for 2020, placing us in the top 2.5% of universities in the world.

Students, graduates and staff at ECU are identified amongst the best in the world, with many fulfilling critical roles in our society. Their outstanding achievements have been recognised throughout Australia and internationally through awards, grants, scholarships and prizes.

Research at ECU both extends knowledge and improves the quality of life for Australians and people across the globe. Our research priorities focus on solving real world problems across the social, economic, physical and environmental spectrums.

I am proud to share this collection of some of the excellent research projects currently being conducted at ECU.

Professor Steve Chapman CBE
Vice-Chancellor

RESEARCH PROFILE

Edith Cowan University (ECU) conducts world-class research that makes a difference, focusing on people, partnerships and results. As part of the vibrant community at ECU, our researchers help to transform lives and change the world for the better.

Located in Western Australia, our community and industry-relevant teaching and research, supportive study environment and award-winning facilities enable our students to do more than just survive in this world – they thrive in it.

Examples of our ground-breaking research include:

- Early melanoma detection through a blood test
- Exercise as medicine for cancer patients
- Metal filtration to improve wastewater quality
- Biometric security system for smartphones
- Seagrass sequestration as an indicator for climate change
- Full blood count analysis for detecting Haemochromatosis

You can explore these projects and more at **ecuworldclass.com**

We have diverse foci for our research, bringing together multi-disciplinary teams to achieve extraordinary outcomes.

Our four key research themes include:

- Health
- Natural and Built Environments
- Securing Digital Futures
- Society and Culture

ECU's research in these fields meshes with, and contributes to, global new knowledge along with Federal and State Government identified research priority areas.

ECU's research is dedicated to finding solutions for real world problems. This is highlighted by the range of industry partners we engage with, and the level of industry funding contributed to our research programs. Projects that range from environmental science and agribusiness, to advanced photonic/optical materials and health, have delivered over $7 million to ECU through industry funding alone.

ECU's partnership activities have focused on building common technical and methodological platforms for ongoing collaboration, and building a critical mass of high quality research expertise at ECU. This in turn generates world-class research outcomes and sustainable new research programs, which attract competitive grants funding.

This publication presents a snapshot of some of the world-class research conducted at ECU.

Professor Caroline Finch AO
Deputy Vice-Chancellor (Research)

STALKING A STEALTHY KILLER

Edith Cowan University (ECU) researchers have made a world-first breakthrough with a blood test able to detect early stage melanoma. Melanoma is diagnosed in more than 14,000 people in Australia each year, with more than 1,700 people – or 5 per day – dying from the disease.

The new blood test could provide doctors with a powerful new tool to detect melanoma before it spreads throughout the body. Early testing has achieved a success rate of almost 80 per cent.

The Melanoma Research Group is one of a growing list of world-class research specialisations at ECU.

Among skin cancers, melanoma has a dual distinction: it can be difficult to catch early, before it has spread to other parts of the skin or other organs, and it is particularly deadly.

As the number of melanoma cases rise around the world, with approximately 132,000 new cases currently being diagnosed each year, Australia has been hit especially hard. The nation features the world's second-highest melanoma rate. Each year, the disease kills more than 1,700 people in Australia—more than are killed in traffic accidents—and is diagnosed in thousands of others.

Even with melanoma being discovered in more and more people, physicians and researchers worry that current tools used to detect melanoma are not always optimal.

Melanoma is currently detected by clinicians performing biopsies on moles or suspicious-looking areas of the skin and pathologists then scanning the sample for signs of the disease. This detection method is invasive as it requires the removal of at least one square centimetre of skin from the patient. It is also expensive as the annual cost to the Australian health system of the diagnosis and treatment of melanoma is estimated to be $201 million. What's more, approximately three out of every four biopsies comes back negative. However, given the dangers associated with melanoma, it is preferable that clinicians err on the side of caution and continue conducting biopsies, notwithstanding the number that come back negative.

For the above reasons, researchers around the world have been in search of a test that could identify melanoma earlier, and with more accuracy.

Antibodies Provide Early Warning

Now, in a breakthrough that could save thousands of lives, researchers at ECU have devised a blood test that can detect early-stage melanoma in approximately 80 per cent of patients.

The discovery is the result of a scan University researchers conducted on more than 1,600 types of antibodies, with a goal to identify a combination of 10 antibodies that can best indicate the presence of melanoma in blood. The blood test, which is still in the development phase, scans for antibodies the body produces when melanoma first presents itself.

"The body may produce these antibodies as soon as melanoma first develops, which is how we have been able to detect the cancer in its very early stages with this blood test," says Dr. Pauline Zaenker, the lead researcher for the ECU Melanoma Research Group. "No other type of biomarker appears to be capable of detecting the cancer in blood at these early stages."

Researchers at ECU analysed the blood of 104 melanoma patients and 105 healthy people, the latter serving as a control group. They found 139 possible antibodies that were expressed at higher levels in patients with melanoma. The research group then used high-level statistical analysis to identify a group of 10 "autoantibodies"—weapons the body utilises to ward off illnesses—and found that they could be used to detect early-stage melanoma in 79 per cent of patients.

Such a tool could be of particular value to people who present additional diagnostic difficulties, such as those whose skin contains 100 or more moles or thin early-stage melanomas, as well as those patients at especially high risk of developing the cancer. It also might allow doctors to reach more patients, including those in remote or rural areas.

Blood Test Improves Diagnosis

The blood test is not seeking to replace biopsies, rather to improve the early diagnosis of melanoma and reduce the risk of cases being missed to help improve patient outcomes.

"A positive test would give doctors an additional tool to have more diagnostic certainty prior to a biopsy," says Mel Ziman, a professor in the ECU School of Medical and Health Sciences, and head of the Melanoma Research Group. "Findings must now be tested among larger groups of patients," she adds.

The research group is looking to perform a clinical trial with 1,000 participants who have been prescribed a biopsy for melanoma, and from whom blood will be collected. The blood test findings will then be compared to the biopsy results.

"The clinical trial will enable us to identify how accurate our test is. We would like to improve its accuracy to 90 per cent, which is what should be expected of diagnostic testing," says Ziman. "By testing more people, we hope to find the optimal set of antibodies, which will increase the test's accuracy rate."

The research group has embarked on a three-year plan to develop the test, and then proposes to seek out a commercial partnership with a business entity to license it. It estimates it will need $3 million to commercialise the finding, including conducting the clinical trials.

Scientists say the end result of their work—saved lives—is more than worth the price of the investment.

"Patients who have their melanoma detected in its early stage have between a 90 and 99 per cent chance of a five-year survival rate whereas if it is not caught early and it spreads around the body, the chance of a five-year survival rate drops to less than 50 per cent," Zaenker says.

She adds: "This is what makes this blood test so exciting as a potential screening tool because it can detect melanoma in its very early stages when it is still treatable."

ECU DISCOVERY TURNING WASTEWATER INTO USEABLE WATER

Engineering researchers at Edith Cowan University (ECU) have developed a high-tech strip of iron that can remove impurities from water in just a few minutes.

This breakthrough comes as a result of modifying the iron-based alloy to develop a new type of crystalline alloy capable of stripping contaminants like heavy metals, dyes and other organic pollutants from wastewater.

It may look like a simple piece of aluminium foil but it has huge implications in the mining, textile and other industries where large amounts of wastewater are produced. It is cost effective to produce and the alloy can be reused up to five times while still maintaining its effectiveness.

ECU treating industrial wastewater for 'a better and cleaner world'.

World leaders are sounding the alarm over a global water shortfall that could displace large swaths of people unless countries dramatically change how they use the resource. As reported in March 2018 by the United Nations (UN) and the World Bank, 40 per cent of the world's population is currently affected by intense water scarcity, putting the planet's life-sustaining ecosystems at risk.

Industrial pollution is a major factor in the dwindling supply of clean water worldwide, a pending crisis that researchers at ECU are not taking for granted. A team led by Laichang Zhang, a professor from ECU's School of Engineering, has developed a crystalline alloy that can strip impurities from industrial wastewater in minutes.

Resembling a simple piece of aluminum foil, the high-tech strip of iron – an extension of Zhang's previous work developing metallic glasses – removes dyes, heavy metals, and other pollutants created by widely used manufacturing processes.

"Mining and textile production produces huge amounts of contaminated wastewater," says Zhang. "This along with population growth results in significant environmental problems. We aim to use metallic glasses to make a better and cleaner world."

An inexpensive type of water treatment

Modifying the internal structure of iron-based alloy has resulted in a new type of crystalline alloy that Zhang says can treat one ton of wastewater for just $15. In their initial research, ECU's team of scientists changed iron's atomic structure to form metallic glass, named for the molecular underpinnings that resemble glass rather than the everyday transparent material.

Compared with the disordered atomic structure of metallic glass, however, the crystalline alloy's ordered structure allows for the kind of fast electron movement desired in wastewater treatment, as those quick-moving subatomic particles are able to bind with dye or heavy metal molecules and leave behind useable water.

"Fast electron transportation from our materials leads to an effective conversion of contaminants into harmless substances or a fast breakage of the chemical structure of pollutants," says Zhang. "That is to say, the faster an electron transfers, the higher contaminant removal efficiency is."

Bearing in mind the expense of designing new metallic glass favorable for wastewater purification, ECU researchers devised an alternative that considered the cost of manufacturing and processing materials as well as expenditure for the water treatment itself.

As ECU's research evolved, university scientists produced partially crystalline metallic glasses at a much lower cost than earlier iterations. The crystalline alloy can also be used up to 30 times without losing its effectiveness, providing a superior substitute to commercial iron powder commonly employed to treat wastewater. Not only does the powder have a single use, says Zhang, it leaves behind an iron sludge that must be purified and safely stored.

"Reusability gives crystalline metallic glasses high economic value in industrial wastewater treatment, and the low amount of metal leaching from them makes it so they can avoid secondary pollutants," Zhang says.

Tackling a global crisis

The UN and World Bank report, based on two years of research, states that 700 million people are in danger of being displaced by water scarcity within the next 10 years. Meanwhile, more than two billion people are compelled to drink unsafe water, and more than 4.5 billion people do not have safely managed sanitation services.

Globally, agriculture accounts for 70 per cent of all water consumption, compared with 20 per cent for industry and 10 per cent for domestic use. But in industrialised nations, industries consume more than half of the water available for human use. Manufacture of biofuels alone has substantial impact on water demand, as between 1,000 and 4,000 liters of water are needed to yield a single liter of biofuel. According to observers, having less available water risks increased disease, economic breakdown, and even violent conflicts over water access.

Although metallic glass has been studied for decades, few researchers have concentrated on its catalytic properties – defined as chemical reactions altered by the introduction of a new substance, or catalyst – in the area wastewater treatment. The global shortage of potable water, particularly in industrialised urban centers, has exerted pressure on scientists to help curtail the dangers posed by high-yield manufacturing operations.

While presenting the UN report last March, Netherlands Prime Minister Mark Rutte said, "We must work to tackle global water crises now. There is no other option."

Zhang agrees with this assessment, focusing his work mostly on organic pollutants such as dyes and phenolic compounds derived from industrial activities. The researcher also studies heavy metals, applying his overall findings to industries producing textiles, leather, and pharmaceuticals.

ECU is currently working with industry partners to further improve the crystalline alloy's effectiveness to reduce its cost in use and manufacture. An Australian drilling-services company is among ECU's collaborators, along with a United States energy concern and Chinese chemical corporation. These enterprises understand the necessity of reusing polluted water from both a business and humanitarian standpoint, says Zhang.

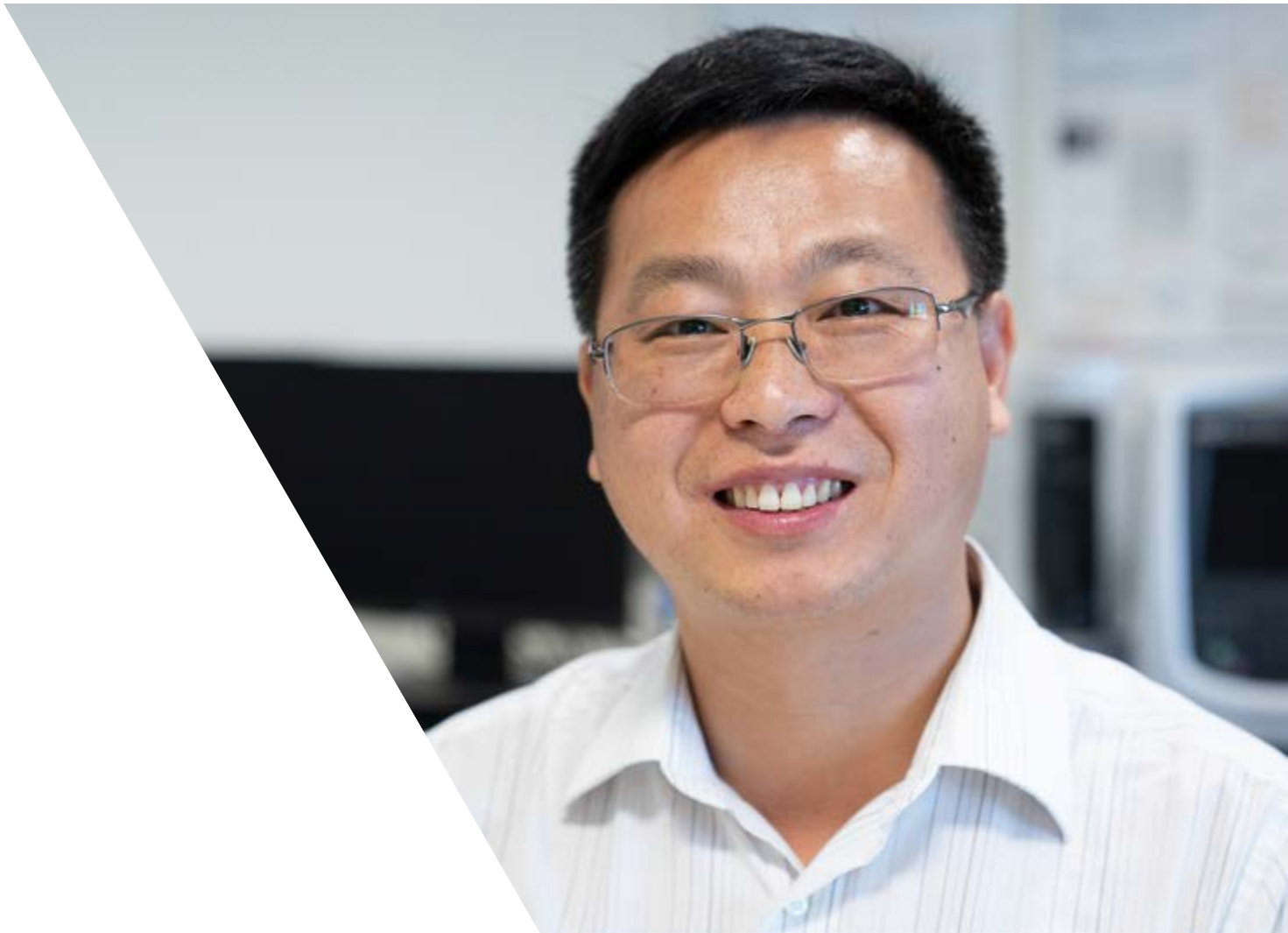
"Fresh water is not only a source of drinking water, but it also supports industrial activities and agricultural irrigation," he says. "But available fresh water resources are being reduced day by day, so our research for removing pollutants from wastewater is receiving wide attention and interest."

Zhang hopes to upgrade the alloy's efficiency in different catalytic environments. Answering this question could, among other benefits, increase the substance's industrial scale.

"Investigating metallic glass in wastewater treatment is interesting, not only because it can bring a better and cleaner environment, but the properties of metallic glass also need to be studied in-depth to further understand unknown application fields," says Zhang.

Zhang has published 180 journal papers based on hs investigations, bringing attention and accolades to the hard work taking place at ECU.

"Our achievements can stimulate the research environment by letting us focus on (the alloy's) practical applications and solve problems with social concerns," says Zhang. "This is a positive trend for the University."



HOW A BONE SCAN CAN DETECT FUTURE HEART ATTACK RISK

New research by scientists at Edith Cowan University (ECU) has found that scans from bone density machines used to identify a fracture, can now also be used to detect future heart attack and stroke risk.

After examining scans of more than 1,000 Australian women taken in the late 1990's, researchers made a breakthrough. They discovered that women who showed a build-up of calcium on their aorta were at a higher risk of cardiovascular hospitalisations and death in the 15 years following their scans. This makes bone density testing incredibly useful as a screening tool.

It means scans can be used to give an early warning of increased risk of suffering a cardiovascular event, providing people with the opportunity to make lifestyle changes to lower their future risk.

IMPROVING BRAIN-INJURY REHAB FOR ABORIGINAL AUSTRALIANS

Researchers at Edith Cowan University (ECU) are endeavouring to effect significant change by forming international research partnerships with the goal of improving brain injury care for all Indigenous peoples.

After building a strong group of researchers in Australia, Professor Beth Armstrong is now initiating collaborations with other countries, including Canada, New Zealand, and South Africa.

Aboriginal Australians are currently twice as likely as their non-Aboriginal counterparts to suffer a stroke or traumatic brain injury, and they face unique challenges when seeking care, ranging from limited resources to racism.

To further bridge the healthcare gap, ECU is facilitating two-way communication through partnerships with hospitals, Indigenous health organisations and patients to improve the cultural security of brain injury care.

Aboriginal Australians are more than twice as likely as their non-Aboriginal counterparts to suffer a stroke or traumatic brain injury, yet they are severely underrepresented in the country's mainstream hospital-based rehabilitation services. Improving care for Aboriginal brain-trauma survivors is the mission of Professor Beth Armstrong and her research team at ECU.

Armstrong, the foundation chair in speech pathology at ECU, is spearheading efforts to recruit Aboriginal brain-injury coordinators to work with stroke patients and their families, while also providing cultural sensitivity training for current staff to make patients more comfortable under care.

"We are looking to connect Aboriginal brain-injury survivors with formal rehabilitation services, but also with local community activities and groups that may assist in their recovery," says Armstrong. "As the most recovery is said to occur in the first six months after injury, stimulation during this time is crucial."

Keeping people connected

Armstrong's research takes into account post-colonisation disparities experienced by the Aboriginal peoples of Western Australia. While many Aboriginal people live in metropolitan areas, most Aboriginal brain injury survivors live in regional or remote areas. They generally have limited access to treatment following an acute brain injury, leading to long-term physical problems as well as general poor quality of life.

To tackle this issue, Armstrong and the ECU speech pathology department, along with multiple Aboriginal and non-Aboriginal academic and community partners, launched the "Healing Right Way" project in 2018, an ongoing clinical trial in which Aboriginal health workers act as liaisons in helping brain-injury patients link with therapy and support services back home. Meanwhile, non-Aboriginal health professionals are learning "culturally secure" rehabilitation practices in working with patients after a stroke or other brain trauma. Introduced at two hospitals at the beginning of 2019, the two-pronged intervention package will expand to six additional sites by mid-2020.

ECU recruits Aboriginal brain-injury coordinators through health-service programs and word of mouth. The project's first two coordinators are nurses, who speak directly with patients and their families either in person or remotely through videoconferencing or by phone. Both are establishing local networks in Aboriginal communities, creating a support system of rehabilitation services before the clinical trial's completion in 2021.

"It doesn't have to be hospital-based rehab," Armstrong says. "It's more about keeping people connected after a brain injury, as isolation is a major problem."

Closing a cultural gap through better care

Stroke and traumatic brain injury often befall Aboriginal Australians at a younger age, with the latter due in part to assault-related head traumas occurring at a rate up to 21 times higher than non-Aboriginal populations, according to the *Medical Journal of Australia*. Cyclical poverty among Aboriginal people also lead to increased health risks including stroke, a problem typical in Australia and other colonised nations, Armstrong notes.

Any injury to the brain can result in mild to severe effects, from speech and personality issues to partial paralysis and difficulty swallowing. Because of limited specialised acute medical and rehabilitation services in rural and remote areas, many people must be flown in from isolated areas to receive adequate care. Being away from 'country' in an unfamiliar physical and cultural environment can result in communication difficulties between patients and staff and leave people feeling vulnerable. There is a need for training of hospital staff to create a culture-friendly environment for Aboriginal brain injury survivors.

Armstrong has many disturbing stories about people who fell through cracks in the system, like the man who spent many years in an aged care facility after a car accident and whose family believed for a long time that he had died. At the same time, ECU's research has revealed stories of amazing strength, such as the young woman who suffered a stroke after childbirth and went on to raise three children while being left with virtually no speech. Such stories provide helpful lessons about the support structures and community characteristics that enabled the woman to manage in this context.

Racism – both conscious and unconscious – often underlies the cultural gap, says Armstrong. And this not only affects those from rural and remote areas. Aboriginal people are still affected by the Stolen Generations of the 20th century, when Aboriginal children were forcibly removed from their families as a result of government policies. They are often wary of mainstream government services such as hospitals. According to Armstrong, many non-Aboriginal Australians still know little of this history and often misconstrue some Aboriginal patients' reluctance to engage with services as 'resistance' or 'apathy'.

In light of these long-existing cultural challenges, ECU's work aims to bring trust to Aboriginal brain-trauma care, says Armstrong. As information-gathering and effective two-way communication are critical facets of wellness development and health literacy, ECU is partnering with hospitals to promote respectful and productive communication.

Health professionals are encouraging to employ a conversational process known as "yarning." This is a conversational and relaxed style of talk in which storytelling is used to both understand a patient's personal context and to convey explanations about their brain injury.

A continuing path to wellness

Linking survivors to formal rehab services and a local network of brain-injury support groups is vital to long-term recovery. In addition, the Healing Right Way project keeps patients abreast of research findings and online resources that can usher them down the path to wellness farther and faster.

"Research plays a vital role in interrogating and understanding key issues that affect Aboriginal communities impacted by the ongoing processes of colonisation," says Braden Hill, ECU's Pro-Vice Chancellor (Equity and Indigenous). "Health outcomes are one such area where Australia's Aboriginal people are well behind other Australians. Professor Armstrong's work is exemplary in that it amplifies the voices of our Aboriginal people in seeking to develop solutions that will improve the lives of individuals, their families, and their communities. Such research reflects ECU's commitment to undertaking socially just research that makes a difference to the world around us in a meaningful and ethical way."

After building a strong group of researchers in Australia, Armstrong is now initiating collaborations with other countries – among them Canada, New Zealand, and South Africa – where brain-injury care services for other indigenous peoples are also lacking. Collaborative publications and conference presentations are already taking place with those countries, with further international research partnerships planned for the future.

Wherever Aboriginal people reside, Armstrong knows there's a distance to travel in closing the health-care gap. Working with Aboriginal researchers and community members serves as her primary motivation in promoting further advancement of brain-trauma treatment that hews closely to Aboriginal values.

"Aboriginal people continue to experience significant racism and other challenges preventing them from accessing services and achieving good recovery from brain injury," Armstrong notes. Equity is needed, she says, to enhance services for indigenous peoples with brain injury across the world.

"The health issues for indigenous peoples are being increasingly acknowledged and brain injury needs to be included in discussions about service improvements for the future."

ECU STRENGTHENS RESEARCH ON SPINAL CORD TREATMENT

Researchers at Edith Cowan University (ECU) have turned the table on treatment for spinal cord injuries using high-intensity neuromuscular electrical stimulation (NMES) strength training.

Their study discovered patients not only tolerated higher-intensity NMES, they also experienced significant health benefits including reduced symptoms of spasticity, improved muscle strength and cholesterol levels, and a clear improvement against the Quality of Life Index.

The study could also have potential application for people suffering brain injuries, multiple sclerosis and stroke.

DISCOVERY MEANS ONE BLOOD TEST COULD SAVE MANY LIVES

Researchers at Edith Cowan University (ECU) have discovered a way to detect the iron overload disorder HFE Haemochromatosis, using data already gathered in Australia's most commonly-ordered blood test.

Haemochromatosis is the most common genetic disorder affecting people of Northern European descent, and results in too much iron being absorbed by the body. If left untreated it can lead to arthritis, cirrhosis of the liver, heart disease, diabetes mellitus and certain forms of cancer.

Lead researcher Professor John Olynyk has determined that by analysing the 12 million Full Blood Counts carried out annually in Australia, large numbers of men and women could be detected who are unknowingly living with haemochromatosis.

ECU's breakthrough discovery is capable of being rapidly incorporated into everyday practice. And, as the treatment for haemochromatosis is for patients to start regularly donating blood, their diagnosis could also save another person's life.

Approach designed by ECU researcher zeroes in on a debilitating blood disorder.

Millions of people around the world may have the blood disease called haemochromatosis, or the gene mutation that leads to it — and yet, relatively few are likely to know it.

Haemochromatosis, a disorder marked by increased amounts of iron in the blood and liver, has something in common with most diseases: Patients benefit when it is caught early. For people with haemochromatosis, that means before the disease makes them feel sick or weak, or experience abdominal or joint pain. In the long run, haemochromatosis can lead to arthritis, cirrhosis, heart disease, Type 2 diabetes, and certain forms of cancer, if left untreated.

Now, a breakthrough in Australia offers hope of avoiding such gloomy outcomes.

With a goal of reaching more sufferers of the disease earlier, a researcher at ECU has devised an approach that can aid in detecting it among a large swath of the Australian population. Used by tapping into the Full Blood Count — a standard measure that physicians worldwide routinely order to diagnose a range of health problems — the discovery can determine who might have haemochromatosis.

"The Full Blood Count is one of the commonest blood tests on the planet," says Professor John Olynyk, the project's leader, and Dean of Clinical Research at ECU. "It's something we felt we could take advantage of."

Olynyk, an international expert in liver disease and Hereditary Haemochromatosis, previously designed the High Ferritin App with colleagues at the Australian Red Cross Blood Service – an online referral tool that assists clinicians in the identification and appropriate treatment of Hereditary Haemochromatosis and which is now the standard of care in Australia. He has now developed a method for using results contained in the routine Full Blood Count so patients in the Australia and other countries with populations of northern European origin can be evaluated for haemochromatosis.

Because the application of treatment has been "patchy," Olynyk says, improving the diagnosis of haemochromatosis presented a chance for him and his researchers to aid public health while saving the country some money.

"We've tried to find that sweet spot where we can find a high number of people who have the disease and a relative few who don't," says Olynyk. "If we tested everyone, we'd incur a lot of unrewarded cost to the health system. This approach based on better application of routine results reported every day in the full blood count, and often ignored, is an affordable way to find people and refer them for further testing."

Wide-Ranging Benefits

The new discovery based on the Full Blood Count detection brings some benefit to the greater public as well, he adds. As part of their treatment, haemochromatosis patients go through therapeutic blood draws every three months to lessen the toll that iron-rich blood can take on their overall health. With more cases of haemochromatosis diagnosed, more donated blood will be available for people suffering medical emergencies.

But most important, it gives medical doctors a chance to get ahead of the disease.

Olynyk, has been tracking down the characteristics of haemochromatosis for decades. In 1999, he led the research team that described the first study of the population clinical penetrance the gene mutation behind the disease. Since then, his focus has been on finding ways to reach people before they are diagnosed clinical complications of the disease — a scenario that is all too common, he says.

Olynyk and his research team built upon findings from an American study conducted 20 or so years ago — findings "that had lain there silently," Olynyk says. American researchers had learned that red blood cells in people with haemochromatosis featured more hemoglobin, a protein responsible for transporting oxygen throughout the body.

Early Detection at No Cost

There are approximately 12,000 haemochromatosis sufferers in Australia, and it is estimated that millions of people around the world may carry the disease. They all share a background that includes Northern European or Irish ancestry. About 1 per cent of people with Irish blood will develop the disease, about twice the rate of Northern Europeans.

The disease has been around for 5,000 years or more, and was first observed in patients in the 19th century, and designated as a disease in the last one.

Now, finally, it appears that it can be uncovered early, and possibly at no additional cost outlay for screening. The new approach is flagging undetected patients at a rate of about 1 in seven people who are tested — a much more cost-effective way to identify them than giving blood tests to anyone who fits the ancestral profile.

Even though the Full Blood Test has been key in ramping up new diagnoses in Australia, Olynyk continues to search for ways to use his app around the world.

"This has global implications," he adds. "The discovery we have made can be very useful in any countries that contain notable populations of Northern Europeans."

ECU RESEARCHERS ARE RESHAPING CYBER SECURITY DEFENCES

Edith Cowan University's Security Research Institute has developed a multiple biometric security system that scans both your fingerprint and the veins in your finger to provide more advanced recognition accuracy and increased security.

Unlike face recognition, finger-vein technology is not visible and doesn't leave traces behind, so the finger-vein biometric based scheme is highly resistant to security breaches.

This new system creates a one-time transformation of a fingerprint and finger vein, which means it can be replaced in the event the system is hacked.

ECU DISCOVERS A POWERFUL OPPONENT TO CANCER

Edith Cowan University (ECU) researchers have revealed the incredible power of exercise as a medicine to improve outcomes for people with cancer.

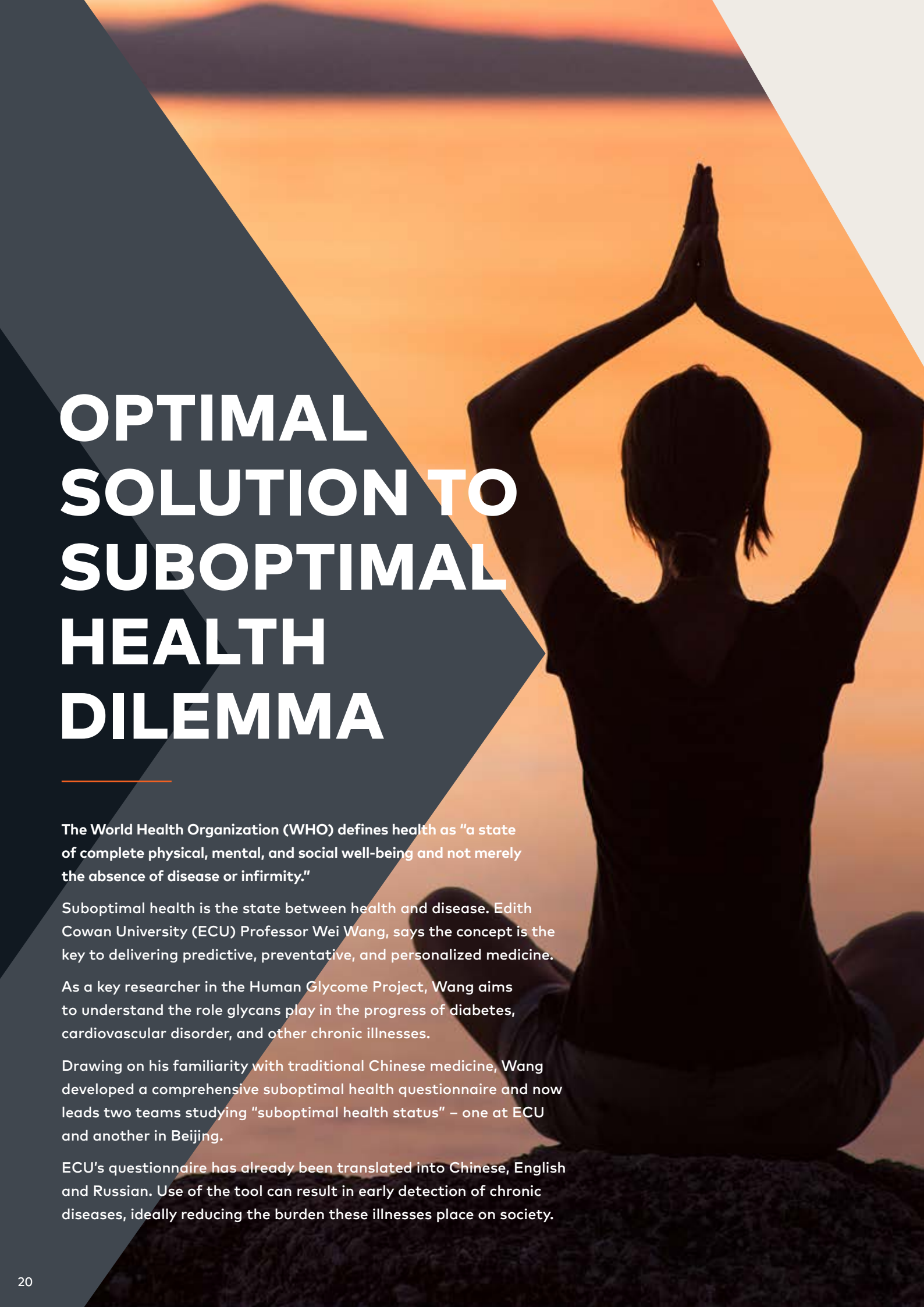
Research by ECU's Exercise Medicine Research Institute (EMRI) is changing clinical practice worldwide by demonstrating that targeted exercise prescription reduces cancer symptoms and treatment side-effects, and enhances quality of life, physical function and health.

Their work includes the discovery of a form of exercise medicine for people with bone metastatic cancer and a specific type of exercise prescription to prevent bone loss in men with prostate cancer.

EMRI researcher Professor Rob Newton says the idea of cancer patients undertaking exercise as a critical component of supportive care was revolutionary but is now well established, and targeted exercise is recommended for all cancer types and stages – even when undergoing challenging treatments.

Professor Newton's research and advocacy in the field of exercise medicine was recently recognised with him being named Scientist of the Year in the 2019 Western Australian Premier's Science Awards.

Professor Rob Newton – Scientist of the Year in the 2019 WA Premier's Science Awards



OPTIMAL SOLUTION TO SUBOPTIMAL HEALTH DILEMMA

The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

Suboptimal health is the state between health and disease. Edith Cowan University (ECU) Professor Wei Wang, says the concept is the key to delivering predictive, preventative, and personalized medicine.

As a key researcher in the Human Glycome Project, Wang aims to understand the role glycans play in the progress of diabetes, cardiovascular disorder, and other chronic illnesses.

Drawing on his familiarity with traditional Chinese medicine, Wang developed a comprehensive suboptimal health questionnaire and now leads two teams studying "suboptimal health status" – one at ECU and another in Beijing.

ECU's questionnaire has already been translated into Chinese, English and Russian. Use of the tool can result in early detection of chronic diseases, ideally reducing the burden these illnesses place on society.

The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

For many, that level of health remains elusive — there is an increasing number of individuals worldwide who report a general malaise even in the absence of a diagnosable disorder. Professor Wei Wang, Pro-Vice-Chancellor (China) at ECU in Perth, Australia, coined the term "suboptimal health status" to describe this condition, and has developed a tool to measure "SHS" with the goal of bringing more precision to preventative health care.

Wang and his team at ECU define suboptimal health as "a physical state between health and disease," characterized by ambiguous health complaints as well as general weakness and periods of low energy. Wang, who has been studying medicine for 30 years, says suboptimal health also describes a reversible stage of a chronic disease, which is a crucial distinction in how physicians can approach any number of health conditions.

"Since prognosis is improved in all disorders by early detection, it is prudent to underscore the potential to improve not only individual well-being, but also that of their family and caregivers, to reduce the overall burden on the health-care system," Wang said.

Addressing a public-health challenge

In Wang's native China, there has been an increase in the number of people who report symptoms indicating illness but without the presence of a specific disease or disorder. Drawing on his familiarity with traditional Chinese medicine, which has long identified a physical state between health and disease, Wang developed a comprehensive suboptimal health questionnaire, called SHSQ-25, in 2009. Wang now leads two teams in SHS study — one at ECU and another in Beijing.

Although suboptimal health status has become a public-health challenge in urban China — including indications that SHS could lead to or exacerbate cardiovascular problems and metabolic diseases — there are few reports of actual SHS investigations, says Wang.

Tackling crippling public-health problems like dementia requires early diagnosis and prevention, a mission characterised by understanding the intermediate stages linking health and disease.

In 2010, researchers used Wang's questionnaire as part of a study associating SHS and cardiovascular risk factors among urban Chinese workers. The study of 4,881 workers measured blood pressure, glucose levels, body mass, and other factors linked to cardiovascular disease, with an overall "SHS score" derived from these results and data collected in the questionnaire.

Thanks in part to Wang's survey, the study found a correlation between SHS and various cardiovascular disease risk factors. Additionally, the prevalence of suboptimal health symptoms increases alongside age, a trend consistent with the rise of cardiovascular-related issues in urban China. As treatments for cardiovascular and other non-communicable illnesses are often implemented after disease onset, understanding SHS is a means of approaching health complaints from the perspective of predictive, preventive, and personalised medicine, Wang says.

"Suboptimal health status is associated with cardiovascular risk factors and contributes to the development of the disease," he says. "SHS should be recognized in the health-care system, especially in primary care."

A powerful predictive instrument

An author of over 200 scientific papers on suboptimal health and related topics, Wang created the questionnaire keeping in mind the increased relevance of SHS intervention and prognosis. Focus-group discussions provided the basis for the survey, while a small pilot study included tests for reliability and internal consistency. The final questionnaire is short and easy to complete, containing 25 items narrowed down to five subcategories: fatigue, the cardiovascular system, digestive system, immune system, and mental health status.

Experts say China — whose recently abolished one-child family-planning policy has resulted in a rapidly aging population — has a higher incidence of chronic illnesses than other middle-income countries. For example, Wang points to a nationwide onslaught of dementia forecasted to reach 23.3 million cases by 2030, according to WHO and also Wang's research on dementia published in the well-known journal of *Lancet*.

Suboptimal health status is also a potential risk assessment for diabetes mellitus — commonly referred to as diabetes — a group of metabolic disorders characterised by high blood-sugar levels over a prolonged period. Diabetes affects more than 425 million people globally, with Type 2 diabetes accounting for over 90 per cent of all cases. The International Diabetes Federation relates Type 2 diabetes to physical inactivity and an unhealthy diet. An increased prevalence of the disease among adolescents and young adults is likely due to a rise in childhood obesity.

These individuals often remain undiagnosed for decades, necessitating the intervention of non-invasive screening tools like SHSQ-25. Research in China found that a higher SHS score among questionnaire respondents indicated a higher occurrence of diabetes. Meanwhile, a separate study in Ghana — where 440,000 people were documented to have the illness as of 2013 — pointed to SHSQ-25 as "a platform for prediction, prevention, and treatment" of Type 2 diabetes. "This is vital, particularly for a region where laboratory-based measures are not routinely available," the study said.

In recent years, Wang's work has centered on using glycans to produce an objective measure of suboptimal health. Known generally as simple and complex carbohydrates, glycans have long been known to play major metabolic, structural, and physical roles in biological systems.

As a committee member and key researcher in the Human Glycome Project, Wang aims to understand the role glycans play in the progress of diabetes, cardiovascular disorder, and other chronic illnesses. According to Wang, glycans can also be objective health markers — a powerful predictor when integrated with the suboptimal health measures endorsed by the university.

ECU's questionnaire has already been translated into Chinese, English and Russian. Use of the tool across additional populations can result in early detection of chronic diseases, says Wang, ideally reducing the burden these illnesses place on society.

FINDING THE LINK BETWEEN SEAGRASS AND GLOBAL CLIMATE CHANGE

Edith Cowan University (ECU)'s ground-breaking marine science research will inform global climate change policy for years to come.

An international research team led by ECU investigated the huge loss of seagrass as a result of a marine heatwave in the Shark Bay UNESCO World Heritage area in Western Australia.

Up to nine million metric tons of carbon dioxide (CO_2) were released into the atmosphere over the following three years as a result of seagrass loss.

This is roughly the equivalent to the annual CO_2 output of 800,000 homes or 1,600,000 cars driven for 12 months.

Seagrass meadows are significant because they store CO_2 in their soils through biosequestration.

As loss can occur quickly and recovery of seagrass is limited and slow, scientists from ECU, together with their global research team, are developing strategies for restoration and repopulation.

RESTORING LINKS TO MELODIES PAST

Edith Cowan University (ECU) is the proud custodian of one of the world's most significant historical keyboard collections from the 18th, 19th and 20th centuries.

"The Founding Pianos" is a prized collection of instruments made from 1736 and includes the First Fleet piano, which left the United Kingdom on board the flagship HMS Sirius and arrived in Australia in 1788.

ECU is breaking new ground to address the global need to document current conservation and restoration practices performed across Europe by offering the world's first PhD in historical instrumental restoration.

Apprenticed to leading restorers, students will learn the techniques to bring these incredible instruments back to life and give a voice to pianos on which great pianists such as Beethoven and Mozart once composed.

Restoring Links to Melodies Past

ECU scholars work to conserve a prized collection of historical pianos.

If the First Fleet piano could talk, it might tell you about its eight-month adventure across the seas from England to Australia, where it arrived as the then-new colony's first piano in 1788. The finely crafted instrument then might go on about the pair of fires it survived, or about how it became the first piano used in lessons in Australia.

Our talking piano could undoubtedly tell you about the pains of aging as well. Historical instruments contain moving parts, ornate inlays, and ivory keys that can disintegrate over the centuries, and are often very hard to replace. Wood rots. Delicate mechanisms can rust or splinter. Sometimes, instruments suffer neglect to the point where they cannot be saved.

So, when Stewart Symonds, a Sydney collector, began looking for a long-term home for the First Fleet piano and 139 other vintage keyboard specimens he owned, he was lucky enough to encounter a kindred spirit — one who is not only an international-award winning fortepianist and educator, but also one with an abiding interest in the conservation of historic keyboard instruments.

That kindred spirit Professor Geoffrey Lancaster, happened to be a research professor at ECU. Shortly after joining the faculty in 2015, he alerted ECU to the cultural heritage value of Symonds's collection and suggested the University acquire it.

"Several of the instruments are unique to the world, often by virtue of the fact that they are the only remaining examples of the work of particular makers," Lancaster says. "Or they are rare, or of Australian cultural significance."

Lancaster's interest transcended merely curating the vintage keyboards. Indeed, he wanted the university to exhibit the collection — now part of a larger group of donated keyboards called "The Founding Pianos." But he also wanted it to spearhead a program devoted to conserving and/or restoring much of what Symonds spent half a century amassing. What's more, Lancaster saw the opportunity to train a new generation in how to do the work.

As fortepianos (the precursors to the pianoforte —or what are simply called "pianos" today) and other keyboards of the era most often linked to composers such as Beethoven, Chopin, Mozart, and Schubert continue to grow older, their maintenance has become a pressing issue. Because many are deteriorating from time, disuse, and neglect, the sounds they make are threatened with extinction.

According to Lancaster, who has recorded more than 50 commercially released CDs and is known as one of the world's most accomplished performers on late eighteenth- and early nineteenth-century fortepianos, this is a potential tragedy.

"Playing on such instruments is akin to traveling in time," he says.

Nearly 50 years ago as an undergraduate piano student, Lancaster became enchanted by an early nineteenth-century fortepiano he spotted in a Sydney antiques shop. The shop owner had a passion for the dozens of old instruments he displayed there — something Lancaster intuitively understood.

"Within a very short space of time, that antiques dealer changed my musical life," he says. "I knew in my spirit that this is what I should devote my life to."

In 2016, after several major Australian institutions had turned down Symonds's offer to donate his collection, ECU bought into Lancaster's passion. The college trucked the collection across the continent to Perth.

Now on campus, The Founding Pianos collection features instruments made from 1736 to 1874, among them the Frederick Beck square piano that came across the oceans on the Sirius with Australia's original settlers on the First Fleet. The collection has been recognised as one of the world's most significant, rivaling those found in Austria, France, Germany, the United Kingdom, and the United States.

What distinguishes the collection is its importance to Australian musical history — and the role ECU plays in keeping many of the collection's instruments in working condition.

"The Symonds Collection is the only such collection at a public institution that has made many of the collection's instruments available for applied research and training into the techniques of conservation, restoration, and maintenance," says Lancaster.

As a result of his vision and Symonds's generosity, ECU is now at the center of worldwide efforts to develop best practices and educational programs on how to painstakingly conserve and restore prized historical instruments. As the university ramps up its research efforts in many academic realms, the Founding Pianos restoration program comes at just the right time, Lancaster says. Too few people worldwide are involved in conserving, restoring and maintaining old keyboards, and fewer still are being groomed to replace them.

In taking on the challenge of reversing those trends, ECU hopes to become a world leader in codifying and researching ways to keep many instruments playable, while conserving those whose operational days are past or that are so valuable as sources of information that they should not be touched. The goal is to develop Australian expertise that rivals that of other Western nations.

Yet, the knowledge the program gathers won't be limited to Australia. ECU has joined a network of august music institutions — including the Royal College of Music in London and the Paris Conservatoire — that feature considerable collections of historical instruments. The University will share its findings and restoration techniques.

Lancaster, citing 40 million piano players in China, believes the research program's reach could one day become wider and much more profound.

With the help of conservators, technicians, and engineers — including several ECU faculty members and staffers — researchers will investigate several obstacles to restoration. Those include repairing or replicating parts made from ivory or whale baleen, both now protected by worldwide conservation efforts.

The university plans to link students with master restorers who will teach them the finer points of the trade. This year, it will begin the world's first PhD program devoted to keyboard instrument restoration, which will research and document current methods of maintaining the instruments' vitality.

One of the first steps in the program involves evaluating the needs of each instrument. During this year, a PhD fellow will observe and document this process, as well as the actual restoration of the First Fleet piano, which will make a return voyage to England, where accomplished restorers will rehab it.

Besides raising the profile of ECU Western Australia Academy of Performing Arts and its reputation as a pre-eminent institution for music study in the region, the focus on historical instruments will enable students to learn to play on instruments that in some ways resemble the modern piano, but make sounds that are distinctly different. "In relation to musical art, it has to do with the deepest levels of meaning," Lancaster says.

"ECU's hope is that the lives of students, music lovers, scholars, visitors to western Australia and members of the broader Australian community will be transformed by the beauty of the sound of the instruments in the collection," he says. "For this to happen, some instruments need to work."

RESEARCHERS USING SCIENCE TO IMPROVE THE TASTE OF BEER

Edith Cowan University (ECU) researchers are applying innovative new ways to improve the taste of beer by using cutting-edge mass spectrometry to examine proteins during the brewing process.

Leveraging ECU's existing expertise in brewing, nutrition and dietetics, researchers are investigating the process of brewing with equipment more commonly used in medical and pharmaceutical labs.

Mass spectrometers measure the individual proteins and their fragments in a food sample, allowing researchers to analyse the different types and amounts of proteins and how they affect the flavour of beer.

There are endless possibilities for this technology and the different ways it can be utilised to introduce science to the popular craft beer market.

ECU SOLAR-GLASS INVENTION IS POWERING AGRICULTURE

Edith Cowan University (ECU)'s Electron Science Research Institute has developed an innovative, high-tech glass that uses nanotechnology to harvest solar energy. This technology can be used to transform windows into generators of up to 50 watts of power per square metre, while still allowing light to pass through.

In collaboration with ClearVue Technologies ECU is building a greenhouse powered by the solar-glass, which has the potential to turn the driest desert into productive agricultural land due to its ability to be tailored to any environment. This will likely be life-changing for parts of the world that are too hot for traditional greenhouse agriculture.

Victor Rosenberg, ClearVue Technologies Chairman, believes that the use of the solar-glass goes far beyond greenhouses, with the potential to transform cityscapes into environmentally friendly hubs and contribute to a greener future.

First-of-its-Kind Solar Glass Invented at ECU Promises Great Benefits to Society.

Fossil fuels are responsible for the carbon emissions that are causing climate change and threatening the world's environmental future. As scientists seek to solve that problem, they are working hard to find new and better ways to harness renewable energy sources, such as wind, water, and sunlight, that can replenish naturally, without harmful effects. Researchers at ECU, are finding success in this mission. They have developed what is believed to be the world's first clear, energy-harvesting solar glass.

A 110mm by 110mm clear solar glass sample, created in the university's Electron Science Research Institute (ESRI), has recently been demonstrated allowing more than 70 per cent of visible light to pass through while blocking 90 per cent of infrared radiation and ultraviolet light.

There are well established plans to develop a 1.2m by 0.6m solar glass sample that can generate more than 40w/sqm.

Other scientists in other places have developed similar solar glass designs, but those versions are not as transparent. Lines, dots, or squares containing the solar cells make those designs partially opaque, thus less desirable for widespread use.

Greater Transparency, Longer Life

ECU's more sophisticated clear-glass technology boasts greater transparency, strong shatter resistance, effective energy generation, tough durability, and a longer lifespan.

It is a technology that could be critical to rural, remote, and underdeveloped areas, as well as major cities, and other areas in between. In agriculture, the glass could be used to build self-sustaining greenhouses to grow food in any climate and in any season. The technology also has potential benefits for the construction industry, automotive manufacturers, public facilities, consumer electronics, and more. Its use could improve lives, make cities cleaner, protect the environment, reduce health costs, and lead to further green advancements.

"This is a proven way of saving energy and, thus, reducing the carbon footprint," says Professor Kamal Alameh, Director of the ESRI. Alameh credits the University's commitment to research and investment in the ESRI with making the invention possible.

State-of-the-Art Institute

The ESRI was created in 2003 in an effort to further position the university as a world leader in nanophotonics and materials science. The world-class facility has undergone rapid expansion since then, and it features state-of-the-art design, equipment, and laboratories.

A number of researchers are solely focused on renewable energy. ESRI has created an extensive network of industrial and academic partners in China, Korea, United Kingdom, Russia, Sweden, United States, Israel, Germany, Japan, and France. ESRI scientists have published more than 200 scholarly journal articles, presented more than 200 conference papers, secured more than 34 patents, and developed technology that has created four start-up companies. University researchers work closely with industry partners to ensure their inventions can be marketable.

In the case of the clear glass technology, Alameh and his research team worked with ClearVue Technologies, an Australian company that produces and sells glass and building products worldwide. Victor Rosenberg, the company's founder and executive chairman, has called the solar glass a "super building material," emphasising that it is commercially viable. "It gives you daylight in which it lets light through, it gives you solar control, thermal control, it's also safety glass, and it gives you power," he said.

Self-Sustaining Greenhouses

The energy-harvesting glass is now being field tested in a variety of ways. Perhaps the most visible is a 300 sqm greenhouse currently being constructed in Perth. A $1.6-million grant from the Australian government is supporting the project.

The solar power of the greenhouse should produce at least 35 watts of energy per square meter of glass, which is sufficient for plant growth, says Alameh. The greenhouse is being constructed with different types of glass in different sections, so researchers can compare their performances, in terms of crop yield, water usage, and energy consumption. The energy collected in the greenhouse will be used to power the structure and to provide lighting, heating, cooling, water desalination, and irrigation, as necessary.

Generating electricity while allowing most of the visible light through can be a huge cost-saver in greenhouses, even on a large scale, he says. The internal system also can be tailored to create optimal growing conditions for particular plants. Because it is a self-sustaining environment, the greenhouses could be built virtually anywhere. "This is particularly significant for parts of the world that are too hot and dry for traditional greenhouse agriculture," says Alameh.

From Pilot Tests to Widespread Use

The new technology also holds great promise for buildings, whether residential, commercial, or public infrastructure, as it is suitable and workable for windows, skylights, facades, and walls that don't bear structural weight. It could help create "zero-net-energy buildings," in which the energy used is equal to the renewable energy produced, says Alameh.

The technology is able to modulate a building's temperature by selectively reducing the amount of thermal, infrared, and ultraviolet rays that pass through, without affecting the visible natural light.

To test that capability, windows made of the clear solar glass have been installed in a self-sustaining bus shelter in Melbourne and in the entrance area of a shopping center in Western Australia. In both cases, the prototype has been working well in terms of energy generation and blocking unwanted solar radiation, Alameh says. Using the glass in public spaces also offers solutions to providing free energy for, among other uses, charging mobile phones and laptops.

The ongoing pilot tests of the new technology are expected to demonstrate its effectiveness, its benefits, and its potential. Alameh hopes the positive results will promote its acceptance and use throughout Australia and beyond. He predicts that in a decade or two, the technology will be incorporated into major installations, large airports, big hotels, and other projects around the world. "There is a substantial international opportunity for this clear solar glass technology to be adopted," says Alameh. "It will have a clear pathway of expansion."

ECU CHAMPIONS INTERNATIONAL SPORTS INJURY RESEARCH

Edith Cowan University hosts one of only 11 international research centres chosen by the International Olympic Committee to study the prevention and treatment of sports injuries and illness.

The Australian Centre for Research into Injury in Sport and its Prevention (ACRISP) is an elite group of researchers across multiple disciplines that is delivering ground-breaking insights and new knowledge that bridge elite sport, community sports and public health.

ACRISP works with national and international sports bodies to translate their research into practical advancements for sport and public health.

LEADING THE PLAY ON SPORTS INJURY PREVENTION

Researchers at Edith Cowan University (ECU) are using novel approaches from the developing fields of sports injury epidemiology and implementation science to understand and prevent injuries on the playing field.

More than 95 per cent of people who play sport aren't professionals or elite athletes, which leads to a large group at risk of injury.

Research led by ECU's Deputy Vice-Chancellor and Vice-President for Research Professor Caroline Finch AO is ensuring competitors at every level can play on and be active throughout their lifespan, thanks to research on sports injury surveillance, injury prevention, behavior change and educational needs.

Using a data-driven approach and biostatistical evidence, Professor Finch aims to create an Australian sports injury surveillance system similar to national data-collection efforts in other countries such as the US. She is one of the most influential sport health researchers in the world, deemed "true sports-medicine epidemiology royalty" by the *British Journal of Sports Medicine*.

ECU also hosts the Australian Centre for Research into Injury in Sport and its Prevention (ACRISP). This is one of only 11 international research centers chosen by the International Olympic Committee to study the prevention of sports injuries and the protection of athlete health. ACRISP works with national and international sports bodies to translate their research into practical advancements for sport and public health.

ECU research harnesses data to prevent injuries on the playing field.

For top-tier athletes or weekend warriors, playing sports is valuable for physical coordination, fitness, and self-esteem, and teaches important lessons about teamwork and discipline. Professor Caroline Finch at ECU is ensuring competitors at every level stay on the field, thanks to her research on sports-injury prevention, education and awareness.

Professor Finch is orchestrating efforts to prevent injuries in Australian rules football as well as among Olympic athletes. ECU's elite-level injury-prevention programming is also being implemented in the amateur ranks, with an emphasis on training and preparation meant to reduce sports-related hospital visits.

"Injuries suffered playing amateur sports costs the Australian economy more than $1.5 billion a year," Finch said. "While there is, rightly, a strong focus on preventing injuries on the roads and in our workplaces, a serious injury suffered on the footy field can be just as devastating for the individual and their family."

An ounce of prevention...

Australian rules football — known officially as Australian football and informally as "footy" — is a major research focus for Finch, author of more than 600 papers and reports on sports-injury prevention. The Australian Football League, or AFL, is the sport's only fully professional association and represents the nation's wealthiest sporting body. As of 2016, the immensely popular game supported 1.4 million registered players participating in over 25,000 amateur clubs nationwide. Female football play is undergoing rapid growth, registering a 25 per cent increase in participation from 2014 to 2015, according to a study helmed by Finch and other researchers.

Like any athletic endeavor, Australian football carries an injury risk, notes Finch. The game's combination of tackling, kicking, jumping, and high-speed running results in a prevalence of lower-leg injuries, mostly hamstring strains, ankle sprains, and anterior cruciate ligament (ACL) injuries.

More contact-oriented than soccer though less so than rugby, injuries in Australian football often occur from sudden changes in direction when running what Finch calls the equivalent of "a mini-marathon" every match.

Although organised women's football is still in its early days, female participants are demonstrating higher incidence of ACL injuries, likely due to decreased ligament development as compared with men and the lack of training programs needed to solve the issue.

Injury prevention is preferable to post-injury medical treatment at any level of sport, says Finch. Enter the FootyFirst program, a training regimen she designed to reduce risk of common leg injuries in community football.

Created in conjunction with the AFL based on the latest scientific evidence, FootyFirst begins with a warm-up, followed by strengthening and conditioning exercises to improve a player's balance, landing, and side-stepping skills. While star athletes have a staff of conditioning coaches supporting them, FootyFirst requires only standard equipment and a spare 20 minutes for warm-up and exercise time.

"More than 95 per cent of people who play any form of sport aren't professionals," Finch says. "There's a whole group of people at risk for injury. That's what motivated me to get them this information."

A pilot FootyFirst program in the state of Victoria resulted in a 22 per cent drop in the rate of injuries over the course of an amateur football season. At ECU, Finch and her team are now delivering videos, instruction manuals, and other resources to parents, coaches, and league administrators countrywide. For its part, the AFL provides accreditations to coaches of national club teams that use FootyFirst in their daily practices.

"My work has emphasised that it's not just about getting athletes to change their behavior," says Finch. "Athletes are managed by coaches, and coaches are under pressure from administrators. Injury prevention requires everyone's involvement."

To Australia and beyond

Finch promotes peer-reviewed evidence and statistics in motivating change among Australian athletic clubs, and has become one of the most influential sport-health researchers in the world. Deemed "true sports-medicine epidemiology royalty" by the *British Journal of Sports Medicine*, Finch uses biostatistics —a merging of biomedical science and mathematics — to understand and prevent injuries on the playing field.

With statistics-based evidence, Finch aims to create an Australian sports-injury surveillance system similar to the United States' National Collegiate Athletic Association (NCAA)'s data-collection efforts. Along with the AFL, Finch is working with governing bodies in cricket and rugby and has spoken to federal and state governments on policies about — among other issues — protecting athletes competing in extreme weather conditions.

Finch is also helping ECU make a global splash via ACRISP, one of only 11 research centers worldwide selected by the International Olympic Committee (IOC) to study the prevention and treatment of sports injuries and illness.

ACRISP provides research and guidelines on everything from training loads to recognition of concussion symptoms. Results are distributed to Olympic sports federations, which disseminate this data to the athletes themselves.

Finch says the IOC recognition is a significant endorsement of ECU's sports-medicine research. This year, ACRISP unveiled two new PhD scholarships for research relating to injury surveillance and prevention in sport.

"It's exciting to be part of an elite group of international research centers delivering groundbreaking insights and new knowledge in the area of sports medicine," says Finch. "The fact that the IOC is supporting us is going to benefit ECU going forward. It's a direct measure of the excellence and relevance of the work we're doing here."

Finch is pleased to assist all athletes in reaching their physical potential at whatever level that may be. Ultimately, preparation is key to a happy and healthy sporting life, she says.

"Training for any team or sport allows for reduced risk of injury, because your body is going to be fine-tuned for the motions of the game," Finch says.

ECU CYBER INDUSTRY PARTNERSHIPS

ECU's world-leading cyber security research team has made securing digital futures their business.

Partnering with industry to deliver powerful research and commercialisation outcomes, ECU researchers are delivering breakthrough technologies in both IT and OT environments.

ECU's partnership with Jindalee Partners in collaboration with Woodside, has resulted in Sapien Cyber Ltd, an emerging leader in the protection and security of critical infrastructure.

Home to the $140m Cyber Security Co-operative Research Centre and offering the largest cyber security and research program in Australia, ECU is recognised by the Australian Federal Government as one of just two Academic Centres of Cyber Security Excellence.

Dynamic partnerships with industry giants such as CISCO, Emirates and RSA continue to provide unparalleled opportunities for students and researchers to deliver world-class projects at the forefront of technology.

ECU IS SMOKE-FREE

Greening ECU

ECU is committed to reducing the environmental impact associated with its operations by conducting its activities in a socially and environmentally responsible manner. This includes implementing strategies and technologies that minimise waste of resources and demonstrate environmentally sensitive development, innovation and continuous improvement.

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