

inSight

Inspiring stories from the Faculty of Science

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Science for a
sustainable future



SCIENCE

inSCight

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A new take on Darwin's 'Tree of Life', this photo shows an oak tree overlaid with a diagram of 3000 species, as a celebration of Earth's biodiversity. It was a finalist in the 2019 Royal Photographic Society (RPS) Science Photographer of the Year (SPOTY) competition, recently on display at an exhibition at the Museum of Transport and Technology (MOTAT) in Auckland. SPOTY showcases outstanding images demonstrating science in action and telling stories behind scientific exploration and application. View this and other photos from the exhibition at spoty.motat.nz and see rps.org/spoty for more about the competition.



Cover photo:
*The Tree of Life,
Homage to
Darwin* by Carol
Ballenger

A word from the Dean

WELCOME TO THE

2020 edition of *inSCight*. This edition is themed 'Science for a sustainable future'. We will be exploring many of the ways in which the faculty has been contributing to and adopting sustainability and sustainability practices.

This time last year, I wrote an opinion piece for Newsroom, encouraging those of us who do science to recognise the inconvenient truth that many of our practices, notably our addiction to conference travel and air conditioning, mean that we do not tread lightly on the planet, and encouraged colleagues to look at how we change those practices.

I need to be careful of what I wish for, as this year has seen an enforced change of such behaviours that none of us would have wanted.

I am very mindful that the relatively mild inconveniences to our way of life we have faced here at the University of Auckland are not replicated elsewhere and that many of you are doing it tough. My heart goes out to those of you in such circumstances.

Science steps up

Nevertheless, COVID-19 has thrown into perspective how a major crisis, such as a pandemic, can deeply impact society and the value of having clear scientific voices providing expert advice to public and government on both the nature of those impacts and how they can be mitigated.

People such as our PM's Chief Science Advisor Juliet Gerrard, COVID-19 modeller and Director of Te Pūnaha Matatini, Shaun Hendy, and science communicator Siouxi Wiles, all Auckland Science staff, have been instrumental in providing that advice and commentary.

Further crises are inevitable. Climate change is the most obvious, but potential disruption in the food, materials, information, energy, and transport domains¹, will all strike at the nature of what work is, what education is for, and how society functions and is governed.

As scientists we need to be ready to provide sound leadership, trusted advice, and graduates who can understand and meet the resulting challenges.



In this issue

FEATURES

4 Racing against the climate clock

Climate science and researching the impacts of climate change is more important than ever before.

6 Kaitiaki of the Waipā River

A joint research project from two academics investigates how Māori could have a greater voice in river management and decision-making.

10 Greening our food production and supply chains

Green chemical science is unlocking ways to reduce and reuse the food we waste.

14 The psychology of sustainability

Professor Niki Harré examines the importance of motivational hope in creating a sustainable world.

16 The show must go on

Sustainability events on eco-anxiety and river futures powered on in the time of COVID-19.

18 Giving biodiversity the best chance

We explore a research initiative looking at "sneaking biodiversity into cities" and how the Predator Free 2050 project is progressing.

REGULAR SECTIONS

8 Our alumni

Science alumni Rachel Brown and Fletcher Sunde share insights into their careers.

20 Our students

We celebrate the achievements of two of our students in their undergraduate and postgraduate studies.

Leading by example

Sustainability, one of the most immediate challenges, is an area we have considerable strength and impact in as a faculty and University.

This is reflected in the University topping, for the second year running, the world University Impact Rankings by Times Higher Education.

The rankings measure how universities worldwide are performing against the United Nations' Sustainable Development Goals (SDGs).

Research for a sustainable world

So in this issue, we, of course, look at research on climate, headlined by our new Professor of Climate Physics, David Noone, who got into atmospheric physics to help him be a better sailor, but whose work now informs global climate models helping us to determine how to navigate our future.

He complements ongoing work in the School of Environment by Dr Murray Ford and Dr Emma Ryan, who have been looking at the impact of climate change on our Pacific neighbours, particularly coral atolls (see page four).

Closer to home, we have much to learn by blending traditional Māori mātauranga notions of stewardship of natural resources with

scientific thinking as Associate Professor Karen Fisher and Dr Meg Parsons from the School of Environment have been doing in their research on fresh water management – working with iwi, local councils and the regional farming community, managing the environment in relation to the environmental health of the Waipā river and in relation to a Māori perspective of stewardship (see page six).

The sustainability and resilience of our cities has been challenged by COVID-19, but Associate Professor Margaret Stanley from Biological Sciences has been exploring the flip side of this – nature in cities and how it returned during lockdown periods. Meanwhile, Associate Professor James Russell, from Biological Sciences/Statistics and Dr Brendon Blue from Environment, have been heavily involved in the Predator Free 2050 movement to eliminate introduced pest species from Aotearoa (see page 18).

Making processes more sustainable yet efficient is a major thrust of the Green Chemistry initiative in Chemical Sciences, including reducing and reusing food waste (especially from fresh produce), on the road towards more sustainable food production and supply chains (see page ten).

Professor Niki Harré from Psychology brings a social sciences dimension to the issue of sustainability and resilience with her impactful research on the social and psychological aspects

“Sustainability... is an area we have considerable strength and impact in as a faculty and University.”

of sustainability, in particular, how to engage people in creating a more sustainable and equitable society (see page 14). Niki has also championed the introduction of a sustainability module of three courses taught across Science and Arts, instilling a sustainability mindset in our students.

This and more, including student and alumni features, are covered in this issue. I do hope you enjoy it.

PROFESSOR JOHN HOSKING
Dean of Science, University of Auckland

1 Rethinking Humanity, Five Foundational Sector Disruptions, the Lifecycle of Civilizations, and the Coming Age of Freedom, James Arbib & Tony Seba, www.rethinkx.com, June 2020

In memoriam: Sir Vaughan Jones

New Zealand's most celebrated mathematician, Sir Vaughan Jones, the only New Zealander to be awarded the maths equivalent of the Nobel Prize, the Fields Medal, passed away in September this year, aged 67.

A mathematician of international standing, when Sir Vaughan accepted the Medal in front of the world's leading mathematicians at the International Congress of Mathematicians in 1990, he wore an All Blacks rugby jersey.

“He was a very proud Kiwi,” says friend and long-time colleague Distinguished Professor Marston Conder from the University of Auckland’s Department of Mathematics.

“He was very down to earth, someone you could have a relaxed chat with over a drink, with a great sense of humour, and who did a lot for New Zealand mathematics.

“For many years he wasn’t just the only New Zealander to receive the Fields Medal, he was the only Fields Medallist in the Southern Hemisphere. This was a huge achievement, awarded only to brilliant mathematicians under the age of 40.”

Sir Vaughan spent his career in the United States but gave generously of his time to the University and to New Zealand mathematics more widely, offering courses and lectures each summer to encourage and mentor younger mathematicians. Sir Vaughan also supported the in memoriam Judy Paterson Mathematics Education Scholarship.

He co-founded and led the NZ Mathematics Research Institute (NZMRI) to promote and foster high quality mathematics. The Royal Society’s Te Apārangī Jones Medal, awarded for outstanding achievement in the mathematical sciences, is named after him.

His most celebrated work was on knot polynomials, the study of everyday knots of the type used in sailing. His discovery of what is now called the Jones polynomial had origins in the theory of von Neumann algebras.

“That work in theoretical mathematics, which basically helps distinguish one knot from another, had application in biological science, enabling scientists to identify whether

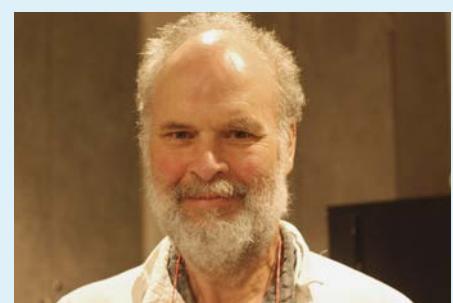


Photo: Akram Aldroubi/Vanderbilt University

two different types of RNA are from the same source,” Professor Conder says.

“That was an outstanding achievement because from theoretical mathematics, his discoveries had real significance in an entirely different field.”

In 2002 Sir Vaughan was made a Distinguished Companion of the NZ Order of Merit (DCNZM) (later re-designated Knight Companion KNZM).

He died after suffering complications resulting from a recent severe ear infection. He is survived by his wife and three children.

Racing against the climate clock

The more we can learn about climate change and its impacts, the greater chance we have of living through it.

CLIMATE CHANGE is one of the biggest threats our world has ever faced. As David Attenborough said in his first feature film which he describes as his ‘witness statement’, *David Attenborough: A Life on Our Planet*, “This is not about saving our planet, it’s about saving ourselves” – a warning that the natural world will survive without us and not the other way around.

As the boiling point of the climate crisis speeds towards us, with experts predicting the disastrous impacts of climate change will be at our doorstep by 2050, we need to work together to reduce global warming and create a sustainable way of life so there is a future to live in. Science expands our fundamental understanding of the world but it is equally important that this knowledge informs the decision-making on how we must adapt to climate change and its challenges.

Unifying climate science research

This is one of the aims of the Climate Science Research Centre initiative, to unify climate

science research as we build towards a more sustainable future. Professor David Noone was appointed this year in a leading role as Buckley-Glavish Professor of Climate Physics at the University and is Director of the Centre, which is in its founding stages. David hopes it will be a “nationwide academic alliance in climate change”.

His research is on water, clouds and changing global wind patterns while he also helps build and use climate models in predicting future climate change. Referring to one of his research projects, David explains, “we’re working to understand how pollutants in the atmosphere change the characteristics of clouds, in two parts – how efficient clouds are in raining and how bright the clouds are, both of which are quite central to understanding how reliable future climate model projections are”.

David’s work involves oceanic clouds that are prevalent in the Eastern Pacific, which have some similarities to clouds around New Zealand. “These clouds happen to be disproportionately important for the global planetary temperatures. Clouds can act to either amplify or limit

temperature changes, and determining which requires careful accounting of the way in which minute cloud droplets form and evaluating the wind patterns near cloud,” he explains.

“We’re trying to understand these physical processes, principally because we don’t know the right way to code these into the climate models,” he says. “It’s clearly an area where models need to be improved and so by doing the observational component parallel to the theoretical side in the modelling, that’s where we can achieve progress.”

National Science Challenge: Resilience to Nature’s Challenges

The National Science Challenges began in 2014 and with over \$680 million in Government funding over ten years, a team of scientists are collaborating on the country’s most urgent science-based issues.

Dr Murray Ford and Dr Emma Ryan from the School of Environment are both working in the



Buckley-Glavish Professor David Noone and Dr Murray Ford

team for the Coastal research programme within *Resilience to Nature's Challenges*, to understand how New Zealand's coast has changed over the past 80 years and what this means for future coastal change. The programme is led by University of Auckland Associate Professor Mark Dickson and Dr Rob Bell from the National Institute of Water and Atmospheric Research.

Emma has been part of this Challenge for four years, and its overarching aim is to improve the country's resilience to current and future natural hazards, one area of which is coastal hazards such as flooding and shoreline erosion. She says one part of the Coastal programme, which began its second round of funding in 2019, explores how New Zealand's shorelines have changed over the past 80 years, shaped by erosion or accretion. They employ historical aerial and satellite imagery and shoreline change mapping techniques to help form this picture.

The project will continue until 2024 and at this stage they have nearly completed shoreline change mapping in Northland. "The combination of that shoreline change mapping work we are doing and the decision support tools that will be developed by other colleagues in the Challenge, will be really important parts of research, information and guidance for coastal managers and decision makers around the country."

Shoreline change in the Western Pacific

Aside from the Coastal programmes project, Murray's individual research is primarily focused on the formation, evolution and dynamics of low-lying atoll islands in the Pacific, which are particularly susceptible to impacts of the climate crisis. Murray's previous research has shown islands have not experienced widespread erosion as is frequently predicted. "However, we've just scratched the surface with our understanding of how atoll islands respond to sea level rise," he says. Currently, Murray and others have been working to expand their island mapping across the Pacific as well as recently building scale models of islands in wave tanks to test how these islands can grow vertically, potentially keeping pace with sea level rise by changing shape and accumulating sand.

"The future for [atoll islands] is certainly not positive," Murray explains, noting that although his past research "paints a slightly more optimistic picture for the geological persistence of the islands. But as societies, economies and cultures, they're still faced with all those challenges along with all the other climate impacts – they're not only faced with sea level rise. When I lived in the Marshall Islands, the biggest impact was drought caused by more intense El Nino events."



Dr Emma Ryan

“...you can walk up and see them and there’s not many examples of those types of exposed fossil coral reefs that are Holocene in age, thousands of years old, in the world.”

– DR EMMA RYAN

Coral reefs as climate archives

"They're quite amazing little pockets of information," says Emma of coral reefs. Her research project, funded by the University of Auckland Faculty Research Development Fund, involved reconstructing past environmental changes in fossil coral reef systems on Kiritimati (Christmas) Island, situated in the Republic of Kiribati in the Pacific Ocean.

Describing the reefs there, Emma says, "they extend for kilometres and these amazingly preserved fossil corals are just sitting on the surface – you can walk up and see them and there's not many examples of those types of exposed fossil coral reefs that are Holocene in age, thousands of years old, in the world."

Through documenting the paleoecology of these reefs, Emma can gain an insight into what the past environmental conditions were like there, such as the water quality and changes in sea level. "This work provides important context about past climatic and sea level changes, within which current and future changes in coral reef systems can be evaluated."

In 2021, the Climate Science Research Centre may bring research on climate, whether past, present or future climate, and the knowledge being uncovered about the impacts of climate change, together. "The spirit of the Centre and of climate science that is being done in Auckland is in finding these interaction points," David says.

He suggests taking a "warehousing approach" to the range of climate science and climate change related research being done, to bring together different research projects across disciplines that are endeavouring to provide the knowledge and tools to help us in our efforts to survive the global climate crisis. "How do we utilise all of that information to empower ourselves to make the right decisions, the decisions we need to make about adaptation and mitigation strategies?" he questions. "There is an underlying theme to these disconnected components, but we're actually all looking at the same problems from different directions, and there is a common need for rigorous science to provide evidence-based solutions." ●

Learn more:

[www.resiliencechallenge.nz/
scienceprogrammes/coastal-theme/](http://www.resiliencechallenge.nz/scienceprogrammes/coastal-theme/)
www.climate.ac.nz





Kaitiaki of the Waipā

The Waipā River system is on the pathway to restoration, and making sure iwi involvement is embedded in every aspect of the process is critical to its success.

THE REVELATION that Māori grew taro at pā sites in the middle of the Waikato's largest peat lake was one of many surprises for the School of Environment researchers delving into the history of the Waipā River as a case study in freshwater management.

Located 20 kilometres south of Hamilton, Lake Ngaroto's polluted waters are in many ways symbolic of the degradation that began when European settlers drained the surrounding wetlands to make way for large scale farming.

"It's going to be generations before it will be up to a quality that people will be able to safely use it again," says Dr Meg Parsons, who jointly led a Marsden-funded research project with Associate Professor Karen Fisher into how Māori could have a greater voice through the establishment of co-governance and co-management arrangements.

"I do think that they provide a way forward that's beneficial for all New Zealanders and for the environment," says Karen, who believes that while the potential exists for iwi to have a powerful role in decision-making "it hasn't quite played out as they would have hoped".

A slippery slope

Unravelling the historic processes that led to the decline of the Waipā River system was critical to understanding the environmental changes, and the relationships with communities, that underpin contemporary initiatives to restore the waterways. "The key question was why is the Waipā River so degraded?" says Meg.

For Ngati Maniapoto, the Waipā was a 'waterscape' of connected rivers, lakes, streams and wetlands that had been occupied for 500 years and became a place of great prosperity with an abundance of food that was being exported before any significant European settlement.

However the Māori wars and subsequent invasion and confiscation of land brought with it a European view that the wetlands were unproductive and should be drained, against the wishes of iwi who saw them as a regulating mechanism in times of flooding.

Increased contamination and pollution of waterways, including run-off from dairy farming and discharges of raw sewerage from townships along the river, have added to the environmental injustices faced by iwi who have fought various

"I do think that they provide a way forward that's beneficial for all New Zealanders and for the environment."

– ASSOCIATE PROFESSOR KAREN FISHER

Above: Meeting of the waters, the Waipā River (left), joining the Waikato River (right) beneath the Hakarimata Range, Ngaruawahia, Waikato District, Waikato Region.
Photo: Rob Suisted

issues through petitions to Parliament, legal action and claims for compensation from drainage boards.

Understanding the relationship between water and health is a key issue. Not only is human waste considered tapu, but Māori believe that contaminants diminish the life force of the river – as evidenced by a huge decline in fish numbers and increased health issues which local authorities have preferred to blame on poor hygiene standards rather than exposure to contaminated water supplies.

As kaitiaki (guardians) of the Waipā, Meg says that Ngati Maniapoto have historically struggled to get their voices heard – and their values recognised. Lawyers and judges often misinterpret kaitiakitanga because they see it from a very Euro-centric perspective, and she says that local authorities have “consistently refused to take action” well into the present century to address ongoing complaints about sewage discharges.

It's against that context that current co-governance and co-management arrangements are now playing out and, perhaps not surprisingly, Karen says that “everyone is still figuring out how to make it work”.

Breaking new ground

Established in 2010, the Waikato River Authority (WRA) was created as a Crown-Iwi organisation to oversee *Te Ture Whaimana o Te Awa Waikato* (Vision and Strategy) for the improved health and wellbeing of the Waikato and Waipā Rivers.

However the linkage between the Waikato-Tainui and Ngati Maniapoto treaty settlements as they relate to both rivers is complex. While there is a lot of ‘sign-posting’ between the legislation, there are also differences in terms of how Waikato-Tainui view their river as an ‘ancestor’ whereas Ngati Maniapoto view the personification of the Waipā as the taniwha, *Waiwaiā*.

Nevertheless, Karen says the legislation recognises the special relationship that each iwi has to their respective rivers and “this is an assertion by Māori of their desire to be actively involved in decision making over the Waikato and Waipā Rivers”.

But while Ngati Maniapoto have representation on the WRA, Karen says that “doesn't necessarily trickle down to the flax roots level”. For instance, there's frustration that iwi management plans simply become part of a box-ticking exercise for councils dealing with multiple interests and iwi “feel like they're just another stakeholder rather than a joint management partner”.

Interpretation of the legislation is an ongoing issue, and Meg says that iwi are constantly having to educate officials and consultants about the meaning of concepts such as Mātauranga Māori (Māori knowledge). According to Meg, “institutional



Associate Professor Karen Fisher



Dr Meg Parsons

practices are limiting the effectiveness of these co-governance and co-management arrangements”.

While there is goodwill and good intentions, Karen says the reality is that iwi involvement is prescribed by a single piece of legislation and “they are being forced to operate within a colonial structure that doesn't necessarily afford them the kinds of rights that they might have had if there was no colonial structure in place”.

Maintaining the status quo also extends to restoration work. “There's a reluctance to actually think about new ways of doing things,” says Meg, pointing to the focus on building bigger and better stop banks and pumping stations as flood defences – rather than planting native trees and restoring wetlands which act as sinks to absorb water.

Limitations on funding for restoration is another sore point. The annual Treaty funding round is contestable and that creates tensions between iwi who are forced to compete for settlement money that they believe is theirs.

Added to that says Karen, is the focus on major projects like sediment control versus smaller projects that might be about cultural identity. “Measuring sediment isn't something that's going to enable a taniwha necessarily to thrive.”

Making progress

However there are many positives, including the creation of a Cultural Assessment Framework to help kaitiaki better understand the environmental issues facing Maniapoto marae and whānau.

Jointly developed by the Maniapoto Māori Trust Board and NIWA, the initiative will develop new ways to assess the health of the Waipā River and incorporate Mātauranga Māori into restoration efforts.

Being involved in restoration work such as tree planting has also been an important part

of a healing process for the ecosystem and for those tangata whenua (people of the land) who were displaced by colonisation and have possibly lost touch with their iwi.

“Through being involved in these sort of restoration projects they've started learning the language” says Meg, “they've started learning about their whakapapa and re-establishing their relationships with each other as well as their river.”

For Karen, being Maniapoto has made it a very personal journey that stretches back eleven years to her very first hui in 2009 to discuss the future of the Waipā River. As her current research nears completion, the big question is what happens next?

“What I'm taking from the research is a much better understanding of the complexity of what post-settlement reality looks like and the challenges that are confronting different groups.”

The three-year project will culminate in a book, co-authored by doctoral candidate Roa Crease and published by Palgrave MacMillan toward the end of 2020. Entitled *Decolonising Blue Spaces in the Anthropocene*, it will be a milestone for the research team, but – for Ngati Maniapoto – Karen says the challenge remains “how can we make this better?”



Taking care of our coastlines

Marine Science alumnus Fletcher Sunde is instilling a respect for the environment in young minds, fueled by his lifelong passion for the marine world.

FLETCHER ALWAYS wanted to be either a marine biologist or a pilot.

"I always spent a lot of time fishing when I was younger on the Manukau Harbour with my dad and brother. We used to see all sorts of things, like sharks and dolphins, so that was probably the start of everything."

In school, he was always good at science, especially chemistry and physics but during his university years biology became his passion and he's never looked back.

He graduated in 2008 with a Bachelor of Science in Biology and Marine Science. Two years later he completed a Postgraduate Diploma in Science (Biology) after which he went further, gaining a Master of Science in Marine Science in 2012.

"Uni is such great fun and you make such good friends. I did a field study across the Hauraki Gulf intertidal and got to survey about 30 sites, including places like Green Island, which is completely off limits to anyone without a permit."

Where have you been working since you graduated?

After my Master of Science I took off to South East Asia for nearly four years, where I went from science intern to project leader at the Tropical Research and Conservation Centre (TRACC) on Pom Pom Island in Malaysia, working on coral reef restoration and turtle conservation.

I also spent a year attempting to start up my own NGO (Project Lautan) in Sumbawa, Indonesia with a uni friend and learned some hard lessons along the way before I returned to Auckland to work with Sustainable Coastlines.

What do you do in your current role at Sustainable Coastlines?

As Operations Director, I lead our team in delivering our three conservation programmes on the ground: Love Your Coast, Love Your Water and Litter Intelligence. I love this role because I can still



Fletcher Sunde

get my hands dirty and support our programme managers, coordinators and interns to deliver our grassroots actions in communities across Aotearoa, dealing with plastic pollution and freshwater restoration.

You have to give people the tools to connect with nature for themselves and from there, conservation action will follow.

What has been the highlight of your career so far?

My experience working at TRACC in Borneo was one of the best times in my life. The project was based on a tiny island straddling the Celebes and Coral Seas. We conducted coral reef restoration work, surveyed turtles and translocated turtle eggs to protect them from poaching.

Where do you see your career heading? What else would you like to achieve?

One day I'd really like to get back into research. There's something really awesome about discovering new things, no matter how small they might be.

What sustainability-focused behaviours and processes do you hope will be the norm in 5–10 years?

There is a big opportunity to incorporate indigenous wisdom into how we see the world and I hope this will start to happen more, as it already is here in Aotearoa.

What motivates you to contribute to a more sustainable world?

Put simply, hope. Positivity breeds positivity. That me simply being positive and hopeful can actually stimulate others to do the same and therefore create positive environmental choices, is a very powerful thought and motivating in its own right.

It's about providing hope and inspiration to people, which then puts them on a more sustainable and regenerative pathway. Instead of telling people why they should do something, it's more powerful if you show them.

"You have to give people the tools to connect with nature for themselves and from there, conservation action will follow."

Finally, tell us something about yourself that we can't learn by Googling you!

I'm in the middle of restoring my boat! A 1961 Lapworth 50 and the first of her kind, designed by William C. Lapworth and built by Choey Lee in Hong Kong. ☺

The business of making business greener

Geography alumna Rachel Brown has been a leader in sustainable business for almost two decades.

AS THE CEO and founder of the Sustainable Business Network, Rachel has been a force in sustainable business for nearly twenty years and was awarded the New Zealand Order of Merit in 2018 for her achievements in this area.

Having completed her Bachelor of Science majoring in Geography in 1991, Rachel says, "I have always been really interested in systems and how one action impacts on another. I think that is the magic of Geography – connecting humans to nature. It involves land use, pollution, climate change and much more."

A major inspiration for her chosen work was the late Jeanette Fitzsimons (former co-leader of the Green Party) who ran the environmental studies course at the University during Rachel's time there.

"She introduced us to global thinkers, she challenged us and she introduced a values-led style of thinking. She was a phenomenon and certainly a highlight for me."

What is the Sustainable Business Network all about?

The SBN is now the largest and longest running network of organisations working on sustainability. Our purpose is to empower business so that people and nature prosper and we focus on climate action, regenerating water (or nature), and moving to a circular economy.

Most importantly we act, we build capability within organisations and broker business to build a more sustainable supply chain.

What drove you to create it?

SBN has been a lifetime in the making. After my studies I travelled the world seeing pollution and levels of poverty that shocked me to the core. I recognised that business was where the power, the speed and the biggest opportunity for positive impact might be.

In the late 1990s, there was an emerging network of businesses focusing on issues

such as organics, green buildings and renewable energy, but it was disconnected and small in number. So we set up the Sustainable Business Network in 2002 to bring these like-minded people and organisations together to see if we could reframe the role of business in society.

How has the general attitude of companies towards being sustainable changed?

Attitudes have changed phenomenally over the years. Twenty years ago businesses were donating to good causes and talking about good corporate social responsibility (so they had a licence to operate).

Today the pioneers are creating fabulous new purpose-led businesses and thinking about the role they play in moving their sectors to become more regenerative and fairer for people by being redistributive.

What is the biggest sustainability problem for New Zealand right now?

Our disconnection with each other (many of us live in social bubbles with little appreciation of the diversity within our own country) and particularly the disconnect with nature.

What has been the highlight of your career so far?

Probably being a part of 24 Hours of Reality with Al Gore in 2012. At that time I represented New Zealand in a 24 hour marathon on climate change. It was completely out of my comfort zone but was extremely good for my own confidence to be a part of that global action.

How did you feel when you were awarded the New Zealand Order of Merit?

I honestly was shocked by the nomination! But then I recognised that an award like this might open doors and give our network more of a hearing and therefore more opportunity to influence. So I accepted the ONZM and feel very



Rachel Brown

honoured to have it. It has made a difference to how we are seen and listened to here in Aotearoa. I still have no idea who nominated me for this so if you are reading this, thank you!

What motivates you to make a difference in the world?

My parents were both science teachers, environmental and social activists, who always pushed us to learn and to be curious. They brought me and my siblings up to look out for the 'underdog', for the voiceless, for the environment. With that in my bones I really always wanted to do something that was about equity and restoring nature.

Finally, tell us something about yourself that we can't learn by Googling you!

In my spare time I am an avid maker, doer and fixer of things. I do this because I treasure 'stuff' and I spend time altering/fixing things so they don't become waste! ☺

"Our purpose is to empower business so that people and nature prosper and we focus on climate action, regenerating water (or nature), and moving to a circular economy."

Greening our food production and supply chains

The team at the Centre for Green Chemical Science is finding new ways to make the food we eat more sustainable.



NEARLY ONE IN ten people in the world experienced severe levels of food insecurity in 2019. Meanwhile, a third of all food produced globally (around 1.3 billion tonnes) is wasted, each year. It may be thrown out by consumers and retailers or spoiled during harvesting or transportation.

These are statistics highlighted by the United Nations, which aims to reduce food waste along production and supply chains by 2030, as part of its Sustainable Development Goals (SDGs).

At the University of Auckland, the Centre for Green Chemical Science led by Professor James Wright, aims to support these SDGs. The individual research projects of its four Deputy Directors share a common goal to contribute to the solution of precisely this global problem.

Dr Ivanhoe Leung, Dr Viji Sarojini, Associate Professor Jon Sperry and Dr Cameron Weber are finding new ways to reduce food waste or reuse that which is currently considered food waste. But importantly, these ways involve developing chemical products and processes which are sustainable and harmless to the environment.

The Centre's team of 25 members from across multiple faculties, carries out interdisciplinary research on other issues too, such as pollution elimination and sustainable energy production.

Keeping fresh food fresh for longer

More than 20 percent of fruits and vegetables produced globally is lost between harvest and retail, according to the UN Food and Agriculture Organisation. Significant quantities of food are also going to waste in retail stores and after purchase.

Ivanhoe is exploring a specific way of reducing fresh produce waste by slowing down the ripening and browning processes of fruits and vegetables so they stay fresh for longer, whether during transport, on our supermarket shelves or benchtops at home.

The two research projects, funded by Marsden Fast-Start Fund grants, involve studying plant enzymes that control these processes in fruits and vegetables, to learn how the plant regulates the ripening and what natural products could be used to slow this process down.

Learning more about the browning process, that is when a cut piece of fruit slowly turns brown over time, and potentially controlling it, is especially applicable to prepared fresh fruit and vegetables, which have a more limited shelf life.

"Our aim is to understand the biological processes at the protein level that are involved in ripening and browning, and to use our understanding to design and develop chemicals

that can slow down these processes," Ivanhoe explains.

"Millions of tonnes of fresh produce and cut fruits are being thrown away every year, so if we could regulate the ripening and browning processes, we could help make agriculture more sustainable," he says, reducing the food being thrown away because it overripened during transportation and was damaged.

Frozen food gets damaged too

Viji's research is currently targeting ways of preventing the loss of a part of frozen food that you may not even realise is being lost, but you've probably tasted it. As frozen food products thaw, drip loss occurs, causing nutrients to be lost along with the fluid which adversely affects flavour and texture too.

"When you freeze something, naturally ice crystals form, and when you thaw it, the ice crystals melt, which causes some of the ruptured cell contents to ooze out along with the water," Viji explains. With meat being one of New Zealand's major exports, she says, "there's a lot of product recall from exported frozen meat because of drip loss, among other things".

Viji is studying how anti-freeze peptides (small proteins) can be used to potentially minimize freeze-thaw damage in frozen meats,

fruits and vegetables. "We look at what is in nature and as synthetic peptide chemists, we can come to the lab and make our own peptides that imitate the function of naturally occurring, more complex anti-freeze proteins."

In collaboration with AgResearch, her PhD student on this project, Charles Kong who graduated in 2016, synthesized these peptides and tested them on a range of fruit and vegetables, where he found freeze-thaw damage from large ice crystals was minimized. This helped to reduce drip loss and the loss of nutrition, says Viji.

Let nothing go to waste

As Ivanhoe and Viji's respective research focuses on ways of reducing food waste, Jon's research is centred around how to extract things of value from food waste products. Specifically, he is studying crustacean shell waste, as these shells have a valuable component called chitin, a biopolymer that contains nitrogen.

"The reason it's very valuable is because it has atmospheric nitrogen which has been biologically 'fixed' or converted into molecular compounds – so nature itself has fixed that nitrogen into a usable form," says Jon, whereas artificially fixing nitrogen is very energy intensive. "The man-made version of doing this is the Haber Process, where nitrogen gas, which is very inert, is converted into ammonia which is used to basically feed the planet – it's the base chemical for fertilizer production."

Currently, these chitin-rich shells are thrown away as waste, often ending up in landfill or back in the ocean. In animals such as insects and crustaceans it is chitin that gives strength to their exoskeleton, which for some consists of a shell. Jon says the current uses for shellfish waste are limited. "You can grind it down and because it has a lot of calcium carbonate in it,

“...if we could regulate the ripening and browning processes, we could help make agriculture more sustainable.”

– DR IVANHOE LEUNG

you can sell it as chicken grit, to put in chicken feed to help with their bone development but it just has really low value applications at the moment."

But why crustacean shells? "The shell waste is really accessible because there's about ten million tons of that produced annually every year," he says.

Funded by MBIE catalyst grants, Jon's been working together with the National University of Singapore to find ways to break down the chitin component in the shells in an energy efficient way.

So far, the team has published findings that show chitin can be degraded down into one particular chemical that is very useful. "You can subsequently convert that chemical into a variety of interesting products that you would not be able to get any other way."

Currently they are determining what these new products could be used for through biological testing. Some are powerful antioxidants, but they are not sure yet if they are safe for consumption. "This is an antioxidant that we can basically get from a waste shell product."

Cameron will commence research on this project too, exploring different sustainable methods to break the chitin down to unlock valuable compounds, but by using alternative solvents or mechanical energy rendering heating processes unnecessary. "Then we could use those processes to see if we can make smaller molecules from chitin which hopefully could then be converted into some of the small molecule products that Jon mentioned," he says.

This is where Cameron's current research on forestry waste may help him in his future work on chitin. "Often for forestry waste, high temperatures and highly acidic or highly basic processes are used to extract things out and you get a lot of decomposition and degradation as a result. We're trying to approach it at preferably low temperatures using non-hazardous materials," he says.

"Some of these approaches can then also be applied to things like food waste, as chitin structurally is quite similar to cellulose so there's the potential that some of these processes could also be applicable to other areas as well."

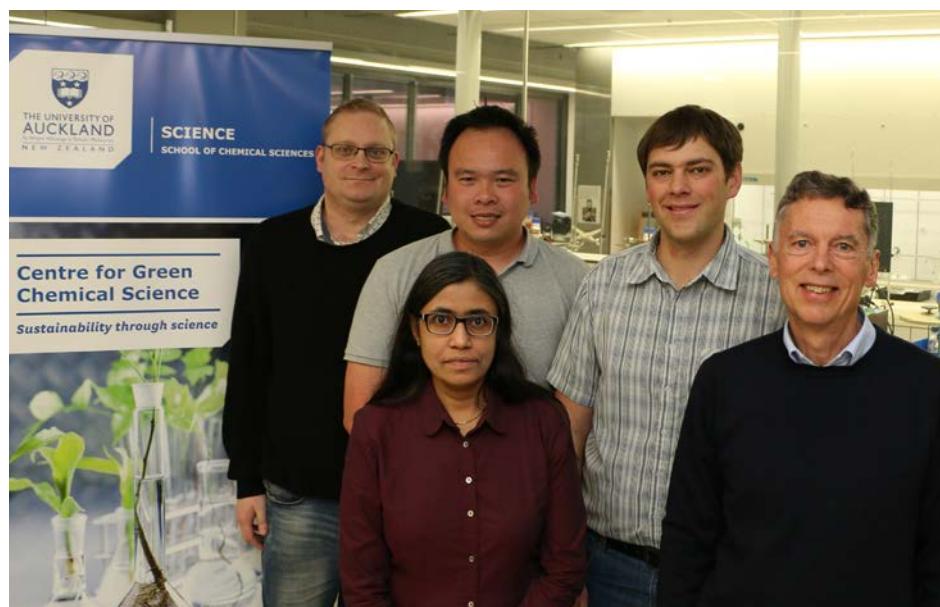
As it lays down the green and clean pavers in the pathway to a sustainable world, the Centre's research has never been more vital than it is today and alongside this, it focuses on connecting with industry, public outreach and of course, teaching its students.

Ivanhoe says they prepare their undergraduate chemistry students to think broadly, beyond the scientific issues in sustainability. "We get them to think about the social side as well as the economical side of things – because it won't work if you only have a scientific solution that is economically viable but not socially acceptable." ●

Learn more:

www.science.auckland.ac.nz/cgcs-about

twitter.com/greenchemuoa



Above: (from left) Associate Professor Jon Sperry, Dr Ivanhoe Leung, Dr Viji Sarojini, Dr Cameron Weber and Professor James Wright.

SUSTAINABLE FOUNDATIONS

Initiatives from the Faculty of Science Sustainability Network

The network is coordinated by Associate Dean Sustainability Gillian Lewis and consists of professional and academic staff from across the Faculty of Science who care about flourishing people and thriving ecosystems, and the role our faculty and the University can play in nurturing both.

Sustainability Network Research Awards

Each year, the Faculty of Science Sustainability Network grants ten awards, of up to \$2,000 each, to support eligible science students undertaking sustainability-related research projects with their living costs. To learn more visit: www.science.auckland.ac.nz/sustainability-research-awards

United Nations Sustainable Development Goals

The SDGs came into force in 2015 and set a 15-year agenda for all countries to end poverty, fight inequalities and build peaceful, just and sustainable societies by 2030.

To learn more about research in the University that contributes to these goals visit: www.auckland.ac.nz/sdg-report





Ways YOU can live more sustainably

- Use biodegradable or re-usable items
- Use recycled printing paper
- Have shorter showers
- Wait until dishwashers are full before using them
- Use energy-saving modes on your electronic devices
- Walk or cycle to work or use public transport
- Take part in tree planting activities
- Choose products that have fewer environmental impacts

Teaching sustainability

In collaboration with the Faculty of Arts, General Education course SUSTAIN 100G Sustainability and Us is open to all students, as well as a Sustainability Module for Science and Arts students.

Responsible waste disposal

Compost, recycling and landfill bins have a place in all staff tearooms in the Science Centre and Biology building.



Green laboratories

Reducing waste, power and water usage, and encouraging eco-friendly alternatives within lab spaces at the University of Auckland.



The University launched Te Kūaha, a new interactive mobile app for staff, students and alumni to understand more about te ao Māori.

Available on iOS, Android and Windows



The psychology of sustainability

Many of us acknowledge wanting to do something about climate change, but there are various reasons why we feel stunted in our ability to help. Professor Niki Harré examines the psychology of sustainability, how we can start making changes and keep ourselves motivated.



Professor Niki Harré

IT WAS IN 2006, after attending a series of seminars and workshops, that psychologist, Professor Niki Harré, became increasingly aware of climate change as an issue that “is about all of us right here and right now”.

A year later, she published her first book on the topic in collaboration with Professor Quentin Atkinson, a colleague in the School of Psychology. *Carbon Neutral by 2020: How New Zealanders Can Tackle Climate Change* covered solutions from specialists across a broad spectrum of subjects who were grappling with climate change in their own fields.

Fast forward to 2020, and Niki believes that we’ve made limited progress in changing how we use physical resources but have achieved a huge change to our collective attitudes to climate change. “There’s almost nobody now who isn’t aware of this issue and that is very hopeful,” she says.

Most of us agree that climate change is something our species has exacerbated and that it’s something we’re worried about. Many of us

will own a keep cup, refillable water bottle and do our best to recycle. However, these can seem like token gestures when the planet is on the line. How do we encourage more of us to adopt sustainable practices?

Stop the press – creating positivity and hope

Melting glaciers, unstoppable bush fires and waterways full of plastic – media outlets are full of daily horror stories about the effects we are having on our planet. This constant negative messaging can easily overwhelm even the most positive person.

This year, with the advent of the COVID-19 pandemic and its daily presence in news cycles, the impact of news on our mental health has become undeniable.

Niki, who has been researching the psychology of sustainability for over a decade, says we are caught in an “apocalyptic double play. We are told both that the planet’s being

ruined and that nobody’s doing anything about it. This becomes paralysing. What’s the point in taking action if most people are ignoring the problem?”

She explains that the key to combatting this paralysis is motivational hope. One way of creating motivational hope is to pass on stories that offer practical, evidence based information instead of catastrophic clickbait. Niki urges us to question how passing on the latter will help build constructive responses to the issue.

She suggests that we reframe the way we think about climate change. “Yes, there’s lots happening to the physical planet, but all over the world politicians, corporations and community groups are responding to this issue.” In Aotearoa most of us have heard of the *Green Party of Aotearoa New Zealand*, *School Strike 4 Climate Action NZ* and *Extinction Rebellion NZ*, but there are also countless community organisations in our own backyards taking collective action.

The benefits of collective action

All this activity doesn't mean there is no place for us in the movement for change.

Ultimately, the real issue is whether we want to take part.

Niki uses the example of elections to explain: "Years ago I came across research about the reason people vote in general elections. It isn't because they think their vote makes a difference. It's because they want to be part of the process."

By taking action on climate change you're a participant in a crucial collective movement, even if your actions are insignificant by themselves.

At the moment, Niki is particularly interested in core human values and how we put them into practice, how to create sustainable organisations and how to inspire activism and keep it going.

As part of her research, Niki runs workshops with community groups and schools. For the past 13 years she has been part of a project at Western Springs College/ Ngā Puna O Waiōrea in Auckland to help the school create and sustain a sustainability culture. She and Dr Daniel Hikuroa, from the Department of Māori Studies in the Faculty of Arts, also recently ran a five-week workshop with 23 community participants focused on identifying shared values and practicing them in their communities.

She says that there are many ways to feel part of the sustainability movement. If you're uncertain of what to do, Niki encourages us to examine our own lives. "Think about your context, your interests and capacities, how much energy you've got. If your contribution is to try protect the Māui dolphin, thank you. If you make art installations that draw people's attention to climate change, thank you." All action is a step in the right direction.

Once you're taking positive action, it starts to become easier to make more environmentally friendly decisions. She explains: "For those of us who are increasingly aware of these issues, environmentally friendly decisions start to be compelling, simply because they feel right. I very rarely drink coffee from a disposable cup, for example. I'm not doing that to make a change. I now look at the cup and think I'm drinking from a piece of rubbish. Why would I want to do that?"

How to provoke change

Niki acknowledges that many people are frustrated by the slow speed of change, but also says that this frustration is useful. "Don't try and get rid of the frustration. It's a frustrating situation. Change is more likely to occur as increasing numbers of people are unhappy with business as usual."

She believes that we are in a better place in Aotearoa since the *Climate Change Response (Zero Carbon) Amendment Act 2019* was



introduced. Passing this Act with cross-party support means that climate change has become "socialised".

Niki uses a topical example to explain: "Jacinda Ardern talks about having socialised masks. What she means is we've now got enough people wearing them and who are ready to wear them, that we can mandate masks on buses, for example. Social readiness almost always has to proceed legislative change."

Even though we now have a social readiness to take action on climate change, there will always be a relative, work colleague or neighbour who is sceptical. Niki says that nagging them is probably a waste of your time and may damage the relationship.

"There's a big difference between bullying or bossing people into change and setting up structures that encourage change. It's like riding a wave. You don't have to boss people into getting on the wave. You just have to constantly stay on the wave yourself and draw attention to it."

It's encouraging to be reminded that we're not alone, and that our actions – individual or collective – can influence others. Niki says that it all comes back to positivity and hope.

"Human beings have to be able to imagine something better. Positivity makes us broader thinkers. If you have positivity and hope, and you feel like others share your core values, then you can cooperate."

We may not all agree on what action to take on climate change, but we can probably all agree that the world would be a better place with more hope. ●



"Change is more likely to occur as increasing numbers of people are unhappy with business as usual."

– PROFESSOR NIKI HARRÉ



The show must go on

In a time of COVID-19, many on-campus events in 2020 had to be postponed or held online as we exercised physical distancing requirements under the various Levels set by the Government. But adapt we did.

THE EVENTS WE normally took for granted being able to enjoy in large gatherings became live-streamed webinars or recorded Zooms and through this we retained the sense of togetherness that events bring, listening and sharing knowledge and ideas. There were upsides to this remote way of gathering too, such as being able to tune in to an event from our homes, sending through questions via chat and having a recording to view later.

A number of recent events took place from August to September, highlighting the importance of sustainability, learning about our natural world and how we can best respond to the challenging global situations we are facing.

Perspectives on eco-anxiety

The Sustainability Network hosted a seminar in September on eco-anxiety. The constant stream of news on the threats of climate change can sometimes seem overwhelming, resulting in anxiety about the future of our planet.

Speakers from the University of Auckland and AUT shared their research and discussed how to respond to eco-anxiety. These presentations included *Facing the apocalypse: Emotions and climate change* from Professor Niki Harré School of Psychology, University of Auckland; *Eco-anxiety in the therapeutic space: A clinician's perspective* presented by Dr Jackie Feather Department of Psychology and Neuroscience, AUT; and *Nurturing hope in young people: From climate change worriers to eco-warriors* by Dr Sally Birdsall Faculty of Education, University of Auckland. Nikhil Gosai and Jarren Iuvale from De La Salle College, participants in Auckland Council's Young Leaders Programme, also each shared a personal perspective.

Speaking on the psychology of emotions, Niki said certain kinds of emotions propel us to certain actions. Research by the USA based professor, Barbara Fredrickson, suggests negative emotions produce 'action tendencies' that drive us to want to solve a problem quickly. "What's really tricky about big issues like climate

change is we can't actually do that, and so we might go into denial which is trying to get rid of the emotion itself," said Niki, noting how the media can perpetuate feelings of fear, anger and anxiety. She explained we should approach global issues like climate change with motivational hope – that people all around the world are working towards solving this problem and we can play our part too.

Jackie spoke on how our relationship to the natural world is not only a socio-political or economic issue but linked to our psychological and physical wellbeing. She said eco-anxiety essentially means "we are scared of what is happening to the environment and we probably all share that at some level" but that it is not yet known how much people are affected by this. She said we need to remember to take care of our own wellbeing too, whether that means spending time in nature or practicing mindfulness. "We can't save the world alone," she said, reminding us to do what we can to be part of collective action.

Sally's presentation centred on hope and how to help young people manage negative emotions and move from 'climate change worriers' to 'eco-warriors'. She explained that there's a connection between hope and taking action to reducing our impact on the environment. Referring to constructive hope, Sally said this is "when people with a high level of hope, feel more optimistic ...that they can achieve their goal. "When we're considering teaching and learning programmes in the formal education sector..what we need are strategies that are going to nurture constructive hope to motivate youth to make change."

River Futures in Aotearoa

The School of Environment Research Committee held its annual research forum in September, River Futures in Aotearoa. River health is a long-standing issue of significant societal concern in New Zealand and the staff and students in the School of Environment provide a broad range of transdisciplinary perspectives related to 'River Futures in Aotearoa'.

"There is incredible generative potential in directly aligning steps towards healthier river futures through collective embracing of Te ao Māori, working with rivers as living, indivisible entities. This embraces recent moves towards 'the rights of the river' – building upon this internationally significant legislation," says the School's Professor Gary Brierley, referring to the Whanganui River becoming the first river in the world to have the same legal rights as humans.

Five key speakers from various organisations presented provocative, constructive and positive perspectives on this topic:

- Gerrard Albert: Chair of Ngā Tāngata Tiaki o Whanganui, the post-settlement governance body for Whanganui Iwi for the purpose of the Whanganui River Settlement
- Anne Salmond: Professor of Māori Studies, The University of Auckland
- Colleen Brent: Healthy Waterways Team, Auckland Council
- Trish Kirkland-Smith: Head of Environmental Partnerships, Fonterra
- Mike Joy: Senior Research Fellow, School of Government, Victoria University of Wellington

Speaking about the research and action project *Te Awaroa, Voice of the River*, which aims to have 1000 rivers in a state of ora (health) by 2050, Anne said, "We're hoping that this relational outcome-focused kind of research might be able to transcend modernist divisions between theory and practice, people and the environment, culture and nature and to revitalize overlooked genealogies, including those in western science that link the arts, the humanities, technology and the natural and social sciences."

"...what we need are strategies that are going to nurture constructive hope to motivate youth to make change."

– DR SALLY BIRDSSL

Colleen from Auckland Council noted the importance on sharing our knowledge about streams and catchments and to visit your local stream with a wholistic view and to be actively involved. "Advocate for your water course – go out, join a community group, join streamside plantings...and I know if we're all working in this together we can get good healthy waterways across the Auckland region and across Aotearoa.

Science shines in Three Minute Thesis Competition

Postgraduate students from the Faculty of Science excelled at the University's 2020 Three Minute Thesis Final in August. In the competition, masters research students and doctoral candidates from across the University take up the challenge of presenting their research in under three minutes.

The School of Environment's Angus Dowell won Masters Runner-Up, for his talk on his research into constructing a regenerative economy. Biological Science's James Hucklesby won Doctoral Runner-Up presenting his work around brain barriers and stroke and Morgane Merien won Doctoral Winner for her talk on the ecology and diversity of camouflage in New Zealand stick insects.

"Last night's final was incredible: a lot of fun and very high in energy – and nerves! The calibre of all the finalists was exceptionally high, and I was shocked to win! I loved hearing about all the amazing research everyone is working on, and in such diverse areas," Morgane said.

Morgane went on to represent the University at the U21 3MT® online competition and the Asia-Pacific Final Competition at the University of Queensland (held virtually in 2020). The Three Minute Thesis competitions (3MT®) originated from the University of Queensland to help doctoral candidates communicate their research to a general audience and now takes place in over 900 universities around the world. ●

More events in Science

With ten schools and departments, the Faculty of Science hosts a wide range of annual events open to the public, including:

Ihaka Lecture Series

The Department of Statistics launched this annual lecture series in 2017, and named it after Associate Professor Ross Ihaka in honour of his contributions to the field. In the 2020 series, three experts discussed the challenges and rewards of applying data science to societal issues. Officially sponsored by The New Zealand Statistical Association.

Gibbons Memorial Lecture Series

The School of Computer Science began this annual lecture series in 2008, to present Computer Science research to the wider public and named it in memory of Associate Professor Peter Gibbons.

The 2020 series explored the fears and excitement of AI today and in the future, and the impacts it could have both on and in our society.

Inaugural lectures

Held throughout the year, our newly appointed professors share their current research and teaching with the University community and wider public.



Want to learn more?

Watch the full recordings of River Futures in Aotearoa and our 3 Minute Thesis presenters below:

<https://tinyurl.com/y6j3fy4o>

<https://tinyurl.com/y43tfwot>

Giving biodiversity the best chance

Creating a safe place for our wildlife to thrive is not only key to preserving biodiversity but also a crucial ingredient for a sustainable world and our own existence.

THE FREQUENT SIGHTING of native birds during lockdown-enforced neighbourhood walks has served to highlight the value of wildlife in urban environments, but it also raises critical questions about the importance of biodiversity and sustainability.

"We're just starting to realise how we rely on nature to provide us with economic benefits, but also with health and well-being" says Associate Professor Margaret Stanley from the School of Biological Sciences.

Research indicates that being surrounded by nature can lower blood pressure and reduce the incidence of depression, but Western societies tend to separate people from nature which makes increasing biodiversity that much more difficult to achieve if there's a lot of intensification.

Wildlife-friendly urban spaces

Surveying vegetation around Auckland primary schools is an integral part of a current study to determine whether people have equal access to nature. And already, Margaret says there's clear evidence that low socio-economic areas have very low urban forest. "They've missed out on the street trees in particular."

Much of Margaret's research is about "sneaking biodiversity into cities", but one of the challenges for schools is that the Ministry of Education doesn't fund trees and vegetation because they're not considered to be assets or infrastructure.

Creating multifunctional spaces near sports fields is one option. "You can have quite diverse vegetation around the outside that supports biodiversity" says Margaret, "rather than just single oak trees every twenty metres around the edge of the park."

Margaret and her students have also investigated the negative impact that excess light and noise are having on wildlife and birdsong in urban environments.

A recent project mapped light pollution across Auckland and found that, by international standards, virtually nowhere was untouched – not even the Waitākere Ranges or the Hauraki Gulf. "We need to encourage people to shield their lights so the spill is going downward and not creating massive light pollution all night."

Another project has measured noise in relation to native bird species, and revealed there were more native bird species where the decibel levels of traffic was lower. For Margaret, it's one more reason to flip our car fleet to electric vehicles as soon as possible.



Associate Professor Margaret Stanley

Predator Free by 2050

A key element in the push for greater biodiversity and sustainability is the need to develop social capital through community engagement which is currently being demonstrated through predator control.

Funded by a Rutherford Discovery Fellowship and the BioHeritage National Science Challenge, Associate Professor James Russell from the School of Biological Sciences and Department of Statistics was at the forefront of establishing the Predator Free 2050 project in 2016. Having a nationwide army of volunteers now supporting the cause is a source of great satisfaction. "The really big breakthroughs come in getting a whole country to mobilise towards it and accept it as a value proposition."

Looking ahead, James is now collaborating with Manaaki Whenua Landcare Research on a major project to develop tools that will help eliminate the last remaining predators.

Understanding 'personality archetypes' is a key part of the puzzle. "When the end comes, do you survive because you were the wiliest and smartest individual – or did you just get lucky?" Understanding the last one to get caught – and the first one to come back – is also critical, so James is consulting with the Zero Invasive Predators (ZIP) group to develop detection tools that will identify the presence of pests – and prevent any reinvasion. "The way you catch the

last one that's evaded everything to date is very different to how you intercept the first one that's coming back."

Interestingly, he says the response to predators can be likened to the response to COVID-19. "New Zealand responded so well to COVID because we have learned so many lessons from all our other biosecurity actions across Predator Free New Zealand."

Like COVID, invasive species are attributable to increasing globalisation and James says the key issue is how you respond. "No border is secure, that's just the nature of reality. The question is, when it crosses through your border are you prepared to respond – and it's exactly what we do for rats."

But it's not just about the battle to eliminate predators. "Predator Free New Zealand is not a panacea to the threats that these species face," says James, which is why he's undertaking new research into the impact of climate change and pathogens on the recovery of wildlife once the pests are gone.

Community involvement

The PF 2050 campaign is also a research focus for Dr Brendon Blue from the School of Environment. His aim, to explore how the restoration of ecosystems is being negotiated.

"Predator Free 2050 doesn't just need community consent, it also requires the

community to be out there doing the work which I think is really quite fascinating.”

Funded by the George Mason Centre for the Natural Environment, Brendon is interviewing stakeholders about the social and political challenges of implementing such a large-scale community-oriented project. “It’s not like getting permission from people to lock the country down for a couple of weeks, this is something that happens over the next thirty odd years and potentially longer.

“Genuinely listening to people is perhaps one of the toughest parts” says Brendon, “especially if you have already decided what you want to achieve.” The difficulty of these conversations has been illustrated by community pushback over the use of 1080 poison in the conservation estate. As Brendon points out, “not everyone protesting 1080 is ‘crazy’ or a conspiracy theorist” but there are dangers in labelling people as such. “If you alienate people early on it’s just not going to work.”

There are signs that this challenge is being taken seriously, with more nuanced conversations taking place at a community level in some places. “There seems to be an increasing recognition that it’s necessary, and I think the approach is very different to what it might have been if we’d done this twenty years ago.”

As treaty partners and kaitiaki, Māori have a major stake in PF 2050 but have had mixed experiences. One of the more complex questions is around the ‘ownership’ of eradication projects. “Who decides what’s going to happen, and who does the work on the ground? Whose time gets paid, and who is expected to provide free labour?” are all legitimate questions, says Brendon.

The ethics of killing is another consideration. While the Government’s announcement of PF 2050 side-stepped that conversation, Brendon believes that it’s a debate worth having – especially with the next generation. “It seems to me that it’s a discussion that you need to be having with your kids, because society kills things and kids should probably know that.”

Brendon hopes the research will shed light on a range of environmental and social issues – from culling tahr and tackling kauri dieback to responding to COVID-19. “Just telling people what to do rather than engaging in a two-way conversation is never going to be a good solution to those kinds of issues longer term.”

And for James, PF 2050 isn’t about trying to wind New Zealand back to how it was a thousand years ago. That’s in the past he says. “What I want is New Zealand to be a place that’s not under threat in a thousand years’ time.” ☀



Dr Brendon Blue



Associate Professor James Russell



To support research restoring our unique natural environment visit: www.giving.auckland.ac.nz/environment

Detecting plastic in our diets

Forensic science has been a passion for Liam Philip since childhood. During his masters research project, he used his forensic skills to investigate an emerging problem – the microplastics in our food.

IN 2019, the World Health Organisation called for a crackdown on plastic pollution and declared an urgent need for further research into the impacts on human health. In the past few years, studies have been carried out on the amount of plastic present in our rivers, waterways, and consequently our drinking water.

In 2020, researchers reported finding microplastics in green lipped mussels and are investigating their effects on the entire marine food web. Many of us have seen what plastic does when ingested by animals, and we have seen headlines on the toxicity of certain kinds of plastic, such as bisphenols and phthalates.

Liam started studying at the University of Auckland in 2014. He enjoyed the way his Bachelor of Science in Food Science and Nutrition linked scientific concepts to the very tangible topic of our health and wellbeing. He has also been passionate about forensic science since a young age, so enrolling in a Postgraduate Diploma in Science majoring in Forensic Science was a natural next step. This year, he completed his Masters in Forensic Science where he researched microplastics in food products.

“It’s been known for a long time that plastic waste is entering and accumulating in marine environments, but we’ve only recently discovered that microplastics are in food products. My masters research looks specifically at food produced in New Zealand. I wanted to see if New Zealand’s clean image was reflected in food products,” says Liam.

“This topic interested me as it seemed to be the meeting of my undergraduate studies in food science and my postgraduate studies in forensic science. It also piqued my interest as it wasn’t something I had heard of previously. I thought it would challenge me and push my education in a new direction.”

Liam received a Sustainability Research Award from the Faculty of Science to support his masters project. He credits the award with motivating him by connecting him with others who are interested in sustainability. “I think the way the award helped me the most was knowing there were other people outside of my own research group and family that were interested in my research.”

Growing up in the Waitākeres was key to his interest in sustainability. “Nature and wildlife was part of my upbringing, so the importance of the environment was instilled from a young age. I believe that maintaining a world with good biodiversity and an environment as we know it is important for maintaining our way of life.”

As part of his research into microplastics, Liam examined 19 different types of beverages readily available in New Zealand supermarkets



Liam Philip

using visual examination and pyrolysis with Gas Chromatography Mass Spectrometry (GCMS).

“The pyrolysis produces a fingerprint of compounds, which can be identified through GCMS, characterising what types of plastic are present. This helped me to gain a greater insight than previously achieved in the examination of food products.”

The beverages Liam looked at included a selection of drinking water, fruit juice, milk, energy drinks, soft drinks, beer, white and red wine, and cider.

“Through my research I was able to identify both Polyvinyl Chloride (PVC) and Polyethylene (PE). These are plastics commonly used as piping and bottles, respectively. Not materials I want to be eating!”

“In total, I examined 13 of the 19 beverages for PVC and PE. Of these 13, seven contained PVC and six contained PE.” Of all the beverages he examined, Liam didn’t detect plastic in the bottled water and white wine.

He hopes this research will show that we are consuming plastics – even in a country with a ‘clean’ or ‘natural’ food reputation like Aotearoa.

“I hope more people become aware that plastic waste management is everyone’s problem not just a problem for the wildlife affected by our waste. I would like to see more people realising that we are already consuming plastic and steps need to be taken now to prevent this getting far worse.”

Sustainability Research Award

The Sustainability Research Awards were set up to boost the profile of sustainability and improve sustainable practices at the University. Each year, the Faculty of Science Sustainability Network grants ten awards of up to \$2,000 each to eligible science students. The awards support students with their living costs whilst they are involved in research projects related to either sustainability at the University or a broader sustainability issue.

[www.science.auckland.ac.nz/
sustainability-research-awards](http://www.science.auckland.ac.nz/sustainability-research-awards)

Liam is due to graduate this year and hopes to continue his research or become more involved in forensics. Reflecting on his masters studies, he believes that “one of the most rewarding aspects was the opportunity to be involved with teaching in the food science department. Having the opportunity to pass on what I had learnt and getting to work with lecturers that I look up to was a highlight”. ●

A powerful pairing: Statistics and a sustainability mindset

For Tuākana Science Scholar

Ruby Pankhurst, a trip to Tanzania inspired her to combine Global Studies with her joy of statistics.

“ONCE WE BECOME aware of the true impact we can have just by making even the simplest of changes, the sustainability fight is no longer this daunting uphill battle,” says Ruby.

In her second year of a conjoint degree in Science (majoring in Statistics) and Global Studies, Ruby’s perception of sustainability has completely changed.

“As I’ve been learning, or rather unlearning during the course of my studies, sustainability is not a performance nor a privilege, but instead it is a responsibility,” she explains.

“When we frame sustainability as a gift to give rather than a burden to bear, as an opportunity, rather than a punishment, I think that we will find more agency and empowerment to enact sustainable change out of genuine desire, rather than obligation, shame or duty, which I think is incredibly important to the effectiveness of any change.”

She chose Global Studies after a school trip to East Africa in 2017 left a lasting impression. “I had the privilege of visiting my school’s sister school in Tanzania. The Foundation of Hope school is an orphanage and school that runs from kindergarten to high school and visiting was one of the most impactful experiences I’ve ever had.

“Spending a month in Moshi really opened my eyes to just how severe global inequalities and disproportionate distributions of wealth and resources really are.”

But she adds it also made her realise, “how these communities should not be defined by their contrast to our standards of living”.

One of the reasons she was drawn to statistics was for “its ability to act as a mirror to a community or population”.

“I think that the knowledge statistics can provide us with about our own society and lives is invaluable when considering how to most effectively enact change. Without an understanding of how we as a community exist, and furthermore who we are, I feel like change will always be ill-conceived, inaccurate and ultimately ineffective, and I feel like statistics is an incredible tool to gain this understanding.”

Ruby describes herself as not being an overly mathematical person in school so it was a surprise to her when she began to love statistics.

Of Niuean and Samoan descent, she has been part of the Faculty’s Tuākana programme since starting university. “Being surrounded by so many people who were generally passionate



Ruby Pankhurst

about math and seeing them work together on math problems was super inspiring and they would make solving a math equation seem like a fun game that I wanted to be a part of.”

She was asked to join the Statistics Tuākana tutoring team this year and was selected as a Tuākana Science Scholar, which she says has been a highlight of her studies so far.

Looking ahead, Ruby explains that what motivates her more than anything to contribute to a more sustainable world “is the inheritance that I leave behind”.

She asks herself, “what can I save a little of, to give in a big way to the future? Because comparatively the sacrifices we will be making today are small in comparison to the damage we may leave for the future to manage”.

After she has graduated, Ruby is considering postgraduate study in Medical Statistics driven by her interest in epidemiology and one that is certainly a timely pursuit given the global events of 2020. With forward-thinking young minds like Ruby, the sustainable solutions of the future are in good hands. ☺

Director of Global Studies programme passes away

Dr Hilary Chung sadly passed away in August this year at 58 years old, after battling cancer for some years. “Hilary was so passionate about everything she did and was instrumental in building up our very successful Global Studies programme,” said Dean of Arts, Professor Robert Greenberg, a long-time friend of Hilary. “I know what a great impact Hilary had on so many of us and on her students.” Hilary also supported a number of charities that raised awareness



about treatment for people with metastatic breast cancer. She is greatly missed by the University community.

Science Student Support Fund

The global pandemic has challenged all of us and put added pressure on those students who may already have been grappling with financial challenges. They may need immediate emergency support due to a crisis or long-term support for those who, because of financial hardship, may not otherwise be able to undertake or complete their studies. Please help us to support our science students by making a donation of any amount to the Science Student Support Fund. www.giving.auckland.ac.nz/science

Sustainability as a guiding principle

Sustainable practice must guide our everyday activities and thinking. Ranked number one in the world for impact towards achieving the United Nations' Sustainable Development Goals, the University is positioned to be a global change-maker.

SUSTAINABILITY conjures up different ideas to different people. When we have a conversation about sustainability, we could be talking about any of its varied facets such as social, environmental, economic, or cultural. A single agreed upon definition of sustainability remains elusive, and so rather than recapitulating each context for any sustainability discussion, I believe sustainability is best served by being embraced as a guiding principle.

There is already a strong precedent for the University community and wider society to adopt underpinning principles in our day-to-day thinking. The principles of the Treaty of Waitangi are a clear example of how, regardless of the context, every time we perform an action, we appraise it against the guiding principles of the Treaty.

We also increasingly see the same for principles of equity, and kindness. Many of us already implicitly use sustainability as a guiding principle in our day-to-day lives, such as when purchasing an item, we consider its manufacturing origin (social), packaging (environmental) and price (economic).

You will have seen the Sustainable Development Goals (SDGs) highlighted throughout this year's edition of *inSCight*. In 2015 the United Nations identified 17 SDGs as a blueprint for peace and prosperity for people and the planet. The Times Higher Education impact rankings show how the global higher education sector is contributing to these SDGs. Since the ranking began in 2018 the University of Auckland has consistently ranked number one in the world, scoring over 90 percent for partnering with the community for the goals, and for both marine and terrestrial biodiversity.

Reflecting this academic impact, the United Nations has identified the University of Auckland as the global hub for SDG4: *Education* and charged the University with promoting scholarship and best practices for this goal. The University is well positioned to rise to this challenge, interpreting education as not just the courses we deliver, but the information we create and how we disseminate it as knowledge to the diverse communities we serve.

This year has been particularly challenging and has reconfigured the landscape of sustainability and its practice. COVID-19 has shifted how the world operates, in particular changing the rules on how the globalisation of education occurs.

The University has much knowledge to share with the world, but we must find ways to promote what our world-leading researchers and educators know, while remaining firmly



rooted with a sense of place (*tūrangawaewae*) from our remote corner of the globe.

Looking forward to the next decade, the University can, and I think will, lead by example invoking sustainability as an underpinning principle in all its research, teaching and operational activities.

We will also demonstrate on the global stage how a University uses education to serve the communities it partners with, in pursuit of maximising sustainable outcomes across the 17 SDGs. By doing so, the University of Auckland will truly become a world-leading University of the 21st century. ●

ASSOCIATE PROFESSOR
JAMES RUSSELL

**School of Biological Sciences
and Department of Statistics**

Faculty research theme leader:
A Sustainable Future

Read: www.auckland.ac.nz/en/science/our-research/research-themes/a-sustainable-future.html

Visit: www.timeshighereducation.com/student/best-universities/top-universities-world-global-impact

"We must find ways to promote what our world-leading researchers and educators know, while remaining firmly rooted with a sense of place."



Connect with our researchers on Twitter...

School of Biological Sciences

@JacquelineBeggs – Professor Jacqueline Beggs
@MMEG_UoA – Associate Professor Rochelle Constantine
@alexeidrummond – Professor Alexei Drummond
@LoraxCate – Associate Professor Cate Macinnis-Ng
@IsldJames – Associate Professor James Russell
@mc_stanley1 – Associate Professor Margaret Stanley
@HilarySheppard9 – Dr Hilary Sheppard
@EmzLCarrol – Dr Emma Carroll
@IsldJames – Associate Professor James Russell

School of Chemical Sciences

@BrimbleM – Distinguished Professor Dame Margaret Brimble
@HartingerHub – Professor Christian Hartinger
@ptolemytortoise – Professor Cather Simpson

School of Computer Science

@DrRizwanAsghar – Dr Rizwan Asghar
@mjdinneen – Dr Michael Dinneen
@joergwicker – Dr Joerg Wicker
@witbrock – Professor Michael Witbrock

School of Environment

@scronin70 – Professor Shane Cronin
@GeoJanUoA – Professor Jan Lindsay
@TectonoFluids – Associate Professor Julie Rowland
@KatarzynaSila – Dr Katarzyna Sila-Nowicka

Department of Exercise Sciences

@MyPlasticBrain – Professor Winston Byblow
@amcmorl – Dr Angus McMorland
@nickgantnz – Associate Professor Nicholas Gant

Institute of Marine Science

@shellfishrestnz – Dr Jen Hillman
@cjlinnz – Associate Professor Carolyn Lundquist

Department of Mathematics

@DrTanyaEvansNZ – Dr Tanya Evans
@EllipticKiwi – Professor Steven Galbraith
@MathmoClaire – Associate Professor Claire Postlethwaite

Department of Physics

@REaster – Professor Richard Easter
@astro_jje – Associate Professor JJ Eldridge
@MERkintalo – Dr Miro Erkintalo
@mdhoogerland – Dr Maarten Hoogerland
@just_shaun – Dr Shaun Hotchkiss
@noonetweeting – Professor David Noone
@droneale – Dr Dion O’Neale
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@ptolemytortoise – Professor Cather Simpson
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@DanHikuroa – Dr Daniel Hikuroa

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SCIENCE

2021 Alumni and friends events

University of Auckland events are always stimulating and entertaining, as well as a chance to catch up with friends and network with new people. There are mainstay events such as the annual Distinguished Alumni celebrations and the Golden Graduates lunch, plus Alumni and Friends receptions in various centres and smaller, informal gatherings led by alumni. In these unusual times we are finding ways to connect and engage online as well.

Update your email address and we'll make sure you stay informed of upcoming events and changes to events. alumni.auckland.ac.nz/update

If you update your email and postal address by **31 December 2020**, you'll go in the draw to win a Bose Wireless speaker worth \$479.

Or visit our events section for the latest on campus. nvite.com/community/universityofauckland

To find out more about alumni benefits and activities please visit alumni.auckland.ac.nz/benefits



Switch to sustainable?

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