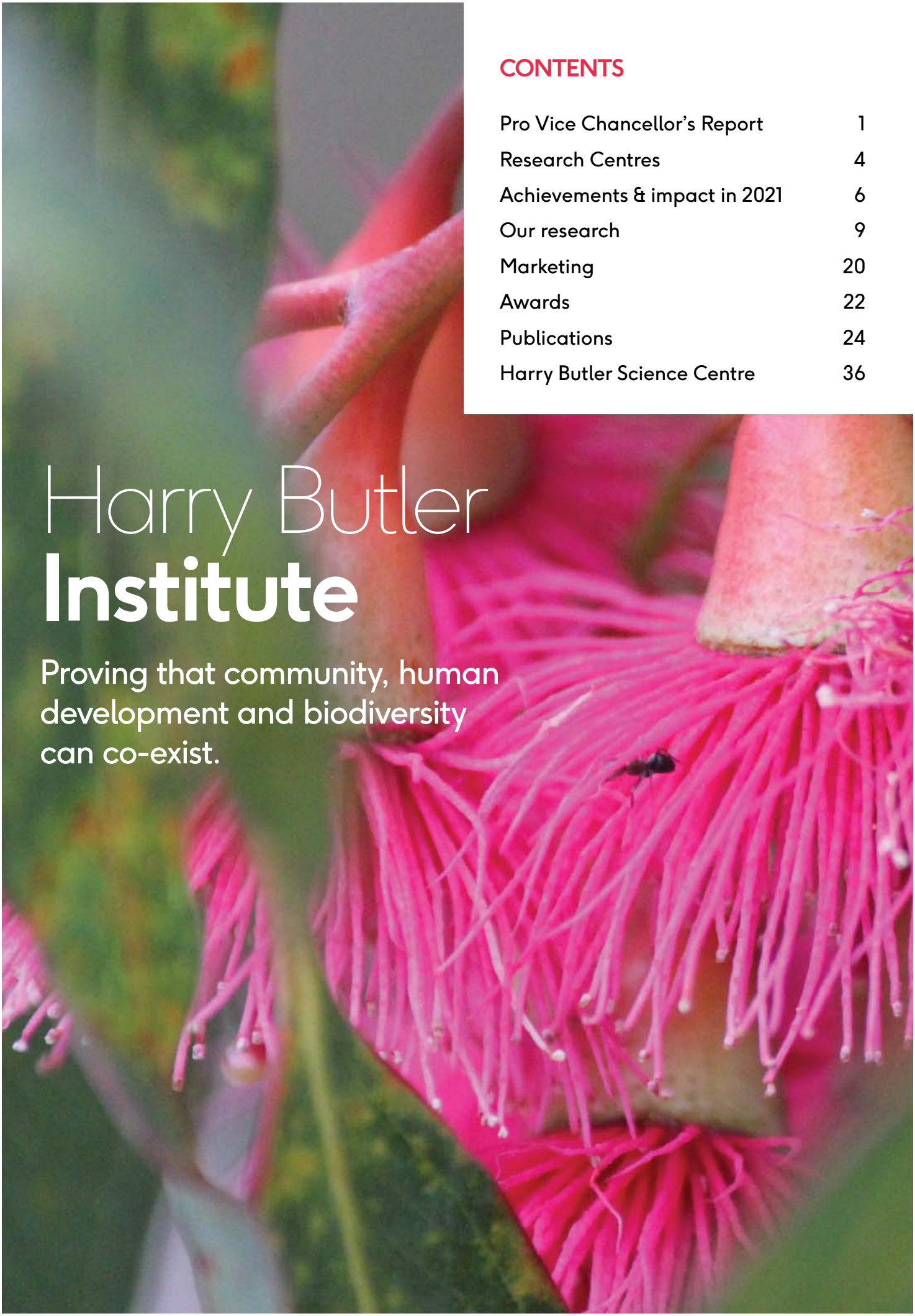
Murdoch University | Harry Butler Institute

2021 ANNUAL REPORT



CONTENTS

Harry Butler **Institute**

Proving that community, human development and biodiversity can co-exist.

Pro Vice Chancellor's Report

Professor Simon McKirdy
PRO VICE CHANCELLOR, HARRY BUTLER INSTITUTE

Our commitment to producing world-class research outcomes that drive us towards a more sustainable future built around coexistence of human development and biodiversity has never been more evident.

As the world continued to grapple with the COVID-19 pandemic through 2021, the university research sector was far from exempt from its impacts. Despite the omnipresent challenges of funding uncertainty, quarantine restrictions, and staff shortages due to exposure to the virus the Harry Butler Institute emerged having achieved novel, innovative research which continues to have lasting real-world impacts.

There is no denying the significant impact the pandemic has had on our own university. In particular, strict border and quarantine restrictions all but halted the regular influx of international students that make Murdoch a global institution. These same restrictions created difficulties for international PhD and post-doctoral researchers waiting to commence research projects and positions with the Harry Butler Institute. Conferences were delayed or cancelled or held virtually, and even domestic fieldwork was postponed for periods of time.

Our researchers persevered, getting on with their passion for translational research that provides tangible benefits for us as a society. For many, it gave us time to publish scientific findings, with HBI identified as an affiliation on more than 364 scientific peer-reviewed journal articles in 2021. The high quality of research published is exemplified by Dr Natalie Warburton's research article, *Extreme bilateral polydactyly in a wild-caught western grey kangaroo*, that was featured on the cover of USA scientific journal, *The Anatomical Record*.

For many researchers, the pandemic provided the opportunity to cement existing partnerships and forge new project partnerships. The HBI attracted more than $12 million in income for research through partnerships, grants and awards.

While we welcomed a number of new PhD and post-doctoral researchers into the Institute, we also saw some of our longest-serving academics move to emeriti positions. Many, including Professors Giles Hardy, Michael Calver, and Lynnath Beckley continue to make invaluable contributions to the HBI and our research.

Pro Vice Chancellor's Report *(cont.)*

Our researchers continued to embrace global collaborative research, with almost 60% of research outputs in collaboration with one or more international colleagues, a 17% increase from previous years. The HBI is fast establishing a name for itself on the international stage as a prominent research Institute in the fields of terrestrial, freshwater and marine ecology, sustainable water, energy, and waste management, and biosecurity/ one health.

As an Institute we pride ourselves on working with industry, government and the community to create innovative solutions and apply them in the real-world. This has been exemplified through some of the key projects undertaken in 2021, including Associate Professor Martin Anda's 'Colliecrete' project (page 9), Dr Grey Coupland's mini-urban forest citizen science project (page 12), Dr Adrian Gleiss' marine megafauna tagging project (page 16), and Dr Mieghan Bruce' Global Burden of Animal Diseases (GBADs) program (page 18).

In addition to researching and publishing, we have worked hard to effectively communicate our findings to relevant stakeholders. While the pandemic has impacted conferences, seminars and workshops, we have pursued other communications opportunities through media articles, interviews and social media posts. We created an HBI LinkedIn page and have steadily built a following of university, industry, government, and community members.

Through hard work, resilience and innovation we have come through 2021 having made strides towards a more sustainable future for all built around coexistence of human development and biodiversity.

Professor Simon McKirdy
Pro-Vice Chancellor
Harry Butler Institute


"Our research has real-world impacts for the vulnerable species we're working to protect."

Research Centres

Our research is driven by a need to better understand and protect the natural world, in collaboration with the industries that operate within it.




Associate Professor John Ruprecht
DIRECTOR, CENTRE FOR WATER, ENERGY AND WASTE

Professor Trish Fleming
DIRECTOR, CENTRE FOR TERRESTRIAL ECOSYSTEM SCIENCE AND SUSTAINABILITY

Professor Alan Lymbery
DIRECTOR, CENTRE FOR SUSTAINABLE AQUATIC ECOSYSTEMS

Professor Chad Hewitt
DIRECTOR, CENTRE FOR BIOSECURITY AND ONE HEALTH

The Harry Butler Institute is comprised of four diverse research centres, each with its own research focus, but with the shared goal of ensuring the continuation of Harry Butler's ethos: improved environmental outcomes based on excellence in both scientific research and industry practice.

A changing world, a surplus of hazardous waste, and a need for products with a lower environmental impact have driven some of the research solutions from the Centre for Water, Energy and Waste. Our team of dedicated research engineers and phycologists have put their minds to some of the most pressing environmental sustainability issues for the region. The outcomes include innovative new products like Colliecrete — a concrete product which utilises recycled material and mining waste, while generating regional employment opportunities.

In a fire-prone country like Australia, fire extinguisher waste is a significant issue producing more than 10,000 tonnes of powder waste annually. Our researchers have addressed the problem with microalgae, using the nutrient-rich powder as an algae food source (along with warmth and sunlight), in a process that captures atmospheric carbon and has the potential to generate a range of new products.

Carbon capture and climate change as well as fauna ecology, landscape restoration, fire ecology and invasive species management have drawn much of the research focus within the Centre for Terrestrial Ecosystem Science and Sustainability. From unravelling the mysteries of ancient extinct kangaroo species to understanding the true and current impacts of invasive red foxes, our fauna research has far-reaching implications.

At the landscape level, our researchers have been investigating the suitability of the Australian climate for the Miyawaki forest revegetation method. This involved engaging primary school students as citizen scientists to help grow, monitor and care for the tiny urban forests, contributing essential research data to the project.

Novel data-collection technologies have been at the core of research from the Centre for Sustainable Aquatic Ecosystems. In research presented at the TEDx Kings Parks Oceans-themed seminar, new biometric technology has revealed insights into the behaviour of marine fauna, such as iconic whale

sharks. Researchers have also used the technology to learn crucial information about the habits and behaviours of endangered sawfish species and large coastal sharks.

Freshwater systems have also been targeted by our researchers, who have been working tirelessly with local governments to implement eradication programs for feral fishes in urban waterways. Projects like these have the added benefit of creating awareness in the general public about the dangers of dumping pet fish in natural water bodies.

Spanning both aquatic and terrestrial ecosystems, invasive species and other biosecurity threats are the primary concern of researchers within the Centre for Biosecurity and One Health. Our research scope affords us the opportunity to address biosecurity issues in our food systems, fibre systems and natural ecosystems. One of major outcomes from the centre in 2021 was the launch of the Global Burden of Animal Diseases (GBADs) program, a collaborative research program dedicated to identifying the individual animals and animal communities most impacted by endemic and emerging diseases.

Across all four research centres we continue to collaborate with industry and community partners to solve real-world problems through scientific research and innovation. Our global reputation for excellence has seen us publishing with international collaborators more than any previous year in the Institutes history.

That reputation is built upon the hard work of the exceptional people that make up the Harry Butler Institute, from senior researchers to PhD and Honours student researchers. We have seen this acknowledged by our peers in industry and academia through the many awards that our researchers have received for their work.

Accolades aside, we are and will continue to be driven by our need to safeguard the environment for future generations, collaborating with partners across industry, community and government to achieve our goals. Learn more about some of our key projects in the case studies presented in the subsequent section of the report.

CAMPONOTUS GIBBINOTUS—A NOCTURNAL ANT NATIVE TO BARROW ISLAND IN WESTERN AUSTRALIA.

UNDERSTANDING THE ECOLOGY OF FIRE IN THE WESTERN AUSTRALIAN ENVIRONMENT IS AN IMPORTANT AREA OF RESEARCH.

Achievements & impact in 2021

SCIENTIFIC PUBLICATIONS

Total (and per FTE):

364 (3.54)

percentage in Q1 outlets: **65%**

percentage in top 10% of outlets: **35%**

CITATIONS

Field-weighted citation impact

2021

2.05

(usually done on a 5 year rolling average)

2017–2021

1.73

Citations per publication

2021

3.5

(**3.0** excluding self-citations)

2017–2021

13.9

(**12.2** excluding self-citations)

NEW FUNDING AWARDS

(income to MU where Chief Investigator is in HBI):

$12,110,106

HIGHER DEGREE RESEARCH

Load

173.63

Equivalent Full-Time Student Load (EFTSL)

Completions

26.15

Equivalent Full-Time Student Load (EFTSL)

RESEARCH OUTPUTS

Percentage of research outputs with international collaborators

2021

59%

2017–2021

42%

COLLABORATIONS

Top collaborating institutions 2018–2021:

UNIVERSITY OF WESTERN AUSTRALIA
CURTIN UNIVERSITY
EDITH COWAN UNIVERSITY
PATHWEST
UNIVERSITY OF QUEENSLAND
UNIVERSITY OF MELBOURNE
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STELLENBOSCH UNIVERSITY
UNIVERSITY OF ADELAIDE


“Restoration is about more than planting trees, we’re restoring ecological function to damaged ecosystems.”

Our research

Centre for Water, Energy and Waste

Scientists create concrete from waste to pave our sustainable future

New 'Colliecrete' product to create jobs in regional transitions away from coal fired power plants as they are retired.

Researchers at Murdoch's Harry Butler Institute are transforming fly ash, a by-product of burning coal, into concrete, recently launching the new product 'Colliecrete'.

"Our researchers have developed an entirely new approach to concrete by making geopolymer cement in a unique chemical reaction and then adding recycled aggregates," said Associate Professor Martin Anda, environmental engineer at the Centre for Water, Energy and Waste.

"We need to be bolder and more innovative and get on with the job of transforming our cities into sustainable cities this innovation is a terrific example of that happening today."

Two hours south of Perth's industrial hub, in the South West town of Collie, coal is mined and burned to produce 50 per cent of Perth's electricity.

The research team is scooping up the soft fly ash from the power stations and mixing it with construction waste, which would otherwise be sent to landfill, to create a greener alternative to concrete, called Colliecrete.

The intent is to reduce the need for unsustainable and destructive practices.

"Conventional cement production is a dirty process and one of the world's biggest polluters of carbon — responsible for eight per cent of industrial global emissions," explained Dr Anda.

"Concrete manufacturing also harms seagrass meadows, which are mined for shells, and blasts holes into Perth's hills to extract rocks needed for production."

Under Dr Anda's instruction, environmental engineering researchers hope to use Collie's tailing dams, which contain a century's worth of old fly ash, as the basis for a green manufacturing industry that will inject fresh jobs into the local economy.

Colliecrete is a Western Australian State Government funded research project financed by Royalties for Regions and Collie Futures Funding.

Collie is the State's historical centre of electricity generation, where for decades, underground and open cut coal mines have provided the fuel to be burnt in WA's power stations to provide electricity to the South West Interconnected System — the main power grid for the State.

This research supports UN Sustainable Development Goals 13 and 15.

THE TEAM AT MURDOCH'S ALGAE R&D FACILITY MONITOR AN EXPERIMENT IN A RACEWAY POND, LED BY ASSOCIATE PROFESSOR NAVID MOHEIMANI.

Making fuel, food and cosmetics from fire waste

Australia generates over 10,000 tonnes of fire extinguisher powder waste each year. New research shows how microalgae can turn this into high-value bio products.

Fire extinguishers are commonly the first line of defence in containing a fire.

However, while they address the imminent risk posed by fire, the extinguisher powder waste produced when they're used or disposed of has a significant environmental risk.

This waste is generally directed to landfill, where it triggers wider environmental pollution, disturbs biodiversity and endangers the health of people and animals by contaminating underground water reservoirs and open water bodies, as well as polluting the air.

As Australia generates over 10,000 tonnes of this waste per year, finding a sustainable solution is imperative. Now, Murdoch PhD graduate Emeka Nwoba has developed a method for harnessing that waste for good.

"The significant amounts of nitrogen and phosphorus in fire extinguisher powder is what causes the subsequent environmental damage, but these non-renewable elements present a valuable resource if they can be reused," Nwoba said.

He has developed a method for waste-to-profit enterprises to do just that. The solution is in algae. He has demonstrated how microalgae can turn powder waste from fire extinguishers into high-value bio products.

How fire waste can produce new products

Microalgal farming requires large quantities of fertiliser, light and warmth. Nwoba has shown how fire extinguisher waste can be used to feed microalgae, with the sun doing the rest.

"This process means no harmful waste is discharged into the environment each time a fire extinguisher is disposed of, but also turns that waste into products like fuels, cosmetics, fertilisers and animal feed," explained Nwoba.

Hence, it creates a green industrial chain to environmentally manage this potentially hazardous waste.

"The other major benefit of treating fire extinguisher waste with microalgae is carbon capture. As microalgae absorb carbon dioxide as they grow, the process presents an opportunity for carbon-neutral fuel production."

The oil from microalgae can be extracted to produce biodiesel or bioethanol, reducing carbon emissions from fuel production by about 78 per cent, while still offering side-stream products.

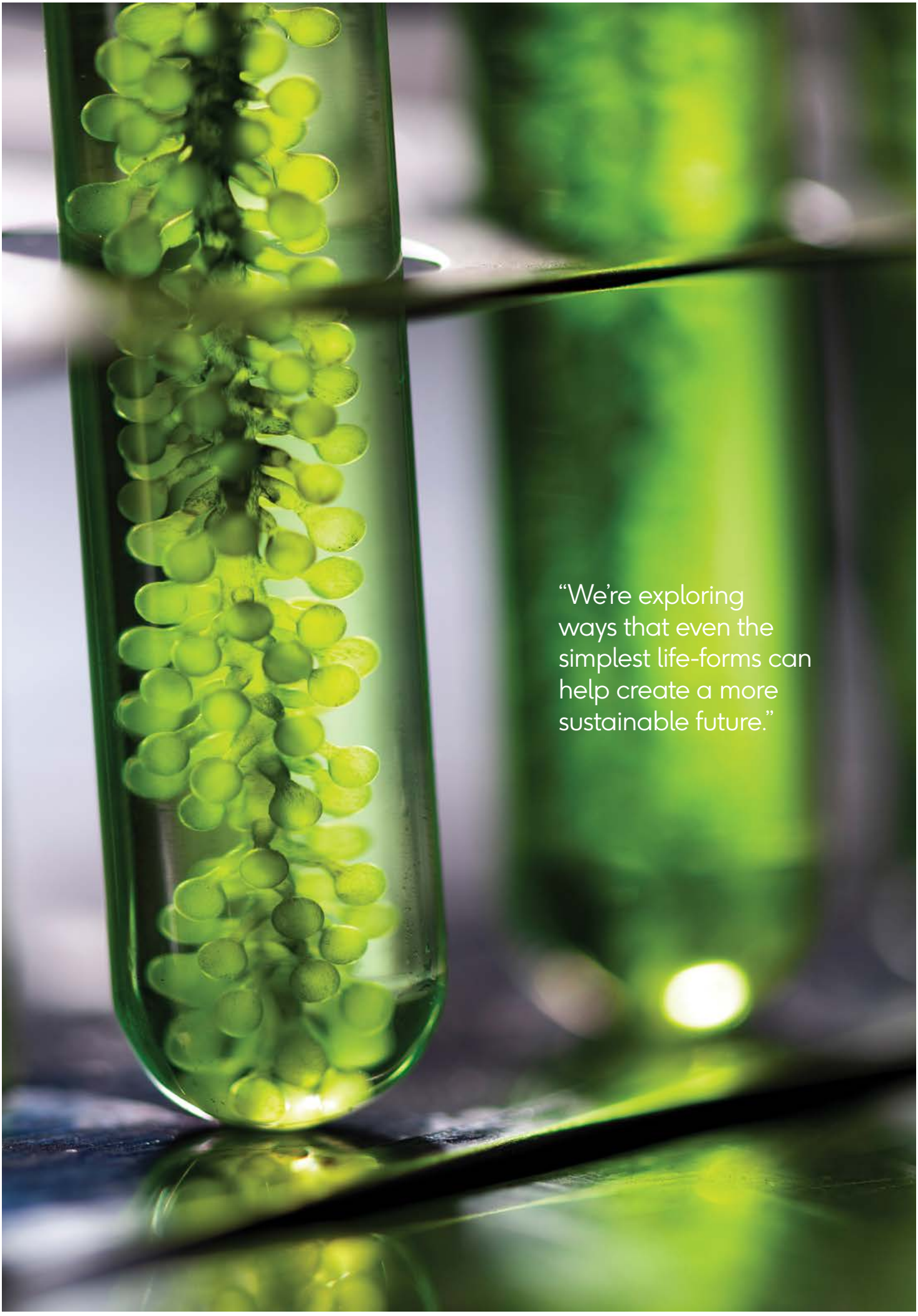
The spent or 'de-oiled' microalgae can be used for feed or to produce biogas to power the refinery that's producing the fuel.

This means using a microalgal facility to treat extinguisher powder waste can continuously generate biomass for different applications, both preventing the environmental damage caused by fire extinguishers and opening up new circular economies.

The discovery by Nwoba, part of the Centre for Water, Energy and Waste at the Harry Butler Institute, shows again how we can harness eco-technology to turn waste into new economic and environmental opportunities.

EMEKA NWOBA MONITORS AN EXPERIMENT AT MURDOCH'S ALGAE R&D FACILITY.

This research supports the United Nations Sustainable Development Goal 12 to ensure sustainable consumption and production patterns.


"We're exploring ways that even the simplest life-forms can help create a more sustainable future."

Centre for Terrestrial Ecosystem Science and Sustainability

Western Australia's first tiny forest for community-led urban greening

The first ever Australian Miyawaki forest has been planted at a Western Australian school.

Murdoch University's Dr Grey Coupland, from the Harry Butler Institute (HBI), has partnered with South Padbury Primary School to plant Western Australia's first tiny forest, following the Miyawaki planting method developed in Japan.

"Miyawaki forests are becoming increasingly popular for urban greening to rehabilitate degraded areas and increase biodiversity in urban areas," Dr Coupland said.

"They contain up to 30 different native species planted in a dense planting arrangement and anecdotally, grow up to 20 times as fast as traditionally planted forests, and support up to 100 times the diversity."

Dr Coupland said the project will help assess how well the Miyawaki method is suited to the Australian environment using Australian species, while also teaching primary school students the importance of citizen science.

South Padbury Primary School's forest contains 26 Australian endemic species that will form four layers within the forest: a canopy layer, tree layer, sub-tree layer and shrub layer. Species planted include iconic species, such as grass trees, (*Xanthorrhea preissii*), a variety of eucalypt and *Banksia* species, as well as a range of smaller species, including Cockies tongues (*Templetonia retusa*).

"Australia's biodiversity is increasingly under threat, and action is required at national and local levels to mitigate this biodiversity crisis. However, at the local level, citizens often feel powerless to act.

"Partnering with local schools like South Padbury Primary School is an excellent opportunity to demonstrate that tiny forests can offer bite-sized local environmental action that can empower and engage communities, resulting in real environment outcomes," said Dr Coupland.

Year 3s to 6s from South Padbury Primary School are taking part in the HBI-led research project, learning about urban sustainability issues and the environmental impact of climate change.

The children will conduct monthly monitoring of the forests as citizen scientists, assessing plant growth rates, animal diversity and temperature regimes within and outside the forest.

DR GREY COUPLAND WITH STUDENTS.

Principal of South Padbury Primary School, Cass Disisto said the school was incredibly excited to be involved in the ground-breaking initiative.

"It is an exciting opportunity for our students and the school community to be leaders in building biodiversity through a hands on, scientifically based research project. Our Urban Tiny Forest reflects the school's moral purpose of 'Be The Change', and our desire to make a difference to others and the world around us."

Dr Coupland said the project will run for an initial two years as she continues to investigate soil microbial activity and diversity. This information will be compared to data collected from adjacent natural vegetation to assess how well the Miyawaki forest is performing under Australian conditions.

"Given the increasing popularity of the Miyawaki planting technique, there is a clear need to better understand the biology of these forests.

"Importantly, this study will enable community decision and policy makers to inform future urban revegetation programs."

This research supports UN Sustainable Development Goals 13 and 15.

Red foxes feasting on Australian mammals

Scientists at the Harry Butler Institute (HBI) have discovered that red foxes are ravaging a larger range of Australian animals than previously realised.

The research found 70% of fox diet samples were turning up mammal remains. It demonstrates a major shift in fox diet over the past 70 years, as they have switched to consuming more native species in the wake of successful rabbit biocontrol.

Professor Trish Fleming, Director of the Centre for Terrestrial Ecosystem Science and Sustainability at HBI, says the fox is one of the greatest threats to Australia's native fauna.

"Unlike feral cats, which prefer taking only live prey, foxes are opportunistic, consuming a range of foods, this opportunism is what has allowed them to exploit a broad range of habitats to become the most widely distributed carnivore next to domestic cats and dogs," said Professor Fleming.

"They never go without; they always find something that they can eat. Their opportunism makes the red fox the world's most successful wild mammalian carnivore. Foxes exploit a range of human environments from farmland to cities. As well as the significant threat to our biodiversity, foxes also cause significant damage to livestock."

Professor Fleming said the research provided valuable insight into the Australian mouse plague affecting parts of rural New South Wales.

For study sites within mouse plague-prone parts of eastern Australia, we found no difference in the incidence of house mouse in fox diet between years with mouse plagues and years without plagues."

"However, the incidence of house mouse in fox diet for these areas was approximately 2.3 times greater than the overall mean in other locations. This may suggest that foxes benefit from localised increases in mouse availability, even if the increase of house mouse in fox diet cannot counter the rapid reproductive rate of mouse populations under ideal conditions."

Professor Fleming and a team of collaborators from across Australia reviewed 85 fox diet studies, totalling 31,693 samples, from across the species' geographic range within Australia.

"This evidence is motivation for greater fox control in Australia, especially around urban bushland reserves where native species such as possums and bandicoots are a significant proportion of the foxes' diet. This review also highlights the importance of integrated pest species management for effective conservation of our unique biodiversity," said Professor Fleming.

"As a precautionary principle, population control of foxes, feral cats, and rabbits should be carried out simultaneously, because removal of any one of these species in isolation can have perverse repercussions for native wildlife."

The fox was introduced to Australia about 150 years ago, and within 30 years of its introduction was already recognised as a threat to livestock and native wildlife.

Earlier studies show the fox has already contributed to the extinction of an estimated 14 native mammal species and one bird species.

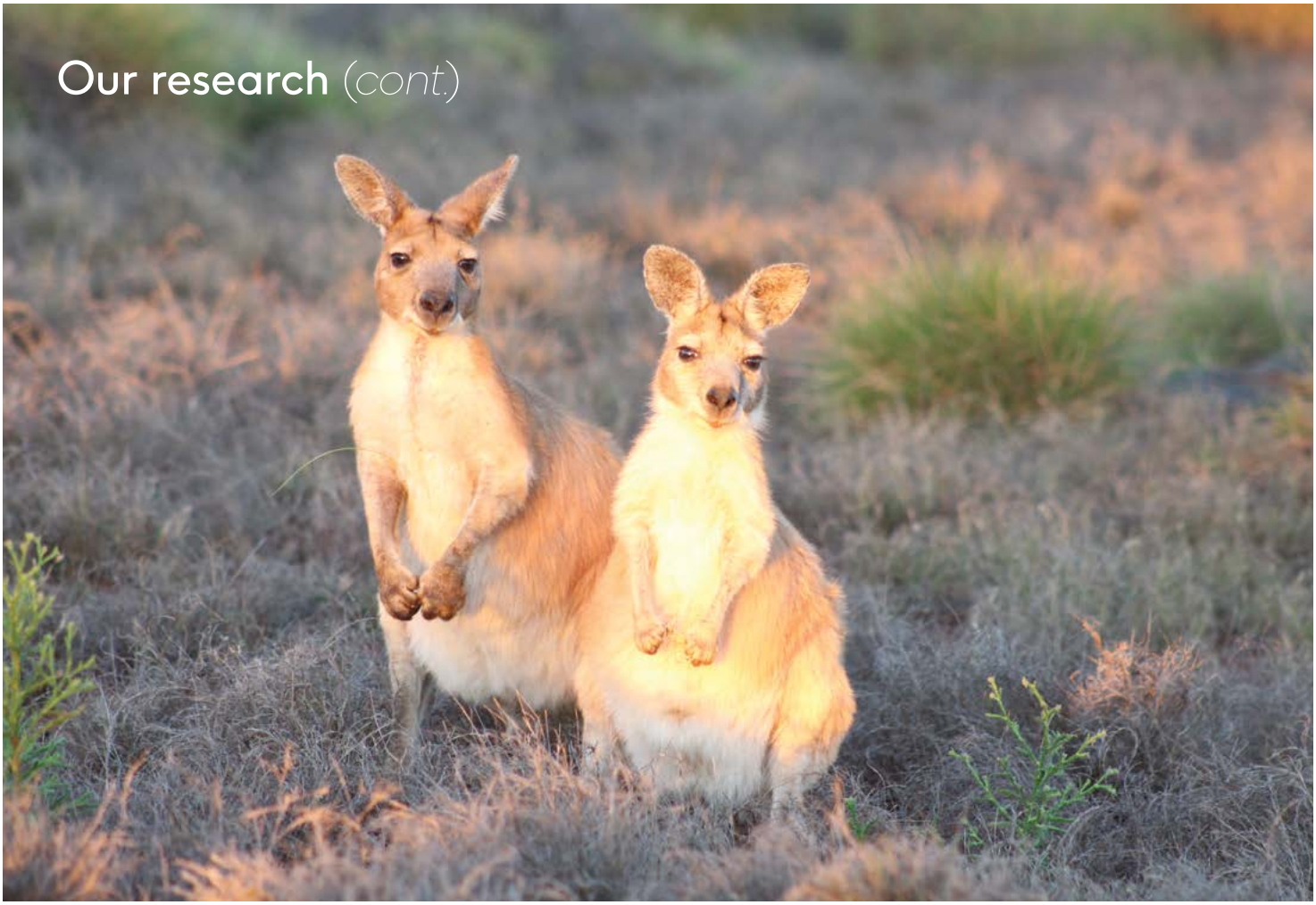
This research supports the United Nations Sustainable Development Goal 15 to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

RED FOX IN MANDURAH.

IMAGE © JANINE KUEHS

RED FOX INSPECTING BAIT.

IMAGE © PROF. TRISH FLEMING



Climbing kangaroo species discovered in caves

Researchers have discovered an extinct kangaroo that adapted to climb through powerful forelimbs and hindlimbs, grasping hands and strongly curved claws.

The research, by Dr Natalie Warburton of Murdoch University and Professor Gavin Prideaux of Flinders University, adds substantially to our understanding of the previous diversity of the kangaroo family.

"The specimens we analysed — including several cranial and two near complete skeletons — suggests this kangaroo species would climb and 'move slowly' through trees," said Dr Warburton.

"By undertaking a painstaking process of identifying and describing the anatomical details of every single bone that was recovered from the skeletons, we have been able to reveal that this species of extinct wallaby was adapted for climbing trees in order to browse on plant material not available to animals that are stuck on the ground.

"This provides a completely new interpretation of the biology of the species."

The skeletons studied were from the Nullarbor Plain Thylacoleo Caves and Mammoth Cave of Western Australia. They were discovered in 2002 and 2003 by WA cavers Paul Devine and Eve Taylor.

"Despite purportedly being an expert in fossil kangaroos, it took me most of that time to work out that these two skeletons belonged to a species first described decades earlier from jaw fragments from a cave in southwestern Australia," said Professor Prideaux, co-director of the Flinders University Palaeontology Laboratory in Adelaide, South Australia.

"The Thylacoleo Caves are famous for both the remarkably complete preservation of the fossil remains and the insights they provide into the unexpectedly high level of diversity of large marsupial species that inhabited what is now an arid treeless plain.

> This discovery provides yet another reminder of just how little we understand of even the relatively recent geological past in Australia"

Given that all but one group of kangaroos and wallabies are ground-dwelling, and that all species that are known to climb trees (tree-kangaroos) are closely related, the finding means that tree-climbing evolved more than once in the kangaroo family tree.

"These fossils have unusually long fingers and toes with long, curved-claws, in comparison to other kangaroos and wallabies, for gripping; powerful arm muscles to raise and hold themselves up in trees, and a longer, more mobile neck than other kangaroos that would be useful for reaching out the head in different directions for browsing on leaves," explained Dr Warburton.

EXQUISITE PRESERVATION OF THE SKULL OF THE NEWLY IDENTIFIED FOSSIL TREE-CLIMBING KANGAROO (*CONGRUUS KITCHENERI*) FROM THE NULLARBOR PLAIN OF WESTERN AUSTRALIA.

"This is really interesting, not just from the point of view of unexpected tree-climbing behaviour in a large wallaby, but also as these specimens come from an area that is now bare of trees, and so tells us that the habitat and environment in the area were really different to what they are now, and perhaps different to what we might have previously interpreted for that time.

"This is unexpected and exciting and it provides us with new information as we try to understand the changing environments of Australia through time."

Dr Warburton's research on the link between structure and function in animals provides important information on our unique wildlife, both living and extinct.

As a leading expert on marsupial anatomy, her work utilises both quantitative and qualitative techniques that contributes to our understanding of animal ecology and biodiversity in changing environments through time.

Read the full paper on The Royal Society.

This research supports the United Nations Sustainable Development Goal 15 to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

EXQUISITE PRESERVATION OF HANDS AND FEET OF THE NEWLY IDENTIFIED FOSSIL TREE-CLIMBING KANGAROO (CONGRUUS KITCHENERI) FROM THE NULLARBOR PLAIN OF WESTERN AUSTRALIA.

IMAGES © DR NATALIE WARBURTON

Centre for Sustainable Aquatic Ecosystems

TEDx a fin-tastic opportunity to share marine passion

Whether it's above the waves or below the surface, the ocean is Dr Adrian Gleiss' happy place, and the inspiration for his work as a behavioural ecologist at Murdoch's Centre for Sustainable Aquatic Ecosystems.

At the 2021 TEDx Kings Park Oceans event, Dr Gleiss shared his passion for all things marine.

He took his audience on an underwater journey, sharing insights into the behaviour of marine megafauna such as whale sharks, and explaining how the latest biometric technology is helping ocean conservation efforts by identifying what its inhabitants need to survive and flourish.

Every time we get a tag back after having travelled on the back of some really cool critter, we get to uncover some of that animal's secrets and invariably, there is almost always some new discovery," Dr Gleiss said.

Such research is vital with marine ecosystems around the world facing critical threats posed by global warming, exploitation, and pollution.

But arguably equally as important is how scientists communicate what is happening and how the general public can help to mitigate the damage.

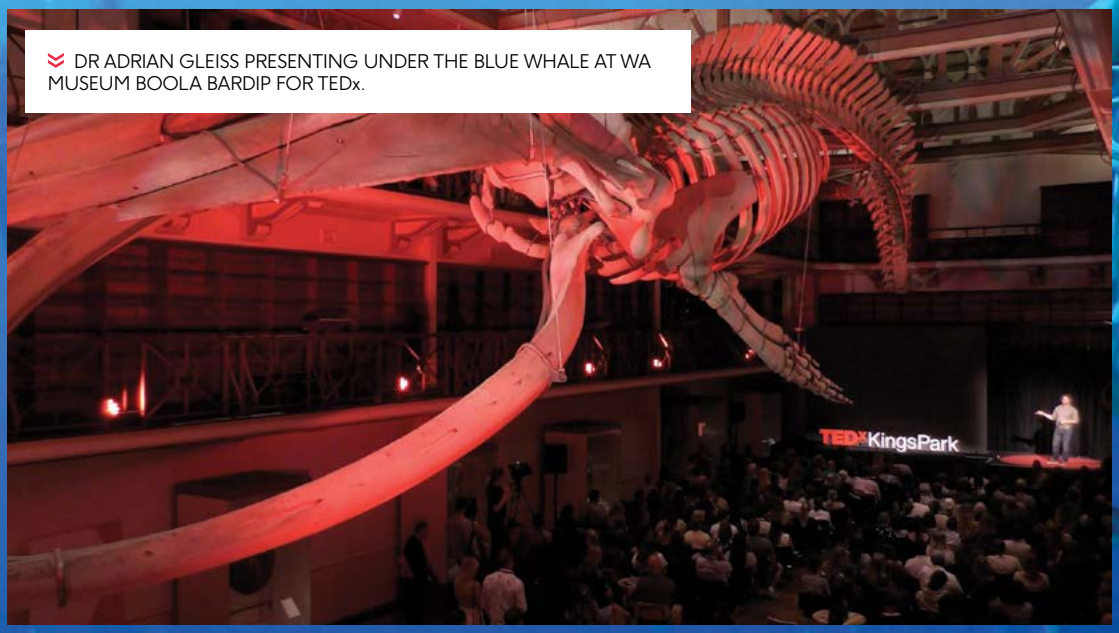
He said TEDx was a unique platform that linked science and thought leadership with a broad audience, and generated enthusiasm for new and exciting ideas.

"Public speaking is something that most scientists are well versed with, but the medium of TEDx is really quite different from your usual scientific talk at a conference," Dr Gleiss said.

"It is important to take a big step back and not delve into the minutia or technicalities of a topic, which is what we as scientists love to do."

For Dr Gleiss TEDx presented an opportunity to communicate a concept, rather than pure science.

"It is about showing the audience the excitement and passion that speakers have for their chosen subject and to therefore raise the profile of the subject at hand, or science more broadly," he said.



DR ADRIAN GLEISS PRESENTING UNDER THE BLUE WHALE AT WA MUSEUM BOOLA BARDIP FOR TEDx.

"It really helps to create emotional connections between the public and the species being studied, which is going to be hugely beneficial for conservation."

Centre for Biosecurity and One Health

Unravelling how animal diseases impact our health and wellbeing

A new research program has been launched to identify the individuals and communities most impacted by endemic and emerging diseases.

Animal health leaders and researchers from the Global Burden of Animal Diseases (GBADs) programme have secured US$7 million from the Bill & Melinda Gates Foundation and UK's Foreign, Commonwealth and Development Office, to rollout a framework on measuring animal health burdens and their impacts on human lives and economies.

The information provided by GBADs will guide public policy and private sector strategy, contributing to improve animal health and welfare more effectively. It will also be a basis for further academic research.

Across the world, livestock production and aquaculture are critical to human nutrition and health. These animals play critical roles in society, providing income and food, but also clothing, building materials, fertiliser and draught power. However, the presence of endemic and emerging diseases, as well as other factors, negatively impact them, jeopardising their contributions.

Every year, hundreds of millions of dollars are invested globally on disease mitigation in order to improve livestock health and productivity. Yet, a systematic way to determine the burden of animal disease on the health and wellbeing of people is not available. It is still unknown how the burden is apportioned between smallholders and the commercial sector, or across regions and gender.

Consequently, decision makers lack the information to accurately assess whether their investments target the animal health issues that have the most significant impact on human wellbeing.

Measure to improve the management of animal diseases: A new program

The GBADs program, led by the University of Liverpool, the World Organisation for Animal Health (OIE) and a partnership of international institutions, will enable the examination of animal health and the disease burden from a different perspective.

By assessing the global burden in economic terms, the program will help identify the individuals and communities which are the most impacted, demonstrating how animal health is intrinsically linked to agricultural productivity, smallholder household income, the empowerment of women and the equitable provision of a safe, affordable, nutritious diet.

"The GBADs program is a key part of our commitment to deploying our research capacity toward the welfare of humankind. The GBADs program is crucial in building a world with zero hunger, good health, and equality for all, an urgent mission in which we are proud to play our part," highlighted Professor Dame Janet Beer, Vice-Chancellor, University of Liverpool.

"We are grateful for the support of the Bill and Melinda Gates Foundation and UK's Foreign, Commonwealth and Development Office, who are supporting this work in partnership with the OIE. Together, we will realise a brighter future for animal and human wellbeing."

"It is more evident now for everyone that animal health and public health are interconnected and play an essential role in building a sustainable and healthy planet. Especially, if we succeed in incorporating the environmental and socioeconomic components", said Dr Monique Eloit, OIE Director General.

The new partnership announced today will support the implementation of the GBADs program. In a world where 1.25 billion people work in agriculture, this programme will have a positive impact on the Sustainable Development Goals contributing to Zero Hunger, Good Health and Well-being, Gender Equality; Decent Work and Economic Growth; and Responsible Consumption and Production.

Prioritising animal health problems to tackle first

"This will not only help us understand what health problems are occurring in the animal population, but also predict patterns beyond infectious diseases, including how floods, drought and fire will affect livestock health and production," said Dr Mieghan Bruce, who is leading Murdoch's contribution to the program.

"Farmers and policymakers will be able to compare the health of their herds to what a disease-free herd looks like, allowing a clearer view on the production loss caused by diseased livestock. We can then prioritise which diseases to tackle using the GBADs objective data."

Dr Bruce is one of the key researchers leading the One Health initiative at Murdoch, which encourages a holistic view of environmental, economic and social impacts of pest and diseases for both animals and humans.

"Maintaining healthy livestock is as important for human health and our environment, as it is for the health of our animals," said Dr Bruce.

"If we have disease-burdened animals it increases the competition for land, air and water. So from an environmental perspective, if we can improve the health of the system, we can use our resources more efficiently to reduce greenhouse gas emissions from livestock production and decrease our water footprint."

GBADs is led by the University of Liverpool, the World Organisation for Animal Health (OIE) and a partnership of international institutions including: the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australia; University of Guelph, Canada; the Institute for Health Metrics and Evaluation, University of Washington, United States; the International Livestock Research Institute (ILRI), Ethiopia; Murdoch University, Australia; Sciensano, Belgium; Washington State University, United States; University of Zurich, Switzerland; and the Food and Agriculture Organization of the United Nations (FAO).

This research supports the United Nations Sustainable Development Goals 2, 3, 5, 8 and 12.

HEALTHY LIVESTOCK MEANS A MORE EFFICIENT USE OF RESOURCES.

Marketing

The Institute recognises the importance of being visible on digital platforms and continues to promote awareness about the wide range of research being undertaken, through a dedicated website and social media networks such as LinkedIn.

The Harry Butler Institute launched on LinkedIn in March 2021 to build a professional digital presence across appropriate digital platforms for consumption by diverse audiences, and to attract business investments to the Institute. This has led to enquiries from industry stakeholders around furthering research opportunities. It has also provided an outlet for frequent public updates about HBI activities and achievements. We have progressively built interest in the page and our activities through regular posts with engaging content.

The HBI website **www.murdoch.edu.au/research/hbi** went live in May 2021 and features pages that lead the viewer through Our Centres, Our Researchers and Case Studies, encouraging viewers to Get Involved and Contact HBI where necessary. This has served a central point of public information about the HBI and our research and provided a means for us to be contacted. 40 HBI news articles were published on the Murdoch University website. Through our maintenance of a professional website and the careful curation of our Google business listing we have attracted more than 6000 unique visitors to our site.

KEY HBI WEBSITE METRICS

6174

unique visitors in the 2021 calendar year to HBI and its associated pages

8810

total visitors to HBI site
(includes all pages)

106 seconds

is the average duration on site

84 (2.1%)

visitors clicked the Contact HBI link from the HBI home page

The HBI will continue to improve upon our marketing efforts through our website and LinkedIn page, and through our relationships within the University that foster broader engagement and involvement.

PAGE FOLLOWERS

347

followers of the HBI LinkedIn page

March to December 2021

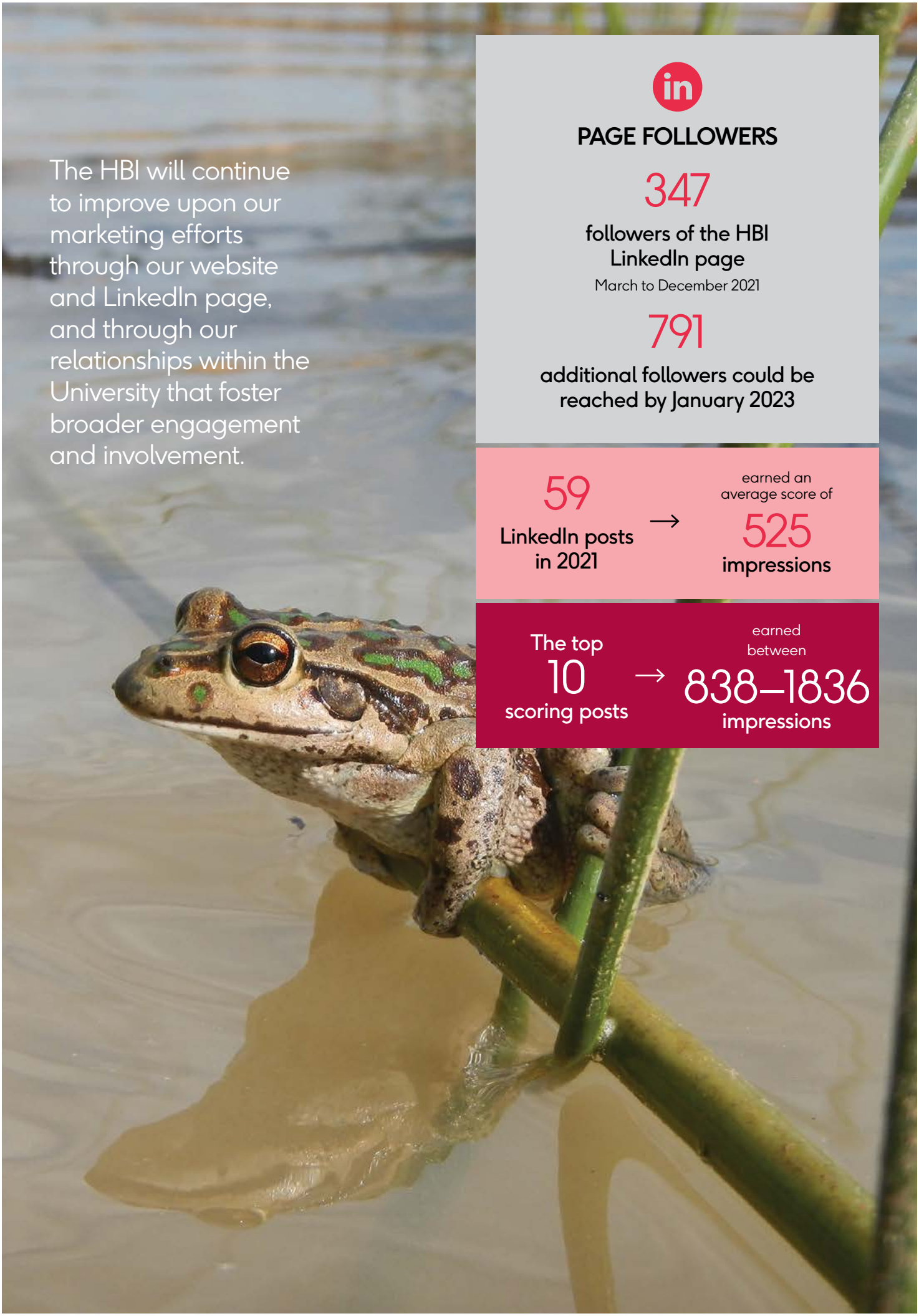
791

additional followers could be reached by January 2023

59

LinkedIn posts in 2021 → earned an average score of **525** impressions

The top **10** scoring posts → earned between **838–1836** impressions



Awards

HBI scholarship student winners

Congratulations to our Harry Butler Institute Scholarship winners Brooks Lloyd, Nicole Maher, Rachel Newsome, Jennifer Kelly, and Rubie Evans-Powell.

The HBI Scholarships will provide the research students with both financial support and an opportunity to work with Industry partners such as Chevron, who support the HBI. The winners were presented by HBI PVC Simon McKirdy and HBI Chevron Chair Peter Landman.

The winning students' projects cover a range of topics, from using AI to detect marine mammals and reptiles, to parasites on reintroduced island fauna, to native tree species affected by climate change.

Read more about the scholarship winners here:
https://loom.ly/cJwJdfY

Dr Kamil A Braima accomplishment

Congratulations to Dr Kamil A. Braima and his supervisory committee on this fantastic accomplishment!

Dr Braima completed his PhD with the thesis Risk management of waterborne Cryptosporidium in public swimming pools and splash parks in Western Australia. We are excited to see what comes next for this promising researcher as he moves into the next phase of his career.

Belinda Robson wins Hillary Jolly medal for limnology

Another award winner at the Harry Butler Institute! Associate Professor Belinda Robson joins Dr Jane Chambers among Murdoch University researchers awarded the Australian Freshwater Sciences Society's top honour: the Hillary Jolly Medal.

Belinda has said she "feels honoured to be nominated by her peers" for this recognition of her ongoing dedication to scientific progress. This is a fitting follow-up to her 2004 win of the Society's Early Career Excellence Award. Always honest, she added that she's "still getting her head around the announcement" and doesn't expect the feeling to sink in until she physically receives the medal at the Hillary Jolly Memorial Lecture next year.

This award recognises her outstanding contributions to research excellence, education, and management. She deserves every bit of it. Congratulations Dr Robson!

James Tweedley tall poppy award

Congratulations to our Institute's own Dr James Tweedley! He has been selected by the Australian Institute of Policy and Science as one of the outstanding early career researchers in Western Australia to receive a 2021 Young Tall Poppy Science Award.

Learn more about the work and inspiration of this young research star in the Murdoch University article linked below!

www.murdoch.edu.au/news/series/series-articles/know-your-academic/meet-james-tweedley-marine-biologist-and-lecturer

Hamish McKirdy 7News Young Achiever award

Congratulations to PhD student Hamish McKirdy for receiving a 7NEWS Young Achiever Awards WA.

Hamish's research is contributing to the development of new, environmentally-friendly pest control technologies for Australia's wine industry.

Last year, Hamish won the Wine Australia Award at the 2020 Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry.

Well done Hamish on this amazing achievement!

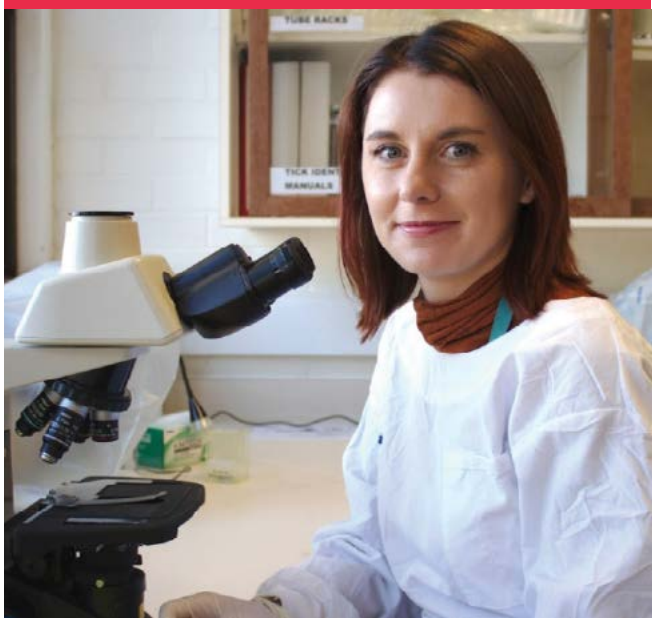
Siobhon Egan wins Sinnecker-Kunz Award

Congratulations to Harry Butler Institute Research Fellow Siobhon Egan who was awarded the prestigious Sinnecker-Kunz Award for early career researchers at the 14th International Symposium on Ticks and Tick-borne Diseases.

Siobhon's research is the first large scale work on the diversity of tick-associated microbes that are circulating in Australian wildlife.

"Globally the incidence of tick-borne diseases are increasing. The most well-known is Lyme disease, where the cases in the United States have doubled between 1993 to 2018," she said.

"In comparison, here in Australia relatively little is recognised, despite growing concerns regarding people becoming sick after a tick bite."



Publications

Researchers across the Institute have published their original research, analytical reviews and novel species descriptions in some of the highest rated scientific journals including *Nature*, *Science of the Total Environment*, *Scientific Reports*, and *Plos One*.

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- Pass Harry's passion and knowledge on to generations of students
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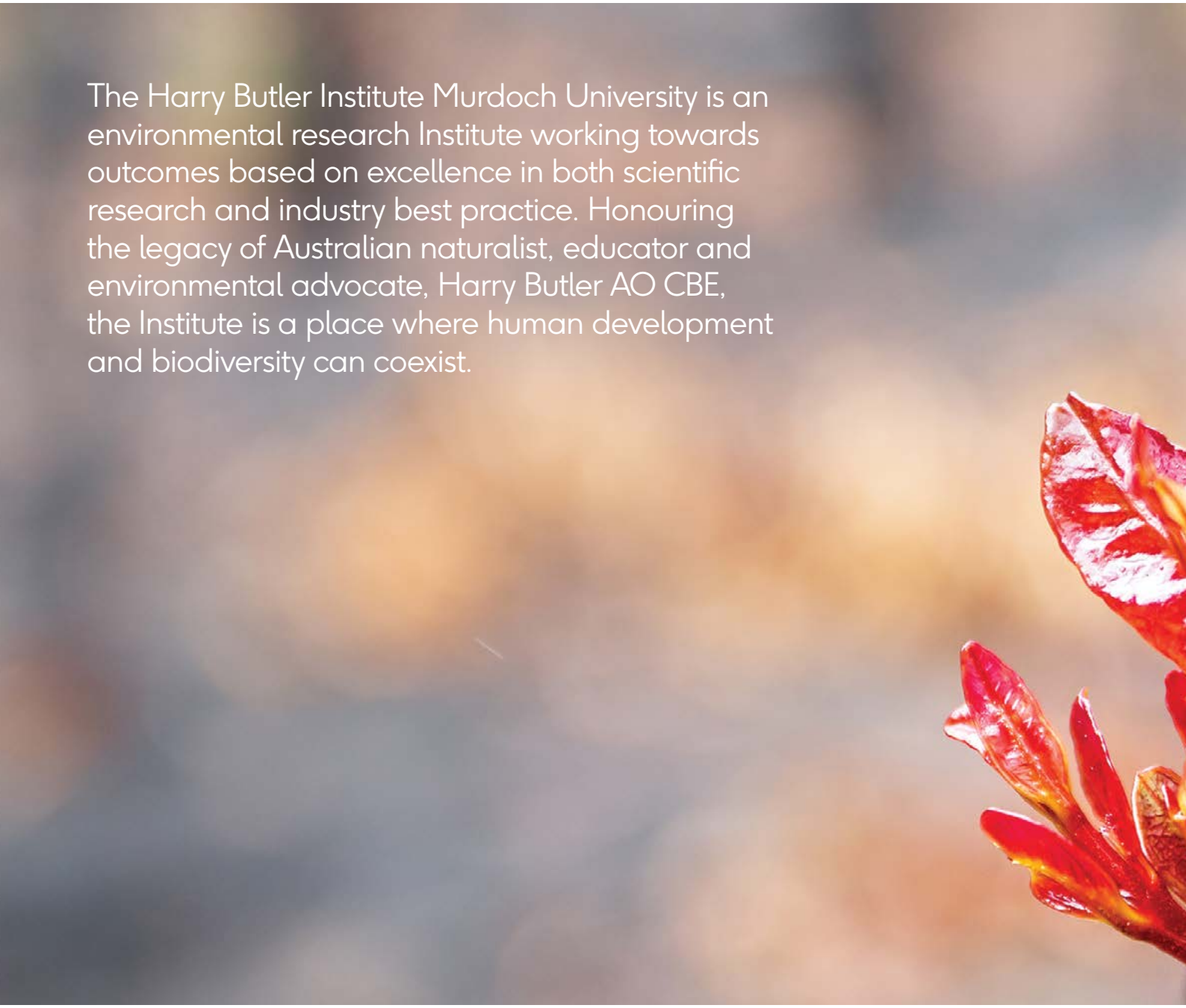

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