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Uniview

THE MAGAZINE OF THE UNIVERSITY OF WESTERN AUSTRALIA

*Powering
the future*



THE UNIVERSITY OF
**WESTERN
AUSTRALIA**

Message from the Editor

Welcome to our summer edition of *Uniview*.

In this edition we showcase the strength of UWA's research underpinning the transition to clean energy as Australia moves away from carbon dependence.

Our researchers have been leading this charge towards a cleaner, greener future for many years, advancing technology to develop practical solutions to existing and emerging challenges.

UWA's work in the green energy space is wide ranging, with expertise drawn from engineering and molecular sciences through to business and economics. In this edition we showcase technology advances by UWA researchers, including our work on microgrids for remote areas, electric vehicles and offshore wind farms.

In other features, we introduce the newly opened Wonil Hotel, which supports research and innovation capacity in Western Australia by supporting the Forrest Research Foundation. We also unveil highlights from the upcoming Perth Festival.

We hope you enjoy reading this edition over the holiday break.

Alison Batcheler
Editor
 Associate Director, Corporate Communications



Power Moves



Winds of Change



Driving Force

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The University of Western Australia acknowledges that its campuses are situated on Noongar land, and that Noongar people remain the spiritual and cultural custodians of their land, and continue to practise their values, languages, beliefs and knowledge.

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From the Vice-Chancellery

Professor Amit Chakma, Vice-Chancellor
 The University of Western Australia

Meeting the challenges of energy transition

As a research-intensive university, we have a responsibility to drive change towards a cleaner and greener future, both locally and on a global scale.

As part of this drive, UWA works closely with our key industry and government partners to find solutions to the economic, environmental and social challenges facing the energy industry.

From sourcing critical minerals to the development of new energy sources, UWA has been at the vanguard of innovation in our State at every step in its history.

An exemplar of this innovation is Professor Hongqi Sun from our School of Molecular Sciences, who was awarded joint WA Mid-Career Scientist of the Year prize in 2023 for his investigations into the potential for hydrogen to be used as an alternative source.

From engineering to business disciplines, our researchers are working alongside industry to meet the challenges of energy transition. This has led to many practical solutions tailored to the unique needs of Western

Australia, such as the development of microgrids for remote areas and the establishment of offshore windfarms in the southern half of Australia.

UWA has also worked at the forefront of the electric vehicle revolution for more than 15 years, meeting the challenges of autonomous driving technologies and other innovations to support the transport industry's move away from fossil fuel dependence.

As Western Australia explores decarbonisation opportunities in support of its commitment to net zero by 2050, the world-class expertise of UWA researchers has never been more critical. ■

Arts shimmer and shine



Wayfinder.
Image credit: Amber Haines

Perth Festival 2024 promises to nourish audiences' minds while delivering a diverse program of artistic events.

The theme Ngaangk, our star, the sun is also the Noongar term for mother, which nourishes everyone and everything that grows and thrives on Noongar Boodjar.

The 2024 Festival marks the end of UWA alumnus Iain Grandage's five-year tenure as Artistic Director.

"Our 2024 Festival will be filled with light, life and love," Grandage says.

"This Festival will bathe us in warmth like our nearest star and have us celebrating our shared lives under the same sun.

"We celebrate not only our shared humanity, but also Ngaangk's effect on the Earth and the botanical marvels that grow here. We cannot wait for you to join us - we hope to make your faces shine."

The Festival program features new voices and established stars including Angélique Kidjo, Akram Khan, Paul Kelly, Brooklyn Rider, Ludovico Einaudi, Sampha, Joan Jonas, Lonnie Holley and Jane Smiley.

It opens on Friday 9 February with the world premiere of the opera, *Wundig wer Wilura*, by Gina Williams and Guy Ghouse.

For more than three weeks audiences can relax, revel and reflect in indoor theatres, galleries and concert halls to sun-kissed beaches and parks, suburban streets, a subterranean food court and public pool.

The sun sets on the Festival at the Supreme Court Gardens on Sunday 3 March with the free Lotterywest event *Under the Same Sun* with collaborations from leading Aboriginal musicians and international greats.

Writers Weekend (February 23-25) has a new home at the State Library of Western Australia and the Lotterywest Films season returns to UWA's Somerville Auditorium for a 19-week line-up of international films. ■

Lotterywest Films run from Monday 20 November 2023 to Sunday 31 March 2024.



Boutique hotel to benefit best and brightest

The best and brightest researchers from around the world are the major beneficiaries of a new boutique hotel located on the banks of the Swan River and adjacent to The University of Western Australia.

Through a unique operating model, net revenue from Wonil Hotel Perth is reinvested back into the Forrest Research Foundation (FRF) which drives research and innovation capacity in Western Australia by awarding fellowships and scholarships. The hotel which is operated by Accor, opened in early 2023 followed by the launch of the hotel's food and beverage outlet West Kitchen & Bar. This completed the development of the Forrest Hall Precinct.

Funding future Industry

The development of next-generation materials and future-proofing Australia's hydrogen export industry are two research areas advancing in Western Australia through the FRF program.

Forrest Fellowship recipient Dr Neil Robinson joined the Fluid Science and Resources research group at UWA in 2022, after completing his PhD at the University of Cambridge.

His widely applicable research on the development and characterisation of next-generation materials is focusing on gas and liquid dynamics within functional porous materials, with anticipated environmental and societal impacts for the energy industry.

UWA's School of Engineering researcher, Dr Arman Siahvashi, was granted a Forrest Fellowship in 2020. He is future-proofing Australia's hydrogen export industry by developing new technologies and knowledge to provide a competitive edge for the industry through safer, and more economical operations while benefiting our environment.

Creating a community of exceptional scholars

Forrest Hall's state-of-the-art scholar accommodation facility was designed with the purpose of attracting and inspiring these top researchers in their academic pursuits while creating a space to enhance their on-campus learning experience.

Wonil Hotel creates a welcoming space for the academic and local community to gather and enjoy the panoramic location on the banks of the Swan River.

Professor James Arvanitakis, Director of Forrest Research Foundation, said the hotel's facilities and its revenue model would have long-lasting benefits to the research community in WA.

"The idea of Forrest Hall is to accommodate scholars who can generate the energy and drive to achieve outstanding results simply through sparking off each other and discussing problems which otherwise seem unsolvable," Professor Arvanitakis said.

"We support each fellow and each scholar to drive their academic career,

to generate the newest and the boldest ideas, to transform, innovate and translate their knowledge, their research and their findings into meaningful results and solutions that will have a real and direct impact on people's lives."

The FRF scholars and fellows, who carry out research on areas ranging from alternative energy sources, astrophysics, coastal erosion and marine management, expanding new fields of research such as DNA origami, Australia's aged workforce, and medical breakthroughs.

"Nothing quite like it exists anywhere else in Australia," Professor Arvanitakis said.

"In addition to the world-leading researchers we are attracting, we are proud to utilise the hub for academic and community activity, making Perth a global knowledge destination."

The FRF was established in 2014 following a donation from Andrew and Nicola Forrest through the Minderoo Foundation. It supports a community of exceptional scholars to undertake doctoral and postdoctoral research which will change the world. ■

For more details about Wonil Hotel Perth - Handwritten Collection, visit Accor's website.



POWER MOVES

By Carrie Cox

Science, industry and government are having to work fast to prepare the State's electricity grid for a perfect storm of change.

For all its complexity, Western Australia's electricity system has largely operated in the same fashion for more than a century. Yes, the lights go out occasionally, especially after rain, but for the most part our State's sprawling power system has worked just as its pioneers might have hoped back in 1888 when CJ Otte first fired up the Perth Electric Light and Power Company.

Back then and for most of the 20th century, the biggest challenge for WA's engineers and decision-makers was growing the Meccano set to keep pace with expansion. But suddenly, in what feels like the flick of a switch, 'growth' has given way to 'overhaul' as the buzzword in utility boardrooms. The conflation of solar energy take-up, serious renewable energy targets, electric vehicle usage, pricing volatility and new technologies has produced a perfect storm of wicked new problems to solve and opportunities to exploit.

Fortunately people such as Dr Chris Townsend, a power electronics expert within UWA's School of Engineering, enjoys a challenge. Much of his work currently sits within a \$2 million project to design power electronics that ensure electrical stability in regional WA microgrids. It's one of a suite of programs funded by the Future Battery Industry Cooperative Research Centre, a federal initiative to maximise the potential of the battery industry and address the challenges of energy transition.



‘We’ve had a power system that’s operated the same way for more than 100 years and the existing workforce know how to operate that system really well.’

Dr Townsend says WA’s electricity system is at a critical juncture and current research has a vital role to play. “Utilities haven’t had to move quickly until now and so there’s some turbulence during that transition,” he says. “We’ve had a power system that’s operated the same way for more than 100 years and the existing workforce know how to operate that system really well, but now we have more and more renewable energy coming into that system and we’ve reached that tipping point where you are going to get more and more problems if you don’t invest wisely.”

Dr Townsend says one of the most important areas for attention needs to be the interface between new energy sources and how they interact with the grid.

“The grid is going to have to change a lot in that we’ve always had power electronics sitting at the end of it and they’re predominantly associated with loads. More and more we’re going to see those power electronics embedded

into the system, controlling the power flows. The utilities and their workforces haven’t had to deal with these devices in this way before, so there is going to be a large upheaval associated with that, as not many people understand this technology and much of it is built overseas.”

Industry education and local manufacturing have equally important roles to play in navigating the transition, according to Dr Townsend. “If you don’t have technology that is catered to the local conditions, you can have stability problems and potentially blackouts,” he says. “There needs to be more awareness of the need to build our own solutions.”

To that end, Dr Townsend’s research team has been working with Perth-based Australian company Magellan Power to design and build new interface technology for the WA grid.

“Together we’ve just produced the first WA-designed 100kVA modular inverter system that will have immediate applications in energy storage, standalone power systems, microgrids and high-power electric vehicle chargers,” he says. “It’s an example of a lot of great work happening in WA with local manufacturers right across the battery value chain.

“I think WA has an opportunity to be the Australian leader in this space. We have the critical minerals here so it makes sense to manufacture storage technology here, so that ultimately we’re the masters of that technology and we can sell it to the rest of the world, rather than just digging up the resources and shipping them overseas.”

UWA has also been working with Western Power to produce new microcredential courses and targeted educational offerings to help upskill its workforce for the technological transitions ahead.

For all the innovation and investment happening in the State’s energy sector now, the overarching goals are modest: stability and cost-efficiency. Interestingly, these have a more complicated relationship since the advent of renewables.



A coal-fired power station.

A high-voltage substation.



Photovoltaic panels are a key part of the solution.



Dr Chris Townsend, a power electronics expert within UWA’s School of Engineering.

“The advantage of the traditional system is that there are only a few big generators and the utilities can control them in the way that they like and maintain a relatively stable system,” explains Dr Townsend. “That’s not necessarily the most beneficial solution cost-wise to the end user because you have to send power from a long way away to where they actually consume it. So it’s better for consumers to have distributed solutions, such as their own solar panels, and produce power where it’s consumed — there are fewer electrical losses and less infrastructure required.

“However, you don’t want everyone to be an island. That’s not cost-efficient. It becomes electrically more difficult to have stability if there are potentially millions of distributed solar PVs out on the network. Ideally you want a system that is a combination of both (distributed and non-distributed power) where people can produce power and trade with people close to them. To do that requires highly functional networks and government entities that are willing to provide local infrastructure for people to share power.”

Another complication of an increasingly distributed network is the cost ‘death spiral’ that could arise from cheaper, better battery technology. Dr Townsend explains: “If people evaluate the cost of, say, solar and batteries and say look, it would actually be cheaper for me to produce and store my own power and disconnect from the grid, that will leave people connected to the grid who will now be part of a more expensive system. The more people disconnecting, the higher the costs of the grid. The higher the costs of the grid, the more people wanting to disconnect, and so on. So we really need to strike this balance where people can have their distributed assets but stay connected to the grid and trade energy in their street and suburb.”

Of course a utopian system would require no storage at all. There would simply be a seamless balance between electrical generation and load

– supply and demand – achieved through precision scheduling and agility. But that might be a bridge too far for a system already grappling with monumental change, new energy sources coming on line and a stop-start electric vehicle movement.

Certainly, the State Government is not playing down the conflation of the challenges currently facing the sector. Its Energy Transformation Taskforce stated in August this year: “Unless we modernise the way the power system is regulated and managed, energy will not be dispatched at the least sustainable cost, the power system will be limited in its ability to accommodate growing levels of renewable generation and other new technologies (such as battery storage) while maintaining security and reliability, and signals for investment in the power system — at the right time and place — will be inadequate.”

Best keep powering on, then. ■



Winds of Change

By Doug MacLaurin

They've been operating for decades in northern oceans, and now offshore windfarms are finally on the horizon for Australia.

It's a moment geotechnical engineering specialist Professor Britta Bienen from UWA's Oceans Graduate School has been working towards, solving the challenges of fixing turbines to seabeds in Australian waters.

"I've been working on offshore wind for a decade now and always looking overseas – to the North Sea to other areas of the world – now, finally, there's an opportunity for us to provide our expertise within Australia, so that is hugely exciting," she said.

Still without a single offshore windfarm, Australia might be a generation behind Denmark where the industry was first established in 1991, but this has benefits



Professor Britta Bienen.

as we can take advantage of the learning curve to date, to be at the forefront of the new clean energy future.

There has been strong interest in feasibility licence applications in declared areas over east, with Victoria's Gippsland region likely to see the first turbines in Australian waters. At the Global Wind Energy Council summit in Melbourne in August, Chris Bowen, Minister for Climate Change and Energy of Australia, announced an area in Western Australia to be proposed for consultation in November.

Professor Bienen's work has helped lay the foundation for the technology to be used – in one of the parts of the world best suited to meet its potential.

"Offshore wind is one of the technologies that can be readily rolled out and Australia, the southern half of Australia in particular, is super blessed with immense resources when it comes to particularly strong and steady winds," she said.

But these large energy infrastructure projects have lead times for planning, preparation, and rigorous approvals that could take six to 10 years.

'I've been working on offshore wind for a decade now and always looking overseas – to the North Sea to other areas of the world – now, finally, there's an opportunity for us to provide our expertise within Australia, so that is hugely exciting.'

"Offshore wind is abundant, efficient and can complement onshore and solar, but if we want that to be part of our energy mix going forward, we need to action this now," Professor Bienen warned.

As with any new market, one of the challenges to getting offshore turbines up and running is bringing the public on board with a technology unfamiliar to many.

Professor Bienen has also been making inroads on that front – bringing a public engagement initiative to our shores, that began as a concept her colleague developed in Belgium during COVID lockdowns.

It's called OffshoreWind4Kids – a hands-on activity that has taken the world by storm.

"It's a simplified smaller-scale turbine, and the substructures replicate the different concepts of how you put the structures offshore," she said.

"We invite families to come down to the river – so in gentle offshore conditions – and they build the turbine, install it, see how it works and get to ask any questions they have."

It's one step in introducing Australians to a new form of energy that could be an important part of the country's future – beyond powering residential and industrial infrastructure.

"Some people are looking at exporting clean energy, so that might be on the horizon as well," Professor Bienen explained.

"It could also open up green manufacturing opportunities. For example, the European Union will soon want to know how much CO₂ is embodied in steel so if you have cheap, reliable green energy there's huge potential for Australia to use that."

But, for now, there's more than enough work to be done. "It's really exciting to be part of the industry globally and now hopefully soon being able to apply this here," she said.

"These are complex multi-disciplinary projects and there is amazing innovation that's coming from everywhere, so the field is constantly evolving.

"It's part of why I love my job." ■

Oceans of opportunity

By Carrie Cox



There is immense potential for Australia to leap ahead of the early pioneers in offshore renewable energy development.

At least from where he's standing, Dr Wenhua Zhao sees a curious link between the recent global pandemic and the emergence of offshore renewable energy infrastructure.

Just before COVID-19, whenever Dr Zhao from the Oceans Graduate School would propose his ideas about offshore renewables for Australia, people would look at him askance. "They might think it sounded crazy," he says. "We have so much land here — why would you need to go offshore?"

Fast forward a handful of COVID-19 years and the world is pursuing offshore renewables at pace and the Australian Research Council has just given Dr Zhao almost \$1 million to develop precise prediction models to enable the economically viable development of offshore renewable energy infrastructure.

A mere coincidence of timing or did COVID-19 rewire global thought? "It's hard to know for sure," Dr Zhao says, "but it does seem like we were simply more driven by purely economic motivations before the pandemic. It was easy to just keep doing what we were doing — there was no time to stop and think. But then everything just stopped. And now the feedback for our ideas is that the time is now right."

Significantly, the International Energy Agency reports that new offshore wind installations increased six-fold from 2020 to 2021, even with pandemic-induced supply chain challenges and construction delays hampering the effort. Europe led the early charge, however the Asia-Pacific has recently surged forward, with major developments going ahead in China, followed by Vietnam, Taiwan, Japan and South Korea.

But it's Australia that arguably has the greatest potential to become a global leader in offshore renewables. Our vast coastline provides enormous opportunities for infrastructure development, while our abundant wind and solar resources are the envy of the world. In terms of wind alone, the Global Wind Energy Council estimates Australia has the potential to generate up to 5000 gigawatts of electricity — or 100 times the capacity of the nation's two largest electricity networks — from offshore developments using a combination of fixed and floating infrastructure.

Moreover, our own relatively small population means that any commercially viable energy generation industry has immediate export potential. If we can get it right, it's worth doing, as the Federal Government now agrees, having lifted the ban on offshore turbines in late 2021 and identified six offshore wind zones around the country.

As Dr Zhao observes, with government support comes the possibility for real momentum. "With that support, it's conceivable to talk about a commercially viable offshore energy industry being up and running within five to 10 years," he says.

Dr Wenhua Zhao sees a curious link between the recent global pandemic and the emergence of offshore renewable energy infrastructure.



Dr Wenhua Zhao doing offshore field work near Albany.

“The fundamentals are already there, especially here in WA where we are so strong in offshore technology and we already have the supply chains through LNG and the close proximity to our markets. We are already known to be a reliable energy supplier.”

The kicker, of course, is cost. While renewable energy targets are no longer a nice-to-have, no country is going to support an energy industry for which the numbers simply don't add up. It's this imperative that makes Dr Zhao's \$944,606 ARC project so important. Over the next four years he is charged with developing the advanced hydrodynamic knowledge base to design cost-efficient offshore wind, floating solar and aquaculture infrastructure to accelerate the development of offshore renewable energy in Australia.

“Ocean waves keep impacting structures over time and can induce a lot of damage, so the challenge is to design infrastructure that can reliably stand there for 20 to 25 years,” Dr Zhao explains. “You can simply make the strongest structure possible, but that's likely to involve a lot of expensive material. A much smarter approach is to identify the key parameters affecting the performance of a structure in particular conditions and use advanced hydrodynamic technology to design bespoke structures that are reliable and cost-efficient. It's a very different approach to existing oil and gas platforms.”

And it's not enough to simply transpose what offshore pioneers have successfully constructed overseas. “WA has its own unique sea environment,” Dr Zhao says. “For instance, swells with long wave periods are common in these waters. Structures have to be designed for those wave periods, otherwise they could excite very strong responses that are harmful.”

That said, Dr Zhao says it's still vital to collaborate with other countries making inroads in offshore development. “Structure-wise, there are a few types in the ocean now, mostly in the northern hemisphere, and it's helpful to work with other countries to learn what's working and what isn't. Ultimately we'd like to develop a concept that takes the best of what already exists and then accounts for our own environment.”

While the go-to offshore renewable option is wind, Dr Zhao's work will form a research resource for any new offshore infrastructure development because, as he explains, they all come back to the same initial challenge: how a structure interacts with ocean waves. “Fundamentally they're all the same in that sense,” he explains. “This research

will make it possible to forecast or simulate for any type of offshore structure and ultimately form the basis of future industry guidelines. That's a key outcome for this project and essential for the economically viable development of marine renewable energy.”

For all the movement now happening in the offshore energy space, some may still question the wisdom of it for a country with so much land mass. But offshore energy generation has some advantages over onshore that are difficult to ignore. For a start, wind is generally much stronger and consistent out at sea and has fewer impediments. Its capacity has also been proven to be greater – typically in the order of 10 to 15 per cent, according to research done by the Blue Economy Cooperative Research Centre.

The fundamentals are already there, especially here in WA. We are already known to be a reliable energy supplier.

And, as Dr Zhao explains, when it comes to wind turbines, bigger is better, or at least cheaper. “To reduce the relative cost of electricity, you need to have bigger and bigger turbines, and it's very difficult to do that logistically on land in terms of delivery and transport,” he says. “For a structure that's 100m long, for example – the same length as a football field – you couldn't use conventional road routes for transport. But for an offshore turbine, you can build it in a shipyard and then put it on a ship out into the ocean.”

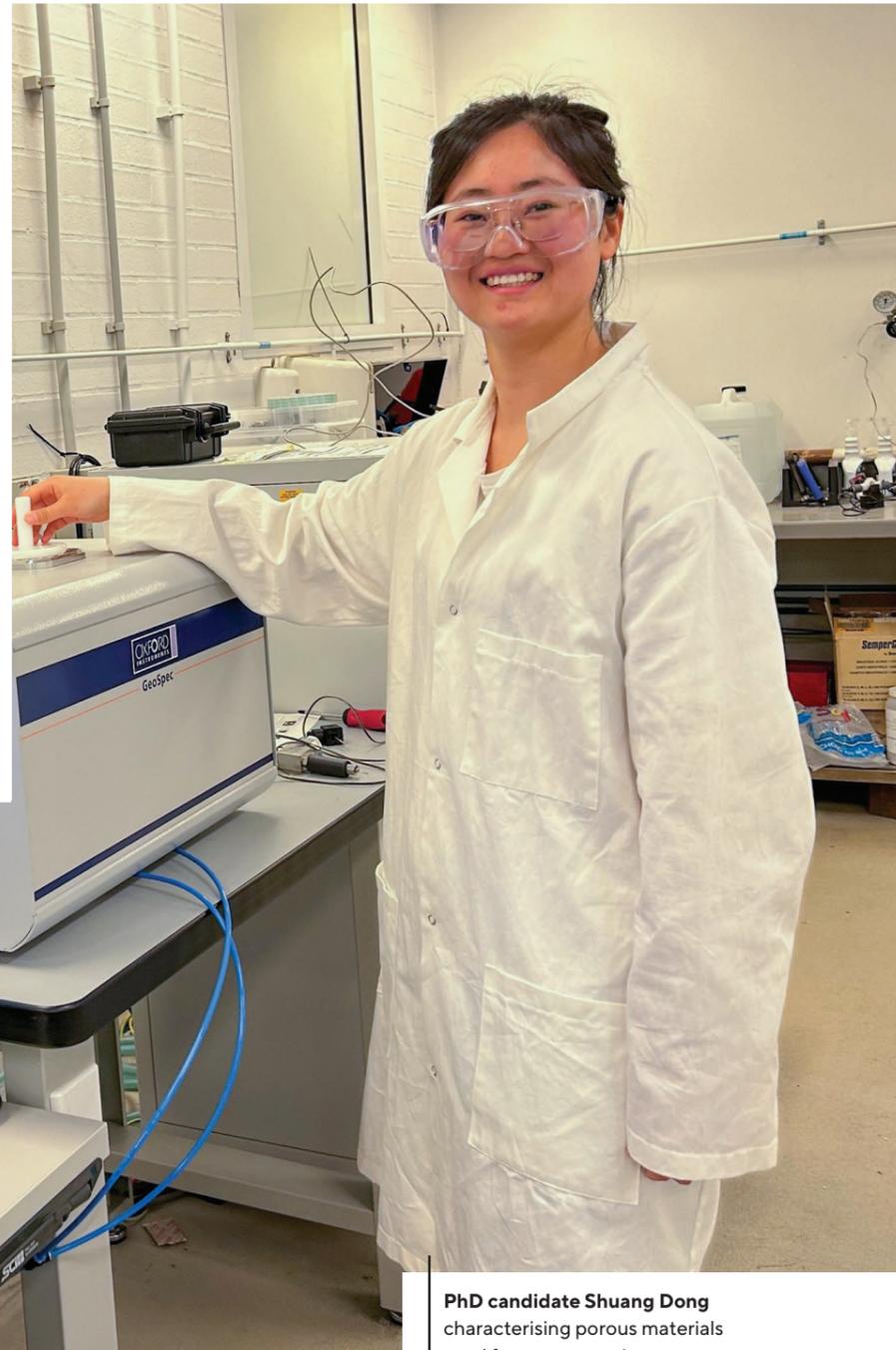
At any rate, comparisons now seem beside the point: both onshore and offshore energy developments will need to be part of Australia's diversified energy landscape to accelerate the transition to renewables. Time is of the essence, as Prime Minister Anthony Albanese told an energy conference in September: “This is a decade in which we either move forward and seize the opportunities which are there, or the world will just go past us.” ■

Foot on *the gas*

By Carrie Cox



Professor Mike Johns with apparatus used to measure hydrogen conversion during liquefaction processes.



PhD candidate Shuang Dong characterising porous materials used for gas separations.

The hot contender to supplant a gas export industry fuelled by fossil fuels is clean hydrogen, but research is needed to bring costs down.

There's a distinct *Field of Dreams* whiff about WA's nascent hydrogen export industry. As governments race to incentivise development and industry stumps up the cash for vital research, there is still the question of if we build it, will they come?

More specifically, as resources expert Professor Mike Johns puts it: if we successfully replace the state's carbonised energy production with clean hydrogen, will buyers like Japan and Korea be happy to cover the considerably more expensive costs of doing so?

It's a tricky question but arguably a redundant one, according to Professor Johns. As research director of UWA Future Energy Industry Cooperative Research Centre, Professor Johns says he doesn't see a more viable alternative than clean hydrogen to replace WA's 390-million-tonne-a-year LNG export market – unless we're happy to keep burning fossil fuels.

And the potential to reduce the production costs of clean hydrogen is significant. Indeed it's an engineering challenge that has partially reshaped UWA's Fluid Science Resources and Research Group, which Professor Johns also co-leads with Professor Eric May. In recent years, the group has pivoted to address the many new questions being posed by industry and government about renewable energy production.

"In oil and gas, it's pretty well established what works and doesn't work and so you're looking at fairly minor improvements only being possible," Professor Johns says.

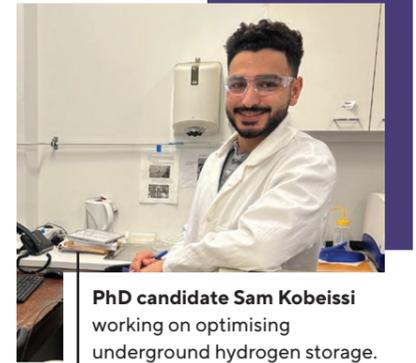
"However, when you're talking about renewable hydrogen, there are a lot of unknowns and lots of opportunities for optimisation. A major driver for our research is ultimately to make it more cost-effective and therefore more acceptable to the public."

One way of storing and transporting hydrogen at high density is in liquid form, however the process involves what Professor Johns dubs "weird physics". The gas has an extremely low boiling point, so to liquefy it (for export) requires highly specialised equipment and energy-intensive cryogenic cooling systems. It's a very expensive process (currently three to four times more costly than producing natural gas) and requires an enormous amount of energy.

"It's where physics meets engineering in a rather bizarre way," Professor Johns says. "If you just liquefy hydrogen, it will boil off immediately, so we've got to convert it first and we're doing a lot of experimental work and modelling right now to reduce the cost of that process. We're also looking at using mixed refrigerants, we're doing some exciting work with magnets, and we're also looking at what happens at the other end of the process – regasification of the hydrogen at the export destination."

The latter project, dubbed 'Cold Energy', attracted \$605,000 in Australian Research Council funding in 2022.

Professor Johns says while governments are now demonstrative in their pursuit of a clean hydrogen



PhD candidate Sam Kobeissi working on optimising underground hydrogen storage.

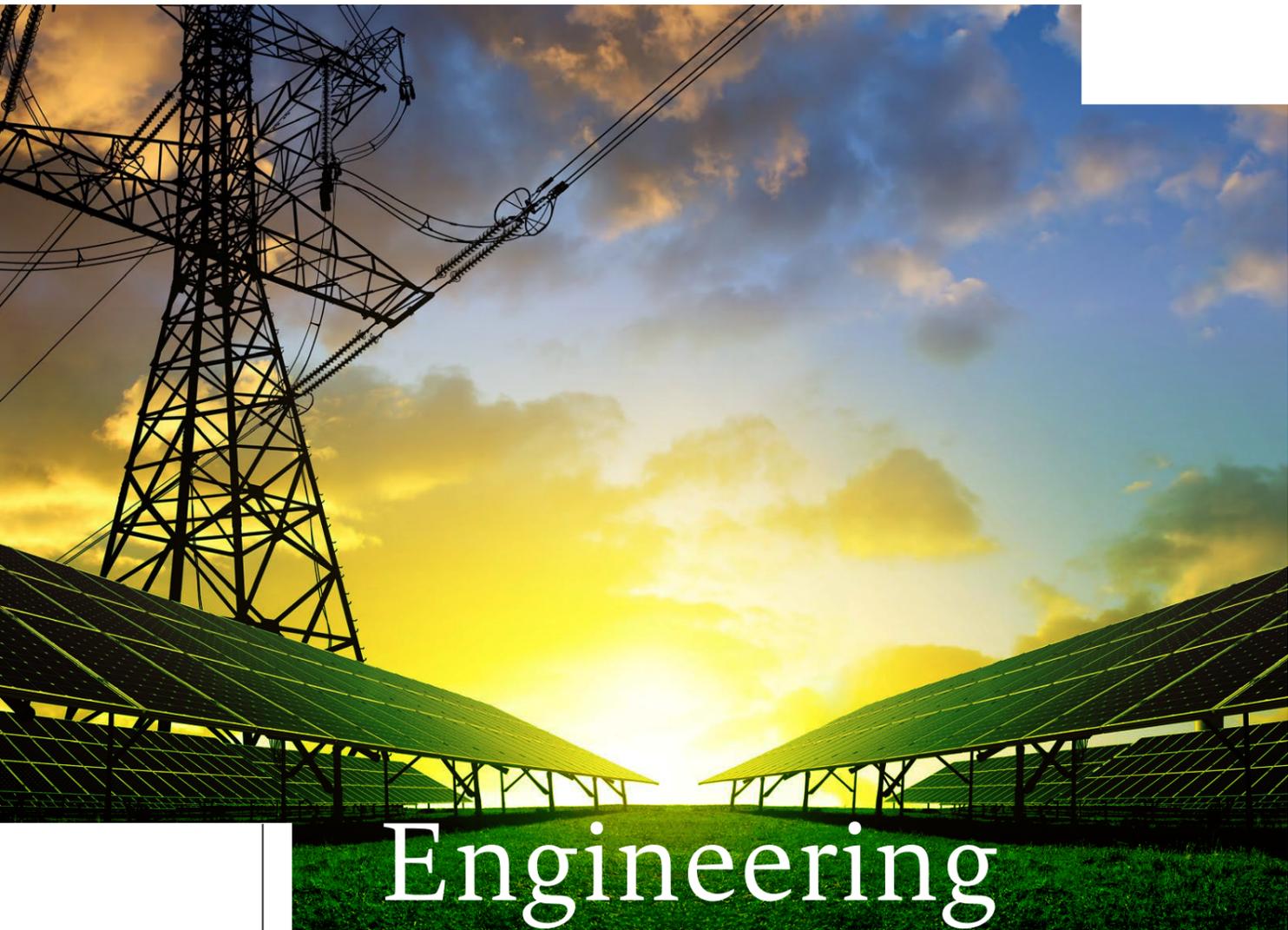
export industry – WA launched its Renewable Hydrogen Strategy and Roadmap in 2019 and has since greenlit several major development projects – the first domino is yet to fall in terms of major export activity. When it does, though, the State needs to be ready to meet potential demand head on.

"The distinct advantage for us here is that we're already a major gas exporter with established markets and a lot of the research we've already done to make the LNG export market more viable has parallels with liquefying hydrogen," he says. "So the research we're doing now is both very exciting and very important."

While exportable clean hydrogen is the primary focus for Professor Johns and his research colleagues, there are domestic opportunities too.

"A lot of our own energy needs can be met with a mixture of solar and wind, but they are intermittent and so the back-up is likely to be gas peakers, (natural gas-powered plants run only in times of high demand) but there will be a small role for hydrogen as a back-up mechanism in certain locations," he says.

"And then there are the industries that are hard to wean off hydrocarbons – typically any kind of processing that needs high temperatures and is hard to run off electricity. Hydrogen could also play a role in long-distance transport, marine transport and aviation. It won't dominate but it would have a piece of the pie." ■



Engineering CHANGE

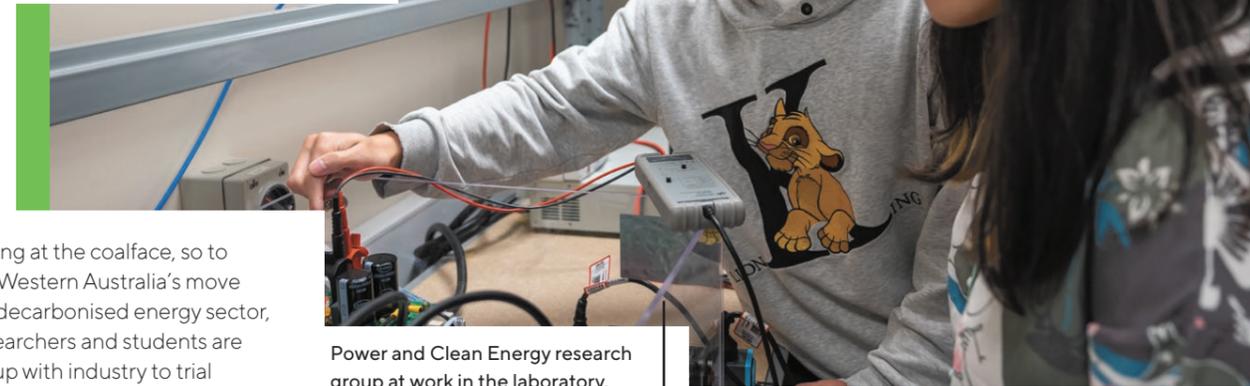
By Carrie Cox

Universities have a critical role to play in shaping the transformation of the State's energy sector

The race to prepare electricity grids for the evolving energy sources that will power them has placed engineering schools in one of the most dynamic periods in modern history.

"It's a really exciting time," says Professor Tyrone Fernando, a lead academic within UWA's Renewable Energy and Microgrids research cluster, "and an absolutely critical one. These things have to be done right. They have to be evidence-based. There are real problems to be solved and this is a time when universities can really make a difference."

'It's the sort of work you can't just do in a laboratory and then present it a few years later. You've got to be working closely with industry all the time so that innovation can translate.'



Power and Clean Energy research group at work in the laboratory.

Working at the coalface, so to speak, of Western Australia's move toward a decarbonised energy sector, UWA researchers and students are teaming up with industry to trial technologies and kickstart new initiatives. Projects include power generation forecasts of renewable energy sources, the designing of microgrids for remote areas, and determining the impact of electric vehicle take-up on power supply.

"It's the sort of work you can't just do in a laboratory and then present it a few years later," Professor Fernando says. "You've got to be working closely with industry all the time so that innovation can translate."

Professor Fernando says the unique challenges produced by WA's vast size and topography could also see us become a renewable energy leader globally, particularly in the area of microgrids. These standalone islands of power, usually disconnected from the main grid and potentially fuelled entirely by renewable energy, are capable of delivering a reliable, storable supply to remote communities. Western Power currently operates four of them – in Kalbarri, Perenjori, Bremer Bay and Ravensthorpe – but Professor Fernando says there is scope for many more.

"I think WA could become the microgrid capital of the world," he says. "Some of these might be connected to the main grid, some completely disconnected, while others might form part of a microgrid

network. The key objectives in each case need to be reliability of supply, cost-effectiveness and no damage to the environment."

He says as the appetite for renewable energy grows, as reflected in the accelerated take-up of solar energy by households (one in three WA households now has rooftop solar), the need to manage distribution networks becomes increasingly important.

"If we want more and more people to take up renewable energy and you still want to maintain the integrity of the whole grid, then that balance between supply and demand, the variability between load and generation, all of that needs to be well managed in a cost-effective way," Professor Fernando says.

To that end, UWA is working with Western Power and other partners on 'Project Symphony' – the pilot creation of a 'virtual power plant' to harmoniously manage the energy created by solar panels, in-home batteries and electric vehicles rooftop solar in the Southern River region. The University is also working with local engineering companies to design and install grid-interfacing power electronics for energy storage systems and microgrids, including

the Cheratta Microgrid Project in the State's north.

Professor Fernando says his team is also working with the Intergovernmental Organisation on an innovative mine electrification project that involved building a 'digital twin' site to enable companies to simulate, track and optimise the performance of their infrastructure. "This project will help our largest miners de-risk the transformation of their mine sites to cleaner technologies." ■



Professor Tyrone Fernando.



Power and Clean Energy research group at work in the laboratory.



Energy Independence

By Bill Grace

Photovoltaics offer the cheapest solution for energy generation and will play a crucial role in achieving Australia's net zero emissions goal.

Many Australian households and businesses now produce their own electrical power, a concept unthinkable 20 years ago. How did this happen and why? Much of it has to do with the solar photovoltaic revolution, and Australia's role in it.

Australia has been a leader in solar technology for decades, led by Professor Martin Green at the Centre for Advanced Photovoltaics at the University of New South Wales (UNSW). His pioneering research, which started in the 1970s, has led to steady improvements in the efficiency of solar panels (i.e. the amount of electricity produced for each unit of sunlight) which has been key to reducing costs. The UNSW technology is used in most solar panels in production globally. Australia has one of the highest take-up rates for private solar PV systems in the world, with system capacity per person around five times greater than the US and 10 times the global average¹. About one in four Australian houses have solar, and 40 per cent in Western Australia².

Solar PV is central to the energy transition in several ways. Firstly, it is now the cheapest way to generate a kW of electricity; and getting cheaper. Secondly, unlike every other energy source it can produce power at the location where it is required in any situation with a clear sky above. The cost of transporting electricity in conventional electricity networks, such as WA's South West Interconnected System, contributes around 40 per cent to wholesale electricity prices so the avoidance of this element is a major factor in the attractiveness of private solar. And of course, the production of power is emissions-free³.

The support for renewable energy in general and small-scale systems, in particular, is significantly due to the Federal Government's Renewable Energy Target scheme. The scheme was introduced in 2001 to reduce Australia's greenhouse gas emissions by achieving 20 per cent of network supplied electricity by 2020⁴. The elegantly designed scheme facilitates the creation of renewable energy certificates from new installations, which are required by

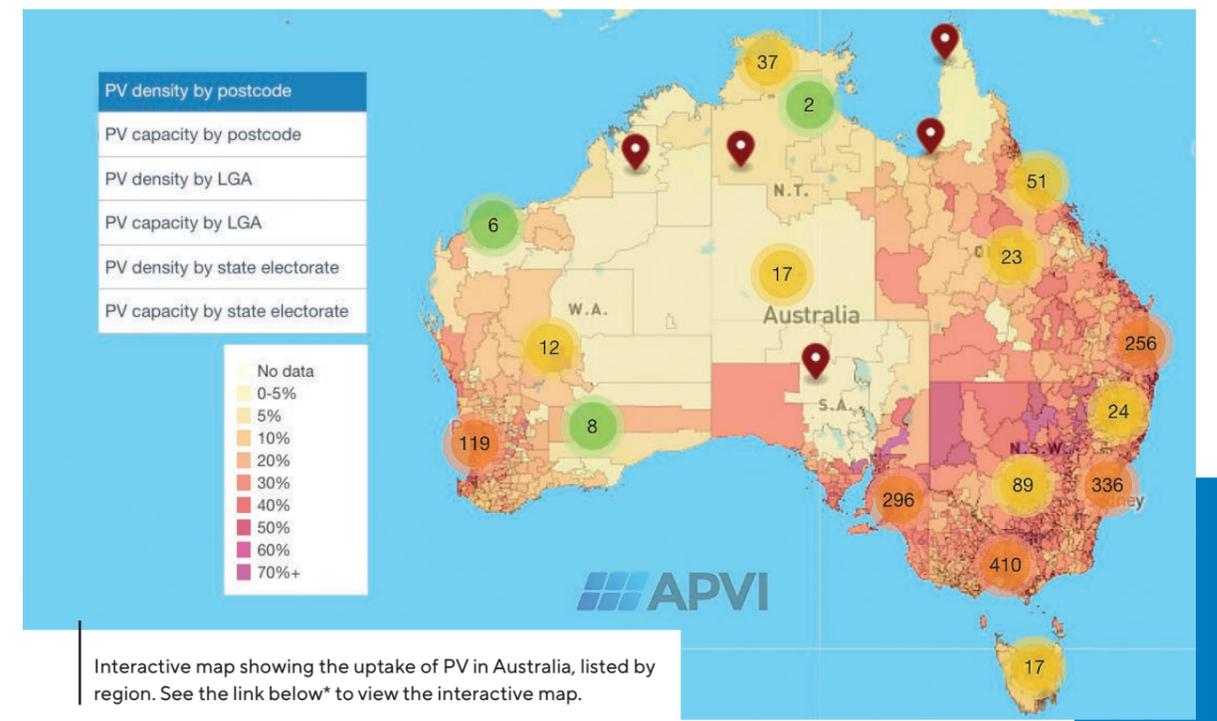
electricity retailers to meet the scheme obligations, thus creating a private market for certificates. Small-scale systems such as those suitable for homes and businesses have their own sub-scheme which effectively provides discounts to purchasers for (mainly) solar panels, solar and heat pump water heaters. In the case of solar PV, the discount presently reduces the installation cost by about a third. In addition, when power is produced that is not needed, it is exported to the network, offsetting the requirement for large-scale generation⁵, bringing some additional revenue from so-called feed-in tariffs. The result has led to massive and accelerating uptake in private solar, as payback periods have fallen to just a few years.

The next step for energy independence will come from coupling battery storage with solar PV. Without batteries, the best an average WA household can do is reduce its imported energy by a little over half, while exporting the balance to the grid during the middle of the day when the sun is high and demand is low. A battery allows the excess energy to be stored (instead of exported) and used in the evenings. Although the business case for a battery is presently marginal, costs for these are also reducing and solar plus battery will become a standard installation in the majority of homes and businesses in coming years, as houses and vehicles electrify.

There is an urgent imperative to reduce greenhouse gas emissions from all sources, and reducing emissions from electricity is critical to the energy transition. Private solar contributes to this objective while also reducing the cost of power to customers and providing greater energy independence. Australia is leading, but other countries will surely follow. ■



Adjunct Professor Bill Grace, Australian Urban Design Research Centre.



Interactive map showing the uptake of PV in Australia, listed by region. See the link below* to view the interactive map.

*Map source: Australian PV Institute (APVI) Solar Map, funded by the Australian Renewable Energy Agency, accessed from pv-map.apvi.org.au/historical on 19 October 2023.

1 reneweconomy.com.au/australia-deploying-new-renewables-at-ten-times-global-average-11689/
 2 pv-map.apvi.org.au/historical
 3 While at present, there are still emissions produced from the energy used to produce a solar panel, this is small when compared to the savings over the lifetime of the panel, and is reducing as renewable energy use in production increases.

4 Later adjusted to a fixed target of 33,000 GWh cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/History-of-the-scheme
 5 This results in some problems for the network but that is another story.

Breaking NEW GROUND

By Doug MacLaurin



(Left to right): Professor Steffen Hagemann, Professor Tony Kemp and Professor Marco Fiorentini of UWA's Centre for Exploration Targeting (CET).

'Years ago, deep mining was considered too costly. Now, due to their smaller ecological impact, they're seen as 'green mines', so the game has completely changed.'

As international demand for copper surges, the partnership between UWA's Centre for Exploration Targeting (CET), The University of Bristol and BHP is delving deep into new territory to find high-quality deposits of the vital material – and minimise the environmental impact of mining for it.

When BHP put out the worldwide call to find innovative solutions to the global shortage, CET built on its strong working ties with the University of Bristol to gain a strong collaborative advantage in the intensely competitive selection process – and came out ahead of the field.

"These days, you can't do this sort of cutting-edge research alone in one institution," centre director, Professor Steffen Hagemann said.

"The phrase world-class is often used, but I'm proud that really is the case with CET. We're attracting people from around the world to UWA and once you establish a critical mass of top-notch researchers, you are positioned to become a springboard for these mega projects."

A research team comprising two postdoctoral fellows Dr Giulia Consuma and Dr Brian Tattitch along with Professors Marco Fiorentini, Tony Kemp and Hagemann, is tasked with finding supplies of copper to catch up with the explosion in demand for the essential component of renewable technologies such as batteries and electric vehicles.

A large part of the problem is that major copper resources lie in porphyry systems: deposits in rocks and megastructures, with a relatively low concentration of the metal – which is further dwindling.

"For example, the Bingham Canyon copper mine, which is one of the biggest in the world, started 120 years ago at an average rate of about 2 per cent. Now they're down to 0.5 per cent," Professor Hagemann said.

"Quality deposits are hard to come by, and because the easy deposits have been found, we have to go deeper into the Earth's crust to find high-grade deposits in a smaller excavation space."

It's that deeper drive and high-grade ore that reduces the environmental impact compared to the low-grade open cut pit mining used to extract the resource from porphyry systems.

Having predicted the search for copper would have to shift its focus to either higher grades or other deposit types, UWA's CET team found itself at the forefront of an alternative approach to sourcing scarce resources, already leading the way with similar exploration in the Kupferschiefer – a 600,000 square kilometre sedimentary rock deposit spanning several countries in Central Europe.

"Years ago, deep mining was considered too costly. Now, due to their smaller ecological impact, they're seen as 'green mines', so the game has completely changed," Professor Hagemann said.

"Our research is very early in the exploration cycle. It is fundamental to understand how our planet concentrates copper in the crust, and what processes are involved."

But there's much more work to be done. That's where the recently funded Australian Research Council (ARC) Industrial Transformation Training Centre in Critical Resources for the Future comes in.

Professor Fiorentini said the training centre aimed to bridge the gap between mineral systems science, exploration protocols and ore processing and metallurgical extraction.

"This new UWA-led centre will build a skilled future workforce and provide enhanced production of Australia's critical resources, while ensuring best practice in environmental protection and community engagement," Professor Fiorentini said.

"It's an extremely exciting time for researchers." ■

Green by the numbers: how hydrogen

adds up to a cleaner tomorrow

By Liz McGrath

In the quest for a cleaner, more sustainable energy future, scientists such as Professor Hongqi Sun are setting their sights on what many consider the “holy grail” of renewables: green hydrogen.

A world-renowned scientist, Professor Sun, new to UWA and its School of Molecular Sciences, is busy building a research team with a focus on finding a catalyst that harnesses solar power to drive the hydrogen production process, making it economically competitive.

“It’s a very, very hot topic at the moment – I think globally most governments are working on promoting green hydrogen and for scientists, the thought of using green energy to produce green energy is the perfect dream,” he says. “But there are many challenges.”



Professor Hongqi Sun.

The promise of hydrogen

As the most abundant element in the universe, hydrogen can be harnessed from a variety of sources, including water, natural gas, and biomass. It’s beauty lies in its emissions-free nature; when used as a fuel, it produces nothing but water vapour, making it a key player in the fight against greenhouse gas emissions and air pollution.

Hydrogen boasts a higher efficiency compared to traditional fuels, delivering three times more energy per unit weight than petrol and nearly seven times more energy than coal. It’s also more versatile and can be stored, liquefied, and transported through pipelines, trucks, and ships to meet demand.

Its applications span various industries including transportation, chemicals and refineries, and electricity generation. Fuel cells powered by hydrogen are already propelling electric vehicles, providing backup power to critical infrastructure, and heating homes and industrial processes.

Unlike ‘grey’ or ‘brown’ hydrogen, which is typically produced from fossil fuels such as natural gas through a process called steam methane reforming or coal gasification, emitting CO₂ at the same time, green hydrogen is produced by splitting water into oxygen and hydrogen gases using an electrical current.

“Solely using electricity from renewable energy sources like solar, wind or hydropower makes it ‘green’ hydrogen production, but doing this on an industrial scale is a huge challenge,” Professor Sun says.

“Technically, yes, we can do it, but we need to reduce the costs. And it’s not only the production challenges but storage, transport, distribution – there are a lot of hurdles that need to be addressed.

“Using renewable energy, for example solar energy, to revolutionise conventional hydrogen production, known as steam methane reforming, also holds great promise.

Turbo charging the production process

Professor Sun’s fundamental research is centred on developing novel catalyst, light and thermal active nanomaterials that can speed up the process of producing green hydrogen, making it more efficient.

“When photocatalysts are exposed to light, like sunlight, they start a chemical reaction that mimics natural photosynthesis, a process where green plants and certain other organisms transform light energy into chemical energy.

“We’re trying to create a similar reaction using water, solar energy and perfectly designed chemical catalysts to produce pure hydrogen and oxygen. Such a system is also expected to work for upgrading fossil fuels to produce clean hydrogen.”

The chemical catalysts, he says, are the key to unlocking hydrogen and can be precisely manufactured to convert as much water to

hydrogen and oxygen (or water and methane to hydrogen and carbon monoxide) as quickly as efficiently as possible.

While true green hydrogen is still some years away, blue hydrogen – produced via dry or steam reforming using natural gas but with CO₂ emissions captured and stored – is seen as a transitional solution to reduce carbon emissions in the hydrogen production process.

The Australian Government’s goal is to become the major global player in the clean hydrogen field by 2030. Clean hydrogen is part of Australia’s Long Term Emissions Reduction Plan1, and producing it for under \$2 per kilogram (H₂ under 2) a priority stretch goal.

“With our abundant solar energy, wind, and large tracts of available land for harnessing solar energy, we have many advantages when it comes to producing green hydrogen but we’ve got a long way to go,” Professor Sun says.

“If we can jump to directly using solar energy to generate hydrogen, reducing steps in the production and installation processes of solar panels or wind turbos and removing any hidden CO₂ from the picture so that we can comfortably claim that what we have is green hydrogen, the rewards will be enormous.

“These tiny catalysts could be the key to unlocking the chemical reactions that we need for this to happen in a cost effective and sustainable way.” ■



A Hydrogen power plant.

1. [dcccew.gov.au/climate-change/publications/australias-long-term-emissions-reduction-plan](https://www.dcccew.gov.au/climate-change/publications/australias-long-term-emissions-reduction-plan)

2. [dcccew.gov.au/energy/publications/australias-national-hydrogen-strategy#:~:text=Australia's%20National%20Hydrogen%20Strategy%20sets.explores%20Australia's%20clean%20hydrogen%20potential](https://www.dcccew.gov.au/energy/publications/australias-national-hydrogen-strategy#:~:text=Australia's%20National%20Hydrogen%20Strategy%20sets.explores%20Australia's%20clean%20hydrogen%20potential)

DRIVING FORCE

By Carrie Cox



The UWA-designed electric jet ski, launched in 2015, was only the second of its kind in the world.

The electric vehicle revolution and the possibilities of an autonomously driven future continue to power this pioneering UWA project.



The driverless electric shuttle bus and two of the cars converted to electric power at UWA.



Students working on the electric conversion of a Hyundai Getz.



The REV team highlighting their work on the autonomous shuttle bus.

Fifteen years ago, Professor Thomas Bräunl and a group of UWA engineering students took on the task of converting a newly purchased Hyundai Getz into a fully electric vehicle. The project, as EV hobbyists were also discovering at the time, was surprisingly simple. “We were done within a few months,” Professor Bräunl recalls. “I remember thinking, ‘This is super-easy. All cars will be electric within two years!’”

It wasn’t just the ease of production that was clear; it was the by-now pressing need to move the transport sector away from fossil fuel dependence. Professor Bräunl couldn’t have imagined that 15 years down the track, not only was the take-up of EVs still a slow-moving beast in Australia but also that his little undertaking – the Renewable Energy Vehicle (REV) project – would have grown into a juggernaut: a wellspring of EV industry firsts, a source of advice to government and a transformative educational experience for hundreds of students.

Since REV began at UWA, projects have included the EV conversion of a Hyundai Getz, a Lotus Elise, two Formula-SAE race cars, 11 Ford Focus conversions as part of the WA Electric Vehicle Trial, establishing WA’s first EV charging network including Australia’s first CCS-type fast charging station, and building some of the world’s earliest electric watercraft.

“We did some of Australia’s first road-legal electric vehicle conversions based on lithium batteries back in 2008 and we were surprised how long it took the industry to adapt to this new technology,” says Professor Bräunl. “Fast-forward to 2023 and we are finally at the beginning of an EV boom that should lead to a fully electric vehicle fleet here towards the end of the 2030s.”

In countries such as Norway, which has been actively making it attractive to purchase electric vehicles since the 1990s, more than 80 per cent of the car market is already powered by batteries. While high demand for charging stations still presents some issues there, the nation’s electricity grid has not collapsed and greenhouse emissions have dropped by a third.



UWA students installing power cabling on an electric jet ski.

‘More renewable energy sources will have to be added to the grid and large-scale storage facilities will have to be built.’



In Australia, Professor Bräunl says the only factors now stalling take-up are purchase price and the availability of charging stations.

“The cars are still too expensive here as we haven’t been on the front foot with incentives and subsidies like other countries have,” he says. (Earlier this year, WA announced a Zero Emission Vehicle Rebate Scheme that will provide \$3500 to eligible EV purchasers.)

“And we’re only now rolling out the implementation of the WA charging grid.”

While WA’s size and geography stymie the task of providing EV charging continuity, Professor Bräunl insists “it’s not impossible”. Indeed, in 2018 he and his team drafted the charging grid plan that is now being implemented around the State.

“But that’s just the first step of what needs to be a much bigger project,” he explains, “which is essentially greening the whole grid. More renewable energy sources will have to be added to the grid and large-scale storage facilities will

have to be built. We have so much coastline here and so much wind and yet large-scale wind turbines are still a rarity in Australia.”

Even without or before any wholesale shift to green energy, electric vehicle technology makes sense, Professor Bräunl argues.

“Even if EVs were powered by fossil fuels, that’s better than having petrol cars,” he says. “Studies show more people die from vehicle emissions than from road accidents – it’s crazy not to do anything about that. Government subsidies for EVs would easily be offset by the savings in health costs.”

As the commercial vehicle market has finally started to catch up to EV pioneers like REV, Professor Bräunl’s team has expanded its focus to the next and much bigger challenge: autonomous driving.

The team’s first project saw the autonomous conversions of a BMW X5 and of a Formula-SAE race car – the first in Australia and one of the first in the world – that was able to complete a fully driverless loop around a race track.

“While electric vehicle technology is simple, autonomous driving is in fact rocket science,” Professor Braunl explains. “It requires building a robot in the shape of a car with high-performance onboard computer systems and sensors – all very complex and expensive.”

Complicating matters in a country like Australia are the bureaucratic speedbumps on the road to testing.

“In Germany, car manufacturers can simply trial autonomous vehicles on the road at any time,” Professor Bräunl says. “While in the United States, there are just a couple of pages of paperwork to fill out. Here in Australia it took us three years and some \$60,000 paid by sponsors for a full traffic analysis and management plan just to drive on a single suburban road.”

Barriers notwithstanding, Professor Bräunl appreciates the public’s broader safety concerns about driverless vehicles but insists that safety is in fact one of the most significant advantages of autonomous driving technology.

“Over 90 per cent of vehicle accidents are due to driver error,” he says, “and while autonomous driving will not bring the road toll down to zero – there will still be a low number of accidents due to system failures – it will significantly reduce fatalities. Of course, closing up that last 0.01 per cent window of risk must be the goal.”

The other big advantage of autonomous driving technology is accessibility. “When it’s fully mainstream, and I think we’ll see that within the next five to 10 years, it will be of great benefit to so many people. It will mean cheaper, accessible individual transport for everybody – the elderly, the sick, basically anyone who can’t drive.”

One of REV’s most exciting recent projects was the engineering of a fully autonomous EV shuttle bus, dubbed ‘nUWay’, purchased as a shell from Singapore. The bus is equipped with eight Lidar sensors to guide navigation and prevent

collisions, two cameras, a GPS and an inertial measurement system. An independent hardware system monitors the vehicle’s movements and automatically stops or deviates the bus if anything comes too close.

While nUWay-1 continues to transport students on campus, an identical second shuttle bus nUWay-2 is currently being used for a three-year public road trial at Eglinton in Perth’s north, taking passengers to and from Amberton Beach. It is the first autonomous vehicle road trial in WA using locally developed technology and delivers invaluable real-world experience for UWA students.

UWA’s Business School is also involved in the trial, investigating enablers and barriers for autonomous vehicle uptake. Associate Professor Doina Olaru, Head of Management and Organisations at the UWA Business School, says: “Student experience will increase through the participation in a unique work-

integrated-learning experience where students from around campus will ‘operate’ the bus, as well as collect data on perceptions and attitudes as part of the research team.”

REV is also now working with the Queensland University of Technology, University of Sydney and other partners on a project to test and deploy automated vehicles in rural, regional and remote areas where more than 80 per cent of the nation’s public roads are located.

Indeed, while the past 15 years have literally sped by for Professor Bräunl’s team and the more than 300 students who have taken part in its many projects, the next 15 may hold the most exciting challenges of all, as Australia moves toward full EV conversion and autonomous driving applications across many industries. ■



Associate Professor Doina Olaru, Head of the Department of Management and Organisations, UWA Business School.



Thomas Bräunl is a Professor in the School of Engineering where he directs the Robotics & Automation Lab as well as the Renewable Energy Vehicle Project (REV).



Switching off coal:

Can we change the toxic jobs and climate politics to power the future?

By the end of this decade 30 million clean energy and associated jobs will have been created across the global economy – outstripping jobs lost in fossil fuel industries.¹ This job bonanza in the clean energy economy is a good news story. However, it also presents an enormous challenge of how to equitably transition existing workers, communities and regions dependent on fossil fuel industries and jobs.

We only need to look at communities in New South Wales, Victoria or the Appalachian region in the United States² to see how poorly planned and co-ordinated transitions led to bad socio-economic outcomes.

So how best to handle the necessary energy transition?

Our research into the ‘Just Transition’ initiative in Collie, Western Australia, offers some important lessons to ensure the switch to a clean energy future does not leave behind fossil fuel workers and communities.

First, changing the toxic politics. When transitioning out of coal fire power generation and coal mining was first suggested by unions in 2007 it was met with fierce opposition in Collie. However, through regular community meetings, and growing state and industry support, a critical mass of the community and workforce came to realise that developing transition plans early gave it the best opportunity for

the Collie community to survive. Changing the politics of transition therefore requires open and honest conversations with all the key stakeholders involved.

Second, buy-in from the state. The State Government has taken the transition politics seriously, housing the Just Transition policy team in the Department of Premier and Cabinet and to date has committed hundreds of millions of dollars to developing the transition. This has included upgrades to the Collie township and infrastructure, relocation of government services into Collie and providing funding to support new industry in the town, including building one of the largest batteries in the world.³ An equitable transition cannot be left to ‘market forces’ but requires state participation.

Third, establish a locally embedded tripartite transition body. From 2018, a Just Transition Working Group (JTWG), with union, industry, government and community members has been developing, rolling out and critically assessing the Just Transition plan for Collie. Critically, the JTWG meetings are held locally in Collie, giving the community a voice and a role in designing the transition. The Just Transition plan is currently focused on training, expanding existing industries and attracting new industries to Collie. The most promising of these is the development of a green steel mill,

which would support more than 200 jobs in Collie.

While the transition still has a long way to go, the basic transition ingredients we uncovered through our research demonstrates that it is possible to get beyond the toxic politics of transition through ongoing tripartite and local engagement that focuses on the possibilities of a low carbon future. ■



Professor Bradon Ellem
Work & Organisational Studies, The University of Sydney Business School and Honorary Research Fellow, UWA Business School.



Dr Caleb Goods
Department of Management & Organisations, The UWA Business School.



Biological Sciences (Biology and Geology)
Building now known as Park Avenue c.1920s-30s.
Photo UWA Archives 2757P.



Emeritus Professor Jenny Gregory AM speaking on behalf of Convocation at the ceremony on 1 September 2023 commemorating the 100th anniversary of laying the foundation stone of the first UWA building constructed at Crawley. She was followed by Ms Sandy Anghie, WA President of the Institute of Architects. The ceremony was also attended by UWA Senators, Convocation Councillors, Julian Donaldson CEO National Trust (WA), National Trust Councillors and members of the Heritage Council of WA. Photo courtesy of Professor Kevin Kenneally AM.

From the Warden of Convocation

Did you know that UWA has a folly? It’s the turret on UWA’s State heritage-listed Park Avenue building. Simply a design element atop the building, serving no useful purpose, it holds fond memories for students who etched their names inside the folly. Legend has it that end-of-term parties included a climb up a ladder and into the turret. On occasions, nearby residents, annoyed by the carousing and with a good view from their high-rise apartments, were known to call the police.

A big crowd of students were on hand when the building’s foundation stone was laid by Premier Sir James Mitchell on 1 September 1923. The event was celebrated exactly 100 years later by the UWA Historical

Society and the Convocation of UWA Graduates at a special ceremony.

There were plenty of speeches when the foundation stone was laid. The Premier, there with the Leader of the Opposition, his ministers and a ‘crowd of thousands’, declared ‘money spent wisely on education was an excellent investment’. He was sure that ‘in the future the work of the University would be greatly appreciated by the people of Western Australia.’

Students were students. Having caught the tram from Irwin St to nearby Crawley Baths, they laughed at references to Tin Pot Alley where they were ‘meanly housed in temporary buildings’ and chortled at the Premier’s advice that students needed ‘a thirst for knowledge’ and ‘decency of conduct’.

Their response to the Premier declaring the foundation stone ‘well and truly laid’, was ‘chook chook chook’ and ‘cock-a-doodle-do’. They then pressed a nearby builder’s crane into service, and a load of undergraduates was lifted above the crowd to pour ‘rich blessings (confetti) on the Premier’s head’.

Now home to Podiatry, the Park Avenue building was initially home to the natural sciences of Geology and Biology. Training in Geology was vital. The goldrushes of the 1890s had demonstrated the potential of the State’s rich mineral resources. It was time to train a new generation for further mining exploration. The choice of Biology, which then included Zoology, demonstrated the intense interest in the State’s environment. ■

1 International Energy Agency (2022) ‘World Energy Employment’ <https://iea.blob.core.windows.net/assets/a0432c97-14af-4fc7-b3bf-c409fb7e4ab8/WorldEnergyEmployment.pdf>
 2 Sheldon, P., Junankar, R., & de Rosa, A. P. (2018). The Ruhr or Appalachia? <https://apo.org.au/sites/default/files/resource-files/2018-10/apo-nid199916.pdf>
 3 <https://www.synergy.net.au/Our-energy/SynergyRED/Large-Scale-Battery-Energy-Storage-Systems/Collie-Battery-Energy-Storage-System>

Celebrating 20 years of Fogarty Scholars



Dr Annie Fogarty speaking at the Fogarty Foundation breakfast.

In 2004, the UWA Fogarty Scholarship Program was born through a partnership between the Fogarty Foundation and The University of Western Australia, in the belief that supporting the development of one person can change the lives of many.

Two decades later, the program continues to shine as a beacon of opportunity for exceptional students, nurturing their potential to drive positive change in our society.

Dr Annie Fogarty, Chairperson of the Fogarty Foundation says the UWA Fogarty Scholars have proven time and again that they're not just students, but catalysts for change.

"The Scholars are our next-generation leaders. They have the knowledge, skills and passion to shape the world in ways that will tackle some of the biggest challenges we face and they have the determination and support of each other to find innovative solutions that will drive positive change into the future", Dr Fogarty says.

Each year, the program selects 10 remarkable high school students based on their outstanding academic records and their contributions in areas such as leadership, community engagement, sports, the arts and entrepreneurial initiatives.

The Scholars receive comprehensive financial support, enabling them to pursue their undergraduate and then postgraduate studies with full focus in their chosen field.

One defining feature of the program is its holistic approach to leadership development, which gives Scholars access to mentoring, career development opportunities, and a network of peers who they can learn from and find support through.

This nurturing environment also encourages Scholars to pursue their own initiatives and provides funding support through the Scholars Enterprise Investment Program (SEIP), promoting innovation and entrepreneurship.

In 2023, the program celebrates a remarkable community of 49 Scholars and 138 alumni who have become the spark for change in their communities, not only within Western Australia, but across the world.

"After 20 years, the UWA Fogarty Scholars are now working across all sectors of our community – from health and finance to education and space, some working with global companies and international health organisations and others have started their own businesses – all are contributing to their professions and the community," Dr Fogarty says.

Their diverse accomplishments stand as testament to the enduring impact of the UWA Fogarty Scholarship Program. For example, the ASEAN-Australia Strategic Youth Partnership (AASYP), started by Scholar Hayley Winchcombe, empowers young individuals aged 18 to 29, fostering expertise and engagement in ASEAN-Australia affairs, ultimately promoting peace and prosperity in the region.

Another noteworthy initiative, Purposeful, founded by UWA Fogarty Scholar Elizabeth Knight in 2018, has been instrumental in helping young people discover their passions and careers, impacting more than 10,000 students and numerous schools.

Many Fogarty Scholars have gone on to receive prestigious awards and scholarships such as the General Sir John Monash Scholarship, New Colombo Plan Scholarship, Westpac Future Leaders Scholarship, Rhodes Scholarship, and Fulbright Scholarship. These accolades highlight the exceptional calibre of Scholars within the program, underscoring their dedication to academic excellence and societal impact.

The UWA Fogarty Scholarship Program stands as a shining example of the transformative power of education and the potential of young minds to create a brighter future for all. UWA is extremely grateful for the Fogarty Foundation's generous partnership which has enabled the development of this nationally admired scholarship program. ■

Footy-loving engineer named 2024 Rhodes Scholar

Congratulations to UWA Fogarty Scholar Caleb McKenna who has been named the 2024 Rhodes Scholar for WA. Caleb has a Bachelor of Philosophy, majoring in Engineering Science and Physics and is currently undertaking a Master of Professional Engineering.

The former Warwick Senior High School student said he wanted to continue studying engineering science at Oxford.

"I hope to look at floating offshore wind as the next step for renewable energy generation," he said.

"I think development in renewable energy generation technologies is a really crucial step towards the climate change fight and moving towards a clean energy future."

Rhodes Scholarships are awarded based on academic excellence, as well as talents including creative or sporting abilities, traits such as courage and kindness and strength of character.

Caleb becomes the 109th UWA student to be chosen as a Rhodes Scholar.



UWA Fogarty Scholar Caleb McKenna.



Fogarty Breakfast attendees.

UWA's Girls+ in Engineering program: A partnership for gender equity in STEM



By Katie Douglas

GiE team at Rio Tinto Marandoo.

In the dynamic realm of engineering, a world of possibilities beckons those with the vision and drive to shape the future, to tackle challenges head-on, and to leave an indelible mark on society. Yet, within this landscape of innovation and problem-solving, a disheartening gender divide casts a shadow, revealing a stark reality: women constitute a mere 13 per cent of Australia's engineering workforce. This glaring underrepresentation raises important questions about equality, untapped potential and the need to bridge this divide.

To address this, and create a pipeline of opportunities for the future, The University of Western Australia's Girls+ in Engineering (GiE) program is designed to inspire female students

to take advantage of Science, Technology, Engineering and Mathematics (STEM) study and career pathways, focusing on areas of science where women are underrepresented.

Inaugurated in 2014 as a joint initiative between UWA and Rio Tinto, the program has gone from strength to strength and was named as a finalist in the 2022 Australian Financial Review Higher Education Awards, Industry Engagement category and the 2023 Premier's Science Awards, Science Initiative of the Year.

GiE's engagement framework is modelled on the Women in STEM Decadal Plan, Australia's national strategic initiative aimed at achieving gender equity and inclusion in the STEM fields. The framework sees current UWA students and industry partner

representatives volunteering in schools as role models, sharing their lived experiences, demystifying STEM careers, and educating students about engineering career options. Along with industry partners, GiE recognises the importance of early intervention and offers a suite of in-school workshops and immersive on-campus events for students in years three to 12.

For current UWA students, the GiE Student Ambassador program provides a support network and opportunities to gain real-work experience in industry. The program offers professional development, mentoring, industry site visits, networking and regional travel opportunities for female and non-binary STEM students.

Since 2014, GiE has reached more than 15,000 school students across WA, mentored more than 250 UWA student ambassadors and collaborated with more than 200 industry volunteers. The program extends its gratitude to GiE's foundational partner Rio Tinto and 2023 industry partners including SLB, Newmont, and Newcrest.

Demonstrating UWA's commitment to increasing diversity and inclusion in STEM, the program also aligns with the Australian Government's Advancing Women in STEM strategy and is a strong example of how UWA is working together with WA schools, universities, and industry to lead the future of sustainable and equitable engineering.

To find out more information about the program or how you can get involved, [contact gie@uwa.edu.au](mailto:gie@uwa.edu.au).



Duncraig SHS students at the GiE Discovery Day event.



GiE team with Rio Tinto in Karinjini National Park.

Barbara York Main: In Her Own Words



Art and science unite in a unique celebration of 'The Lady of the Spiders'

Barbara on the east steps of the Park Avenue Zoology building in the 1940s.



Playwright, Julia Jarel.
(Photo credit: Dave Nicolson)



Actors, Tim Parish and Logan Bin Bakar, enact a scene adapted from 'A Third Generation Farm', Twice Trodden Ground. 1971, Barbara York Main.
(Image credit: Dave Nicolson)

It was while delving into the lives of contemporary women of the Wheatbelt as part of a creative writing PhD, that UWA student Julia Jarel first encountered the remarkable life story of Barbara York Main.

"I was reading Tony Hughes D'Aeth's seminal work *Like Nothing on this Earth: A Literary History of the Wheatbelt* as part of my research," Julia recalls.

"Inspired to read some of Barbara's work, I began with *Marginal Country* and was astonished by its beauty and resonance. I had lived and worked in the Wheatbelt in my early teaching career and was enchanted by the way Barbara evoked the spirit of the landscape so hauntingly through her writing."

Popularly known as the 'Lady of the Spiders' after a David Attenborough documentary about her, Barbara spotted her first trapdoor spider as a young child on the farm her father had cleared from the arid WA bushland.

While her four brothers played team sports; Barbara wandered in search of insects, spiders and reptiles and in 1957, the extraordinary environmentalist became the first woman to earn a PhD in Zoology from UWA.

She married Albert Russell Main, an equally gifted zoologist, who supported her career as fervidly as she supported his and together, they raised three children.

"I had created a piece of verbatim theatre as part of my candidature and, in collaboration

with UWA music archivist and Manager of the Callaway Centre, Helen Munt, developed this into a full-length play by including readings and biographical information about Barbara, using only her own words," Julia says.

Readers included Helen Munt, local actors, current UWA students and UWA alumni, all with deep connections to the University, the Wheatbelt, or the Perth theatre scene. Barbara's daughter, Monica Main, a professional actor and radio presenter, was also part of the performance which, fittingly, was held at the G20 lecture theatre in UWA's Park Avenue precinct, a place where Barbara conducted much of her ground-breaking research. ■

Hidden cultural treasures now within easy digital reach

The diaries, essays and recordings of one of Australia's most renowned female pianists are among a treasure trove of cultural curiosities now housed in one digital location – UWA Collected.

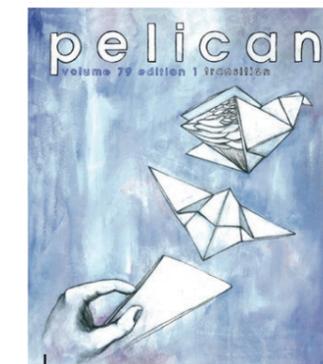
The works of Eileen Joyce, who grew up in Western Australia before embarking on a celebrated international career in the mid-20th century, is now memorialised in a single digital collection that also features many other items of cultural and historical significance.

The launch of UWA Collected – the first academic platform of its kind in WA – is a boon for historians, researchers and the culturally curious.

Centuries-old hand-painted maps, recordings of historic events and preserved oral history are among thousands of digital records that have been captured and stored in one easily navigable location.

UWA alumni and local history buffs can even look back on the oldest copies of the University's student magazine *Pelican*, which began in 1929, and the original handwritten minutes of the UWA Senate.

Interested history-seekers can browse the collection at collected.uwa.edu.au. ■



The Pelican, Vol. 79, no.1 (2008)
(UWA Student Guild Archives)



Remembrance Day on Whitfeld Court

Image credit: Manny Tamayo

The UWA Historical Society has been supported most professionally in recent years for the annual November Remembrance Day on Whitfeld Court, by the Western Australian University Regiment (WAUR).

Many *Uniview* readers will have known people who have been in the Regiment or served in it themselves. Several UWA Historical Society members fall in this category, namely our Chancellor, the Hon Robert French AC, who recalls being an Honorary Colonel for some six years, Senate member, Warren Kerr AM, and former Warden of Convocation Dr Doug McGhie.

It will celebrate its 75th anniversary in April 2024 and we give a 'shout-out' to all former WAUR members to get in touch to duly celebrate and acknowledge past members and historical events.

Raised as Perth University Regiment on 22 April 1949, its role was to provide training to undergraduates as part of the Citizen Military Forces (CMF). Initially located in a Catalina shed at Crawley, it became WAUR in May 1950. The WAUR Badge, incorporates the shield of The University of Western Australia, and the motto 'Seek Wisdom'. A significant change in 1975 was the introduction of the Women's Royal Australian Army Corps into the traditional all-male unit.

To assist with the anniversary please contact Major Mark Tamblyn at mark.tamblyn@defence.gov.au. ■

In the frame

Connected: our alumni, staff and students snapped at UWA events this year.

Stay in touch or update your details at:

alumni-update@uwa.edu.au

GRADUATION HIGHLIGHTS



LIFETIME ACHIEVEMENT AWARD

Congratulations to UWA graduate Dr Joan Pope OAM who was awarded an ICDS Lifetime Achievement Award that celebrates the work of leading researchers in the field of Dalcroze studies.



UNI HOCKEY CLUB CENTENARY

Save the date for the UWA Hockey Centenary Cocktail Party on Friday 14 June 2024 at the University Club. UHC is seeking information or pictures since the creation of the University Women's Hockey Club in 1924, or the University Men's Hockey Club in 1929. For more details visit: uwahockey.org.au/centenary/ or contact UWAHC100@uwahockey.org.au.



SUMMER PROJECT LOCATES UWA'S GARDEN BENCHES

UWA is known for its lovely gardens. What makes the spaces even more lovely is the chance to sit and enjoy them from a number of named wooden benches.

But where are they all?

After years of sitting on the benches enjoying the calming views, Joan Pope, Margo Warburton and Marc Tennant started their project into the history of UWA in collaboration with the UWA Historical Society.

Through the early mornings of last summer Marc wandered about geolocating and photographing the benches one at a time in high resolution, while Joan and Margo checked their histories and formulated the database.

UWA Crawley, Nedlands and QEII campuses have approximately 130 benches and we now know exactly where 120 of them are located with high quality images to add to the digital gallery. Some are looking in top form while others seem to have faced the weather for a good length of time. Some gems are hidden in little unsuspecting corners no one would even notice.

The full list of images and information will soon form a collection in the new digital gallery that UWA Library is developing. You will be able to hunt benches and see who these benches commemorate. If you would like to assist in building 'The Background Stories' of the UWA graduates and staff who have been honoured by their friends and families we welcome your interest. Contact the team via marc.tennant@uwa.edu.au.

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