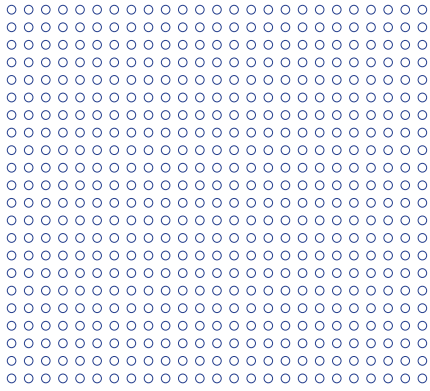


**Biomolecular
Interaction Centre**



Biomolecular Interaction Centre

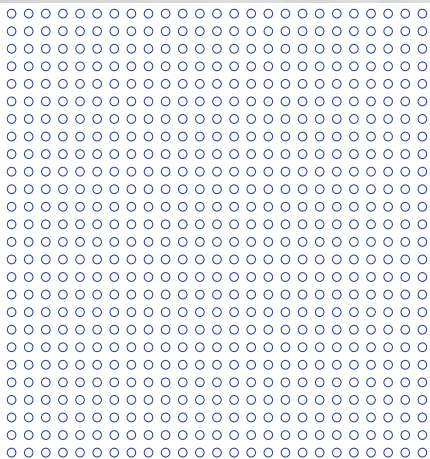
2021 Research Report



PhD candidate Amanda Board is studying oil-storage proteins found in plant seeds

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Directors' Comment

This year, we were delighted to invite Dr Vanessa Morris (School of Biological Sciences) and Dr Debbie Munro (Mechanical Engineering) to join the Principal Investigator team in BIC. Vanessa and Debbie each bring a different perspective and expertise to the group which will help ensure we are best serving researchers by promoting multi-disciplinary research across BIC.

We welcomed seven new Associate Investigators into BIC with a wide range of expertise from understanding protein-protein interactions; to using hydrogels as tools to improve tissue regeneration; to microbial evolution and bacteriophage biology.

As a Research Institute, we attracted more than \$4,000,000 new research funding in 2021. This includes funding from the Ministry of Business, Innovation and Employment as well as subcontracts with our collaborators and nationwide centres such as the Riddet Institute (see page 5 for our current grants).

2021 saw success for our Investigators in the Canterbury Medical Research Foundation funding round with Dr Amy Osborne, Dr Daniel Foley, Dr Vanessa Morris and Dr Tim Allison each awarded Major Project Grants of more than \$100,000 towards their research.

Each year, we support BIC researchers through seed funding and postgraduate and summer student scholarships. This year, we awarded over \$380,000 to researchers across six departments/schools (see page 7 for more details on the grants awarded). Thank you to everyone involved in the selection panels; it is always a challenging task to choose between competitive applications!

We are also pleased to be able to support a fantastic group of postdoctoral fellows and postgraduate students through BIC (see pages 19-22 to learn more about our growing team).

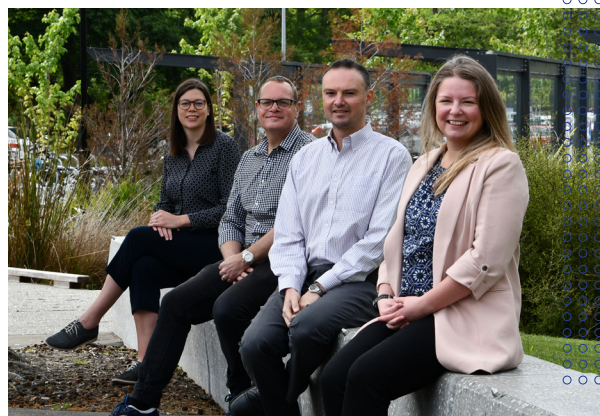
We continue to invest in capabilities that benefit BIC and the University of Canterbury. This year, our new equipment includes a NanoTemper Monolith and a Biacore T200 Surface Plasmon Resonance machine.

Ideas in the wider community

- 52 refereed journal articles and book chapters
- 26 conference presentations
- 1 patent
- 1 new spin-out company
- Held our annual BIC symposium
- Held a Techweek industry-interface event in collaboration with the MacDiarmid Institute

Where next?

One of our key areas of focus is strengthening our impact – whether it is commercial, environmental or societal. To be able to do this more effectively, we must be able to communicate the breadth and depth of research across BIC. With this in mind, we are planning to review the BIC flagships to ensure the way we present ourselves to people outside BIC – and the value we can bring – is easy to articulate and to understand. The themes under consideration include broad areas such as the environment, health, materials, sensors and food.



Biomolecular Interaction Centre management team

Left to right: Jen Crowther (Research Advisor), Ren Dobson (Deputy Director), Matt Watson (Director), Ria Chapman (Institute Manager)

Financial Summary

	2019	2020	2021*
	\$000	\$000	\$000
Externally funded research			
Funding received	2,162	3,676	4,100
Expenditure	2,166	3,393	4,095
Surplus (deficit)	(3)	283	5
Operations			
Income			
Overheads	275	515	667
PBRF	237	237	270
Other	520	462	450
Total income	1,032	1,214	1,387
Expenditure	1,043	1,079	1,267
Surplus (deficit)	(10)	134	120

*forecast as at 30 November 2021

External Research Grants

Active grants

Prof. Antony Fairbanks, Prof. Renwick Dobson: Glycoprotein manufacture. MBIE Smart Idea. \$1,166,667 (2017 - 2022)

A/Prof. Volker Nock, A/Prof. Ashley Garrill: Beyond myrtle rust: toward ecosystem resilience. MBIE Research Programme led by Landcare Research NZ. \$232,175 (2018 - 2023)

Dr Mitja Remus-Emsermann, A/Prof. Volker Nock: Using Synthetic Communities to Visualise Bacterial Plant Leaf Community Development and Pathogen Invasion Processes at the Single-Cell Resolution. Marsden. \$300,000 (2018 - 2021)

Dr Jodie Johnston: Understanding internal communication with proteins. Marsden. \$703,167 (2018 - 2022)

Prof. Conan Fee, A/Prof. Don Clucas, A/Prof. Ken Morrison, A/Prof. Matt Watson, A/Prof. Daniel Holland, A/Prof. Digby Symons, Prof. Richard Green, Dr Tim Huber: 3D printing porous media for process engineering. MBIE Endeavour Research Programme. \$9,812,551 (2019 - 2024)

Prof. Renwick Dobson: Understanding bacterial membrane transport proteins: Setting an antimicrobial TRAP. Marsden. \$890,000 (2020 - 2023)

A/Prof. Volker Nock: Electrotaxis and protrusive force generation in fungal and oomycete pathogens – pathways to new biocontrol strategies. Rutherford Discovery Fellowship from the Royal Society of New Zealand. \$800,000 (2020 - 2025)

Dr Azadeh Hashemi: Developing a simple and effective method for directing the differentiation of stem cells in the lab. Rutherford postdoctoral fellowship. \$170,000 (2020 - 2022)

Prof. Renwick Dobson: NSC Biological Heritage: Host, Pathogen and Environment. \$180,000 (2020-2023)

Rebecca Hurrell: New Zealand Product Accelerator funded by Callaghan Innovation and led by the University of Auckland \$468,750 (2019 - 2023)

Dr Carlo Carere: New Zealand Product Accelerator: Turning NZ dairy organic waste into H₂ fuel using New Zealand extremophiles. \$20,000 (2021-2023)

Prof. Matt Watson. New Zealand Product Accelerator: Maple Syrup Feasibility Study. \$15,000 (2021)

A/Prof. Matt Stott. Waerau waikawa iti rongoa paturopi: New Generation peptide antibiotics. MBIE Research Programme, led by University of Auckland. \$390,621 (2020-2025)

Prof. Conan Fee, Dr Tim Huber. Āmiomio Aotearoa, a circular economy for the wellbeing of New Zealand. MBIE Research Programme led by University of Waikato. \$696,674 (2020-2025)

Prof. Daniel Holland, Prof. Matt Watson. Understanding maple sap exudation using micro computed tomography. NZ Synchrotron Group Capability Build Fund. \$12,000 (2021-2023)

Prof. Renwick Dobson, Dr Laura Domigan, Dr Olivia Ogilvie. Singapore Future Foods: Understanding the interactions between plant-based protein and cellular agriculture. MBIE Catalyst: Strategic, led by University of Auckland. \$867,799 (2021-2023)

Dr Vanessa Morris, Dr Claudia Meisrimler. BioSAXS capability. NZ Synchrotron Group Capability Build Fund. \$15,000 (2021-2023)

Prof. Conan Fee. Development of Concentrated/Solid Household Products and the Scale-up Process. Callaghan Innovation R&D grant. \$30,500 (2021-2022)

A/Prof. Volker Nock. Growing Future Horticulture Goes Urban programme - New Plants for a New World. MBIE Strategic Science Investment Fund, led by Plant & Food Research. \$80,000 (2021-2023)

Dr Grant Pearce. Leaft Foods. Callaghan Innovation R&D grant. \$30,500 (2021-2022)

Prof. Matt Watson, Prof. Daniel Holland, A/Prof. Justin Morgenroth. Non-invasive sap flow measurement and mechanisms for reliable tree syrup yield predictions. MBIE Smart Ideas. \$999,999 (2021-2024)

Dr Vanessa Morris. A new inactivation mechanism of a crucial tumour suppressor: investigating amyloid formation in cancer. Canterbury Medical Research Foundation. \$109,923 (2021-2023)

Completed grants

Prof. Antony Fairbanks. A new paradigm for organelle targeting. Marsden. \$870,000 (2017-2021)

Prof. Renwick Dobson. Advanced tools for food structures and interactions. CoRE Riddet Institute. \$329,175 (2018-2021)

Prof. Conan Fee. Advanced tools for food structures and interactions. CoRE Riddet Institute. \$181,575 (2018-2021)

Prof. Renwick Dobson, Prof. Conan Fee, A/Prof. Volker Nock, Dr Neil Pattinson. A simple biomarker assay platform. MBIE Smart Idea. \$1,166,667 (2017-2021)

Prof. Renwick Dobson. New biophysical methods to understand how bacteria import metabolites across their cell membrane. Royal Society of New Zealand - Catalyst: Seeding. \$80,000 (2018-2021)

Prof. Renwick Dobson. CoRE: Riddet Institute - Protein production via cellular agriculture. University of Auckland. \$150,000 (2020-2021)

Prof. Renwick Dobson. Endolysins. Institute of Environmental Science & Research Ltd. \$20,000 (2020-2021)

A/Prof. Volker Nock. Biological mimicry for medical diagnostics. Science for Technological Innovation, led by Massey University. (2019-2021)



BIC Grants Awarded

Seed Funding

Dr Debbie Munro, Dr Rachael Wood: Capacity building to apply cell culture and tissue engineering to novel endometriosis diagnosis and treatment methods. \$19,500

A/Prof. Tammy Steeves: Building an integrative genomics framework to mitigate maladaptive reproductive traits in endangered species. \$15,000

Dr Vanessa Morris, Dr Christoph Göbl, Dr Campbell Sheen: Development of a small-molecule sensor based on the aryl hydrocarbon receptor. \$24,500

Prof. Daniel Holland, Prof. Matt Watson: Understanding maple sap exudation using micro computed tomography. \$25,000

Postgraduate Funding

Claudia Allan. Supervisors: Dr Claudia-Nicole Meisrimler, A/Prof. Volker Nock. PhD project title: In the dark, but well informed: How do plant roots sense water stress and pathogens?

Alexis Blackie. Supervisors: Dr Daniel Foley, A/Prof. Deborah Crittenden, Prof. Mark Hampton. PhD project title: Selective pharmacological inhibitors to reveal the roles of splicing-associated kinases in breast cancer.

Daniel Mak. Supervisors: Prof. Ren Dobson, A/Prof. Volker Nock. PhD project title: Designing capillary chips for wine testing.

Summer Scholarships

Dr Rachael Wood: Microneedle drug delivery system development. Student: Michelle Hsieh

Dr Heon Park: Biomedical sealants using biomimicry. Student: Matthew Joe

A/Prof. Volker Nock, Dr Claudia Meisrimler: Multiplexing plant physiological research using a novel bi-directional dual-flow-RootChip platform. Student: Blake Elliot.

Dr Debbie Munro: Development of a Novel Wireless Communication and Power Source in an Implantable Spinal Fusion Detection Device. Student: Kaleb McGillivray-Seaton

A/Prof. Mark Staiger: Bio-inspired monolithic biodegradable plate system for bone fracture fixation. Student: Jordan Richard

Dr Natalia Kabaliuk: Immunohistochemistry of rTBIs in Cultured Ovine Brain Tissue. Student: Thomas Spillane

Dr Ali Reza Nazmi, Dr Carlo Carere, Dr Tim Allison: Analysing Winogradsky columns to isolate PHA producing communities. Student: Stephanie Bain

Prof. Richard Hartshorn: New Ion Exchange Materials from Waste Collagens. Student: Emlyn Hoyt

Flagship One

Evolving and Engineering Biomolecules

Flagship Leader: Prof. Renwick Dobson

Under this flagship theme, we explore fundamental questions of how molecules evolve, function and interact. We focus on harnessing biomolecular interactions, creating enzymes with novel properties, rewiring cells to produce biomolecules in short supply, utilising long-term evolution experiments to better understand structure, function and evolution of proteins and mining evolutionary diversity for new function.

Flagship Highlights

Unravelling the mechanisms of bacterial gene regulation

Prof. Ren Dobson and his team have been carrying out Marsden-funded research, investigating sialic acid metabolism in bacteria. Sialic acids are molecules that coat the surfaces of human cells. Bacteria have evolved the capacity to import and metabolise these sialic acids for energy or to coat their own surfaces to evade the human immune system. The enzymes involved in these processes are therefore promising antibiotic targets.

Bacteria respond to environmental changes by upregulating the transcription of some genes and repressing others. The *Escherichia coli* transcriptional repressor, NanR, regulates sialic acid metabolism, but the mechanism of this is unclear. With the help of breakthrough single-particle cryo-electron microscopy structures, BIC researchers have unveiled the molecular basis for the regulation of bacterial sialic acid metabolism, and have published their findings in *Nature Communications* (Horne et al., 2021).

Funding Success

Dr Vanessa Morris has been awarded a Major Project Grant from the Canterbury Medical Research Foundation to investigate the molecular details of fibril formation by a crucial tumour suppressor. She hopes this work will provide insights into cancer biology and new avenues for cancer therapy. Dr Morris was also awarded \$15,000 from the New Zealand Synchrotron Group, with BIC AI Dr Claudia Meisrimler, to develop capability on the new BioSAXS beamline at the Australian Synchrotron.

Prof. Conan Fee and Prof. Ren Dobson have both received Lottery Health Research grants to help purchase new equipment: a Biacore T200 Surface Plasmon Resonance system and a Beckman Optima Analytical Ultracentrifuge.

Sarah Manners and Abigail Schwartzfeger have both been awarded UC Aho Hīnātore | Accelerator PhD Scholarships. They will begin their PhD's in BIC next year supervised by A/Prof. Matt Stott and Prof. Ren Dobson, and Dr Vanessa Morris.

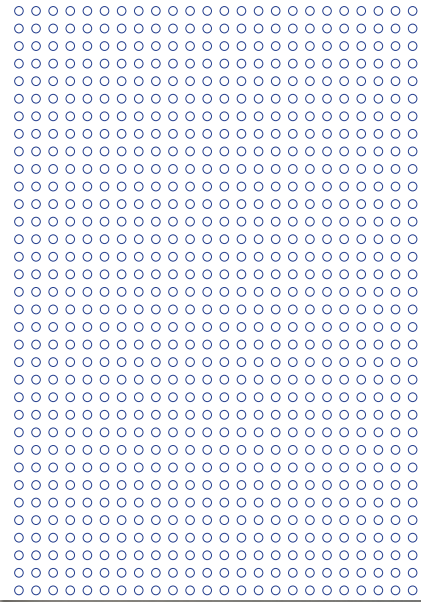
Prof. Ren Dobson has secured \$560,000 in funding from the Riddet Institute, to develop 'Advanced tools for food structures and interactions'.

Aimee Harper has joined BIC as a PhD student in the new joint postgraduate school: Food Transitions 2050. She is co-supervised by Prof. Ren Dobson and Dr Vanessa Morris at UC, and Dr Gert-Jan Moggre at Plant and Food Research.

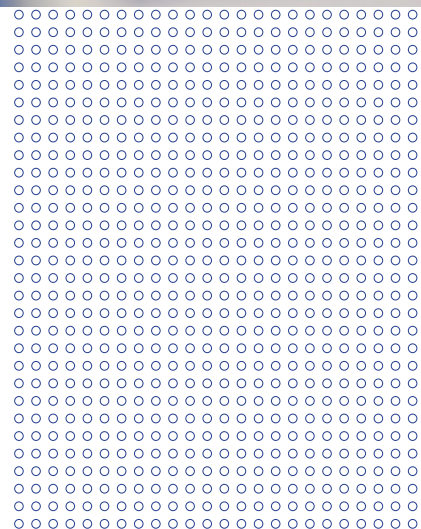
Dr Grant Pearce is supervising BIC Master's student Joel Brunke, funded through a Callaghan Innovation R&D Student Fellowship Grant. Joel is working with the innovative food technology company, Leaft Foods Ltd, to investigate the extraction of plant protein from leaves.

Flagship support

Flagship funding has been used to support two summer students: Sarah Manners, working with Prof. Ren Dobson and Emilie Hamzah, working with Dr Vanessa Morris.



The 'Molecular Foods' team:
Aimee Harper, Dian Munoz,
Amanda Board, Hamish Trlin
and Dr Olivia Ogilvie.



Flagship Two

Engineering Biotechnology

Flagship Leader: A/Prof. Volker Nock

This flagship brings together rapid prototyping and advanced manufacturing technologies from the engineering disciplines to help inform molecular and cellular life sciences. To achieve this, the flagship incorporates a diversity of input from the physical sciences and engineering with the aim to develop new platforms that help unravel the complexity of biology.

We work with cells, animals and plants and our research spans the biological hierarchy from molecules to whole organisms. We are focused on the following broad areas of activity: 3D printed devices for bio-separations, biomolecular interactions on surfaces, biomolecular interactions related to disease, biochemistry on chips and sourcing of advanced materials from nature's pantry.

Flagship Highlights

Innovations in microfluidics

Capillary systems are a promising technology for point-of-care microfluidics, since they are pre-programmable and self-powered. A/Prof. Volker Nock and his team have developed an innovative new "off valve" that serves as a key building block for capillary circuits (Menges et al., 2021), providing easy-to-use, multi-purpose valving functionality and autonomous flow control.

Building on this technology, A/Prof. Volker Nock, Prof. Ren Dobson, Dr Tanya Rutan (Bragato Research Institute) and PhD student Daniel Mak took away the 'Greatest Global Impact' prize at this year's Innovation Jumpstart awards. Daniel's PhD project involves developing novel capillary microfluidics assays for wine diagnostics. The award comes with \$20,000 of funding to explore commercialising this technology. Daniel's PhD project is partly funded through the Bragato Research Institute, and by BIC Postgraduate funding.

3D printed smart formulations for agriculture and conservation

Dr Pram Abhayawardhana has been exploring how 3D printing could be a useful tool in developing smart formulations for agriculture and conservation. The team has

tested a number of candidate hydrogels with a combination of compounds to identify chemical release profiles, stabilities, and chemical and physical properties under various conditions. Extrudability studies have narrowed down the options for potential inks to be used to create tuneable final products. The team are now planning to test proposed shapes with the selected formulations to optimise printing parameters. The initial work was supported by BIC seed funding in 2020 and there are plans to extend the work into a PhD project to include the usage of 3D screen-printing to explore the mass manufacture ability of complex geometry agrochemicals.

Applying Cell Culture and Tissue Engineering to Novel Endometriosis Diagnosis and Treatment Methods

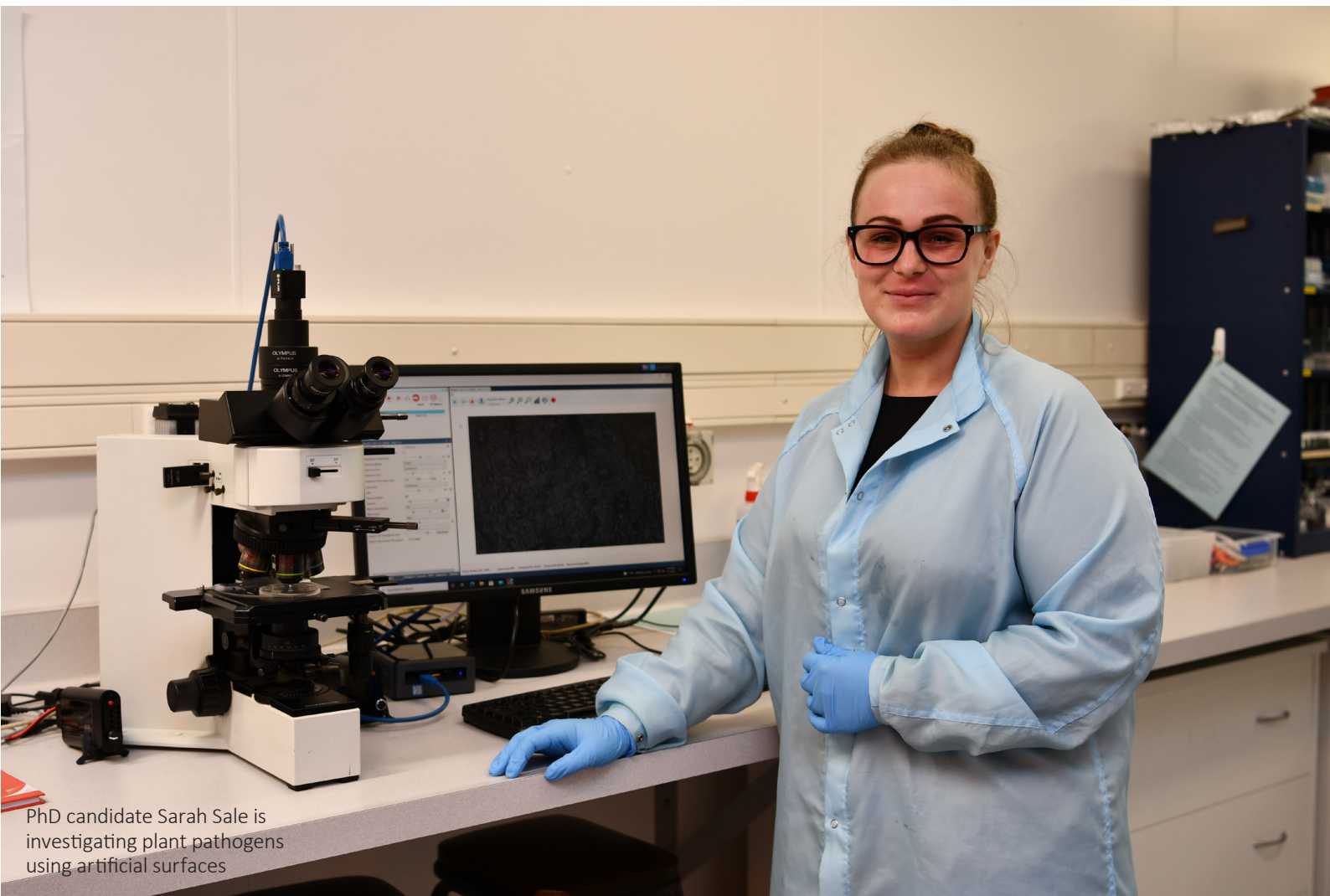
Dr Debbie Munro and Dr Rachael Wood received BIC seed funding this year to build capacity in cell culture and tissue engineering techniques. This will allow BIC researchers to undertake cross-disciplinary mechanical, biomedical and biochemical engineering projects. The first intended application is addressing the public health crisis of treating endometriosis. This will be achieved by targeting the specific endometrioma biochemistry to improve diagnosis and treatment methods.

Funding success

A/Prof. Volker Nock has received funding from Plant and Food Research to contribute to their research programme titled 'Growing Future Horticulture Goes Urban - New Plants for a New World'. This programme recognises that, by 2050, almost two-thirds of people will live in cities. It aims to create the science and technologies needed to produce food closer to consumers and that makes growing plants in urban environments possible.

BIC Director Prof. Matt Watson, BIC AI Prof. Daniel Holland and A/Prof. Justin Morgenroth have been awarded \$1 million in MBIE Smart Ideas funding. Their research aims to assess the feasibility of establishing a maple syrup tree industry in New Zealand. The project is also supported through funding from the New Zealand Synchrotron Group Capability Build Fund (\$12,000) and BIC Seed funding (\$25,000).

Dr Claudia Meisrimler and A/Prof. Volker Nock have secured \$14,000 from the Brian Mason Scientific and Technical Trust for: 'Multiplexing plant physiological research using a novel bi-directional dual-flow-RootChip platform'. Claudia Allan is working on this project for her PhD, supported by a BIC Postgraduate award, along with BIC summer student Blake Elliot.



PhD candidate Sarah Sale is investigating plant pathogens using artificial surfaces

Flagship Three

Chemical Biology

Flagship Leader: Prof. Antony Fairbanks

Chemical Biology is where synthetic chemistry acts as an enabling science to allow the study and manipulation of biological systems and processes. The goals of Chemical Biology are two-fold. Firstly, to provide molecular level insight into biological processes, and secondly to reveal windows of opportunity for interference with said processes, for example for the development of new therapies.

Flagship Highlights

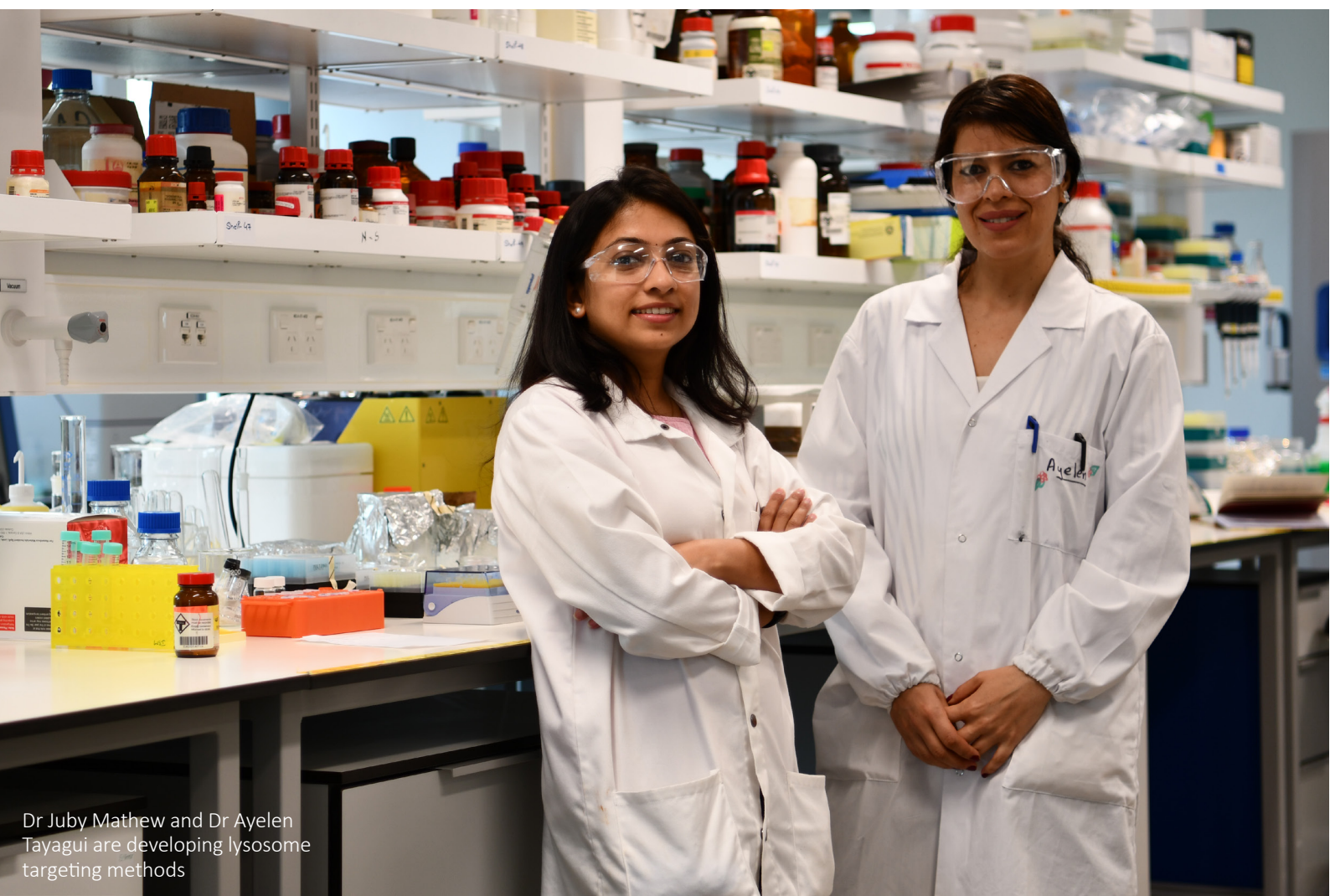
Visualisation of lysosomal targeting

Dr Juby Mathew and Dr Ayelen Tayagui have been working in the Fairbanks group, investigating the efficiency by which externally administered molecules, typically proteins, are trafficked to the lysosomes in mammalian cell lines.

Lysosomes are the 'dustbins' of cells, where metabolites are sent for degradation by numerous lysosomal enzymes. Lysosomal Storage Disorders (LSDs) occur when dysfunction of a

particular lysosomal enzyme causes build-up of a particular metabolite in the lysosomes of cells, causing death or severe morbidity.

One method of treating LSDs is enzyme replacement therapy (ERT). ERT uses a recombinant version of the non-functional lysosomal enzyme in order to restore enzyme activity. In many cases ERT has low effectiveness, primarily because the recombinant enzymes do not possess the required sugars attached to their surface in



Dr Juby Mathew and Dr Ayelen Tayagui are developing lysosome targeting methods

order to be trafficked to the lysosome.

The Fairbanks group has a long track record of protein 'glycoengineering', and aims to improve the outcomes for children with lysosomal storage diseases by significantly improving the efficacy of current ERTs. Synthetic chemistry will be used to modify the sugars attached to the surface of an ERT, so that transport to the lysosome will be significantly enhanced.

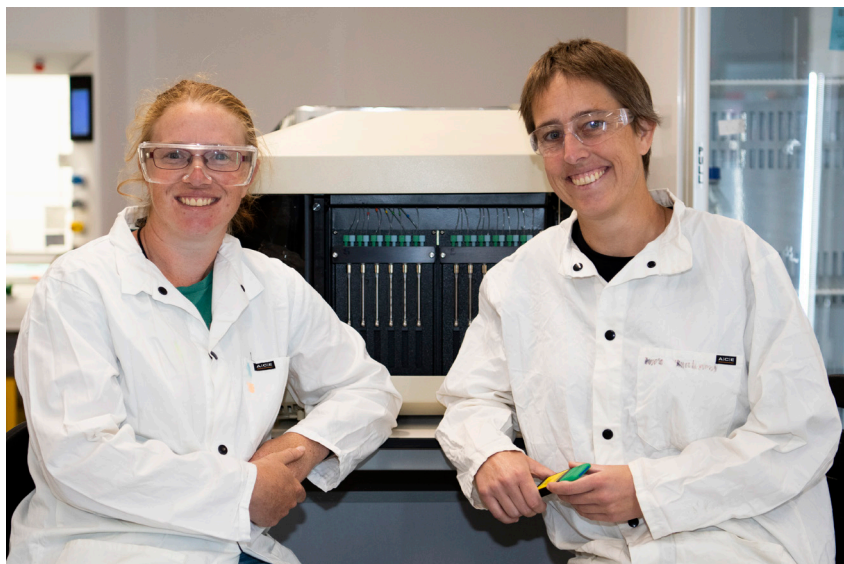
Development of a selective inhibitor of cdc2-like kinase 4

Dr Dan Foley's group aims to prepare a selective inhibitor for a biomolecule (CLK4) involved in the 'spliceosome', a complex molecular machine found in all human cells that enables correct formation of proteins. When the spliceosome malfunctions, mutant proteins are generated that promote cancer development and progression. Development of a selective inhibitor is important towards revealing CLK4's specific role in cancer. The Foley group recently identified 'azaquindole-1', a small molecule found to inhibit a small selection of kinases, including CLK4. In this ongoing project, synthetic chemistry will be used to prepare variants of azaquindole-1, making small structural changes that will identify which parts of the molecule are important for selective and potent CLK4 inhibition.

Optical Detection of CoV-SARS-2 Viral Proteins to Sub-Picomolar Concentrations

A team of researchers from BIC, the Callaghan Innovation Protein Science and Engineering team and the MacDiarmid Institute have combined forces to develop a supersensitive new method for directly detecting the virus particles that cause Covid-19 (Stanborough et al. 2021). Their approach focusses on detecting the SARS-CoV-2 spike protein that is responsible for the virus being able to infiltrate human cells. They have shown that they can detect the spike protein to sub-picogram concentrations, i.e. at biologically-relevant levels. This approach holds great promise for development into rapid, point-of-use detection systems.

A/Prof. Deb Crittenden and Dr Fiona Given have received Tier 1 KiwiNet funding to explore the commercialisation of this technology and were shortlisted in this year's UC Innovation Jumpstart awards.



Dr Fiona Given and A/Prof. Deb Crittenden have developed a sensitive detection system

Funding success

Prof. Antony Fairbanks has secured \$951,000 in Marsden Funding for the programme: Radically different; new reactions of unprotected sugars in aqueous solution.

Dr Timothy Allison has been awarded \$110,000 from the Canterbury Medical Research Foundation, to investigate: The assembly of the exotoxin secretion system in *Mycobacterium tuberculosis*.

Dr Daniel Foley has been awarded \$109,946 from the Canterbury Medical Research Foundation and \$7,308 from the Royal Society of Chemistry to develop chemical tools to reveal the roles of splicing-associated kinases in breast cancer.

Flagship Support

Flagship funding has been used to support the establishment of several mammalian cell lines (location: Chemical Biology laboratory, ER 406), to be available for use in biological assays by BIC researchers.

Flagship funding has been used to support two summer student research projects: Daniel Small, working with Dr Daniel Foley and Jude Kalan, working with Prof. Antony Fairbanks.

Impact and Application

Biomolecular interactions find applications in a broad range of fields including drug design, nanotechnology, food science, agritech and diagnostics. An established strength of BIC is our capacity to take ideas from the research lab into the real world.

Health tech success

Dr Debbie Munro is a BIC PI and a Senior Lecturer in Mechanical and Biomedical Engineering. Dr Munro moved to UC three years ago after various stints at the NASA AMES Research Centre, ITT Cannon in Japan, Synvasive Technology and Sarcos Robotics (making dinosaurs for Jurassic Park at Universal Studios Hollywood).

Dr Munro's research revolves around medical devices, biomechanics, and diagnostic sensors for improving people's lives. Last year she won the Large Enterprise award at

the HealthTech Supernode Challenge, and this year she took out the MedTech CORE HealthTech award for Best Translational Research for her 'smart' implant sensor technology to help detect changes in patients who've had spinal fusion surgery. Following further research in collaboration with the Auckland Bioengineering Institute, Dr Munro has plans to commercialise her technology.

Non-invasive sap flow measurement for reliable tree syrup yield predictions

BIC Director Prof. Matt Watson, BIC AI Prof. Daniel Holland and A/Prof. Justin Morgenroth have been awarded a \$1 million MBIE Smart Idea grant to establish New Zealand's potential as a maple syrup producer. Canada's freezing winters play a pivotal role in its maple syrup production by getting the sap flowing in big, old maple trees, which can then be collected and processed into syrup. Aotearoa's mild winters would seem to rule that out, but Prof. Watson's research team believes New Zealand has commercial sap potential waiting to be tapped; not in old trees, but rather young maples that more readily produce sap in winter.

A trial plantation has been established near Hanmer Springs, with more planned for Canterbury, Waikato and Rangitikei. Instruments will monitor factors such as sap flow and local weather conditions. 3D imaging will be carried out at the Australian Synchrotron in Melbourne on live sugar maples to help better understand sap production mechanisms through freeze-thaw cycles. While commercial production is a long way off, it is projected that 2000 hectares of maple trees could generate \$60 million a year in maple syrup revenue.



Dr Debbie Munro is developing an implantable sensor system to measure the progress of spinal fusion treatments.

Sustainable is Attainable

Established in 2019, Sustainable is Attainable is a programme that brings together a number of businesses from the food processing and manufacturing sector in South Canterbury to collaboratively address their sustainability issues. The initiative is led by Venture Timaru in collaboration with the University of Canterbury.

With funding from Callaghan Innovation, three university students spent the summer (2019-2020) collating and researching the various waste streams, including biowastes, plastics, and PPE, from the participating companies. Since then, a number of projects have commenced that aim to add value to these by-products, including generating fuel from biowaste; extracting functional ingredients for food, nutraceuticals and cosmetics; and developing high-value soil conditioners.

AgResearch are supporting a student project as part of Sustainable is Attainable and the Building Better Homes, Towns and Cities (BBTHC) National Science Challenge. Imogen

McRae, a third-year University of Canterbury School of Product Design student, has been working on developing non-slip pavers (to end Timaru's slippery pavement woes) made of waste material sourced from South Canterbury businesses. Keen to involve the community in her research, Imogen has undertaken a street-side activity and survey and incorporated the feedback into her designs.

Sustainable is Attainable has recently expanded to include the Hawke's Bay. Nicky Solomon, who manages the Hawke's Bay arm of the programme says "By better understanding what waste streams exist in the region, we can determine what synergies there might be, and how one company's waste might be combined with another's to create something more valuable. We are really fortunate to be able to benefit from the work that has been done in South Canterbury, and potentially integrate our work with theirs."



Courtney Wright-Watson is one of the initial students who worked on the Sustainable is Attainable project, and is now completing her Masters in Environmental Science.

Innovation Jumpstart success

BIC researchers took out three of the five Innovation Jumpstart awards this year. The goal of the competition, which is run annually by UC Research and Innovation, is to support researchers to transform valuable ideas into reality so they can make a difference. It is open to University of Canterbury academic staff across all research areas:

Prof. Ren Dobson, A/Prof. Volker Nock and Daniel Mak were awarded 'Greatest Global Impact - Bridgewest Ventures' for their technology: *Capillary microfluidic assays for improved testing in the wine industry.*

Dr Sarah Kessans was awarded 'Greatest Global Impact - WNT Ventures' for: *Nanosatellites for biotechnological research in microgravity.*

Dr Tim Huber, along with Dr Nick Emerson, Andy Park and Dr Dennis Pau were awarded 'Greatest Commercial Potential – KiwiNet' for their technology: *Seaweed Plasterboard.*

Dr Fiona Given and A/Prof. Deb Crittenden were shortlisted for an award for their technology: *Surface-enhanced Raman spectroscopy (SERS)-based point-of-care diagnostics.*



The winners of the UC Innovation Jumpstart awards pictured with Prof. Ian Wright, Dr Elizabeth Hopkins and Dr Alexandra Stuthridge

Equipment

Outstanding facilities and new strategic capability are critical to BIC's mission of delivering world-class research in biomolecular interactions at the interface of engineering and science. As such, BIC continues to invest strategically in capital equipment and on-going maintenance.

Nanoscribe Photonic Professional GT2

Housed in UC's NanoLab, the Photonic Professional GT2 is the world's highest-resolution 3D printer; objects printed with this ultra-precise system are so small that an electron microscope is needed to see them. It can be used to replicate micro millimetre-scale biological structures, such as those found on the surface of a leaf or in our bodies.

NanoTemper Monolith

The NanoTemper Monolith uses microscale thermophoresis technology to measure the strength of interactions between biological molecules. The Monolith can measure a broad range of binding affinities in-solution, using very little sample.

Biacore T200

The Biacore T200 is a high performance system for real-time biomolecular interaction analysis, using surface plasmon resonance technology (SPR). The Biacore T200 provides high sensitivity and a wide dynamic range.



Hon Dr Megan Woods, Minister for Research, Science and Innovation with A/Prof. Volker Nock at the opening of the Nanoscribe

New Associate Investigators

In 2021 we welcomed seven new Associate Investigators into BIC:



*Dr Rachael Wood,
Chemical and Process Engineering*



*Dr William Kelton,
University of Waikato*



*Dr Mak Sarwar,
University of Otago, Christchurch*



*Dr Artemio Mendoza,
Bio-Protection Research Centre*



*Dr Duane Harland,
AgResearch*



*Dr Evelyne Maes,
AgResearch*



*Dr Heather Hendrickson,
Massey University*

Postgraduate Students

BIC hosts honours, masters and doctoral students across a broad range of topics. Some of their projects are externally funded and others are partially or fully supported by BIC via contestable funding rounds and flagship funding. Here, we profile some of our newest postgraduate students.

Claudia Allan

In the dark, but well informed: How do plant roots sense water stress and pathogens?

Claudia is a BIC funded PhD student immersed in the field of plant molecular biology, co-supervised by Dr Claudia Meisrimler and A/Prof. Volker Nock. Claudia's multidisciplinary project aims to establish and refine a bi-directional-dual-flow-RootChip (bi-dfRC) - a microfluidic platform combining plant culture on-chip with guided root growth and controlled exposure of the root to solute gradients. This technology will probe for dynamic root responses to microbes and drought stress effects in a variety of combinations and spatial orientations while tracking fast signal transduction pathways (calcium and hydrogen peroxide) for plant defence.

Claudia was born in Christchurch and received her Bachelor of Science and Master of Science with distinction, both in Biotechnology, from UC. In the future, she strives to create strategies for bio-protection against climate change using plants.

Aimee Harper

Mechanism of Action of Cell Envelope Proteinases on Selected Plant Proteins

Aimee is funded by the new joint postgraduate school Food Transitions 2050, jointly supervised by Prof. Ren Dobson and Dr Vanessa Morris at UC, and Dr. Gert-Jan Moggre at Plant and Food

Research. Her research will focus on cell envelope proteinases, the enzymes which break down caseins in milk during fermentation, and understanding their mode of action on plant proteins. The proteolysis of caseins is one of the most important processes in developing desirable textures and flavours in fermented dairy products such as cheese and yoghurt. Understanding how this process works in plant-based alternatives may be a way to improve the flavour and texture of plant-based fermented dairy alternatives.

Prior to starting her PhD, Aimee completed her BSc (Hons) in Chemistry at UC, and then worked as an analytical chemist both in NZ and the UK.

Te-Rina King-Hudson

Redox regulation of peroxiredoxin-2 in human erythrocytes

Te-Rina is working on a collaborative project between BIC and the Centre for Free Radical Research at the University of Otago Christchurch, looking at a redox-sensitive protein in red blood cells called peroxiredoxin-2. Peroxiredoxin-2 may be a useful target and marker for various pathologies. Te-Rina's research will shed light on the mechanisms that regulate peroxiredoxin-2 redox state and the consequences of oxidation *in vivo* and *in vitro*. They intend to do this by combining biomedical techniques to analyse peroxiredoxin-2 systems in blood samples and biophysical techniques such as analytical ultracentrifugation (AUC) to

characterise interactions between recombinant proteins and ghost membranes. They are supervised by Prof. Ren Dobson, Prof. Mark Hampton, and Dr. Andree Pearson.

Te-Rina was born in Christchurch and received their Bachelor of Science and BSc Honours in Biochemistry at UC. They are passionate about biochemistry, diverse representation and inclusion as mana takatāpui, and research that works with communities to help communities.

Daniel Mak

Novel Capillary Microfluidics Assays for Wine

Daniel is working on improving the testing capabilities of wineries via microfluidic devices. He aims to develop cheap, hand-held, Point-of-Care devices that can be used on-site rather than in a laboratory. These devices can be used by process workers to test the content of wine samples quickly and easily, allowing for more advanced monitoring and control of the winemaking process.

Daniel completed his Bachelor of Engineering with First Class Honours in Chemical and Process Engineering at UC and is now completing his PhD in Electrical and Computer Engineering/Biology. Daniel is supervised by A/Prof. Volker Nock, Prof. Renwick Dobson, and the Bragato Research Institute's Dr. Tanya Rutan.

Daniel was born and raised in Wellington before moving to Christchurch to study. He enjoys chess and following financial markets.

Simon Reid

3D-printed catalysts for spacecraft propulsion

Simon started his Masters in 2020 and transitioned into a PhD in 2021. Simon's research, supervised by Prof. Matthew Watson as part of an MBIE funded Endeavour Research Programme, is to develop new catalysts in order to improve the performance of hydrogen peroxide thrusters. Part of this research involves using numerical modelling to better understand the decomposition of hydrogen peroxide and allow the catalyst geometry to be optimised via 3D-printing. This research is in collaboration with Callaghan Innovation and Christchurch-based Dawn Aerospace, who are building a suborbital spaceplane based on the same technology.

Originally from Ashburton, Simon completed his Honours degree in Chemical and Process Engineering in 2019 at the University of Canterbury. During that time, he also researched freeze-thaw cycles for sugar maple trees in New Zealand. In his spare time, you can find Simon tramping outdoors or fervently watching cricket.

Michael Newton-Vesty

When you are an à la carte eater in a buffet world: Understanding selective bacterial nutrient uptake through structural and functional analysis

Michael is a PhD student studying biochemistry, working to understand the structure and function of bacterial membrane

transporters involved in disease. Supervised by Prof. Renwick Dobson in the School of Biological Sciences, he hopes to characterise membrane transporters in order to guide the development of novel antibiotics.

Michael completed both his Bachelor's and Master's degrees at UC, where he took an interest in protein biochemistry. He plans to combine structural biology techniques such as X-ray crystallography and Cryo-EM to investigate membrane protein structure, with functional studies to elucidate how nutrients can be efficiently and selectively transported. Michael is interested in drug design for preventing disease and hopes to use his knowledge in protein biochemistry to pursue this area after his PhD.

Matt Rennie

Sap flow characterisation of Acer saccharum in NZ

Matt Rennie is a Master's student, co-supervised by Prof. Matt Watson and A/Prof. Justin Morgenroth. Matt's research is part of a wider research group looking to develop the foundations for a potential tree syrup industry in New Zealand. Matt is seeking to understand the sap flow dynamics of *Acer saccharum* (Sugar maple) with a test site planted outside of Hanmer Springs, and the horticultural practices needed for the trees to exude sap, outside of North America. The goal of which is to determine the various climatic and horticultural drivers that influence sap flow and identify future areas for plantations. The unique

challenges of this project have given Matt insight into a wide range of sciences and helped develop new skills that continue his passion for the field.

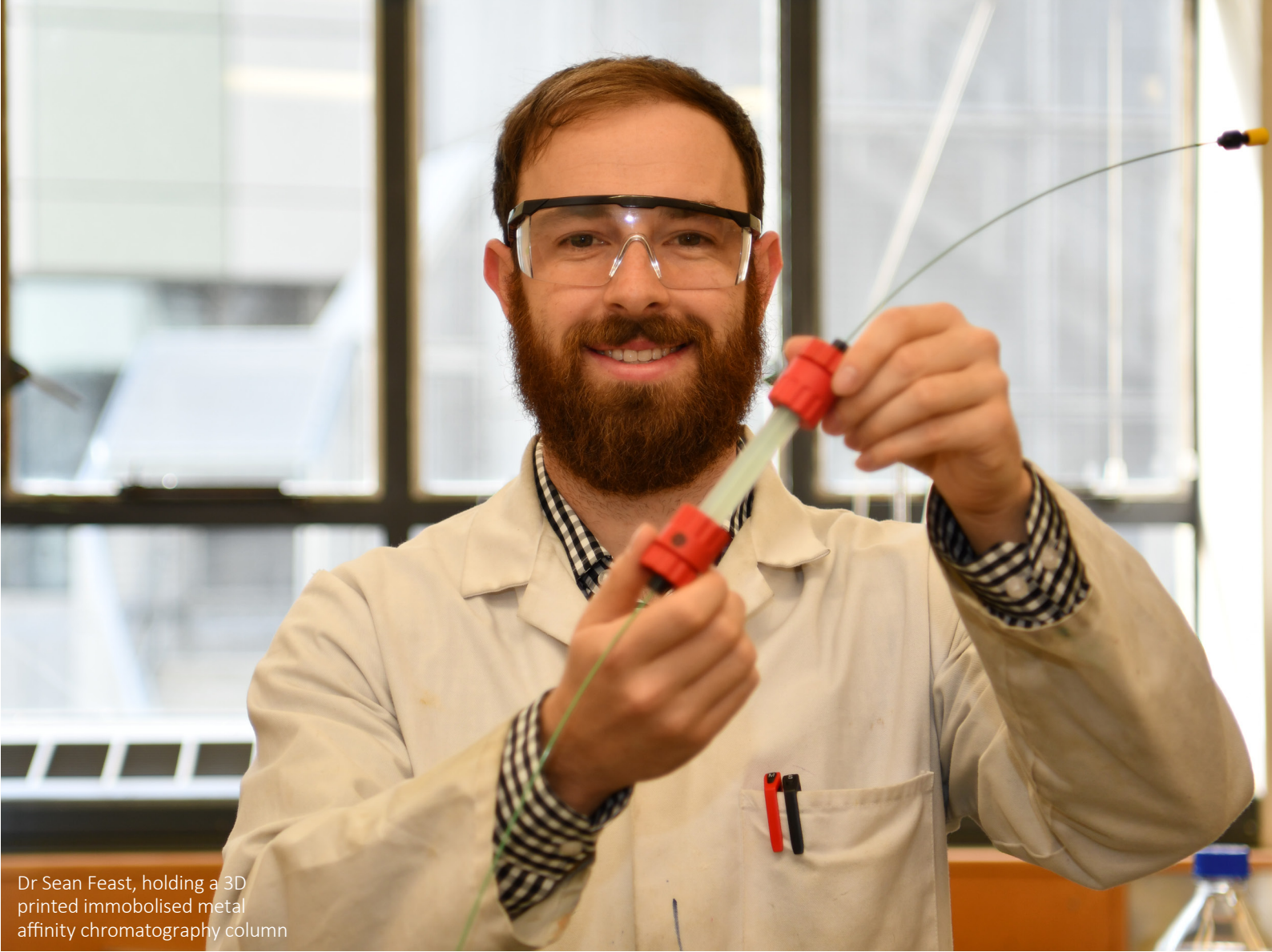
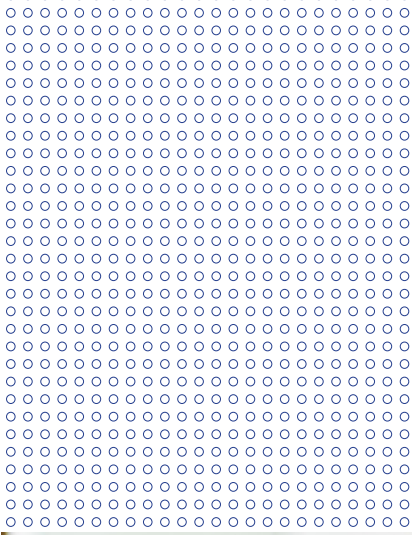
Matt was born and raised in Hawkes Bay and came to UC to study chemical and process engineering, for his interest in solving real-world problems and the opportunities that the South Island has for his weekends such as fishing, mountain biking and tramping.

Hamish Trlin

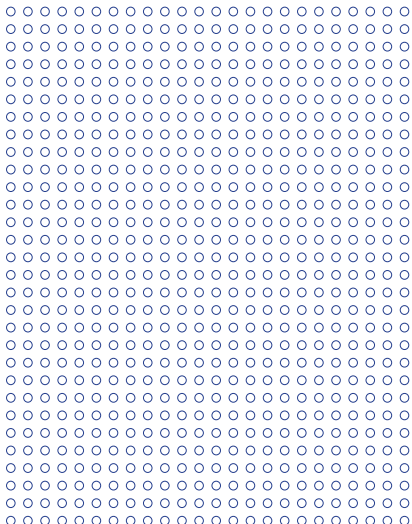
Cell-based meat allergens: the impact of cell culture on allergenicity

Hamish Trlin is a PhD student studying the impact of cell culture on the allergenic profiles of cultured meat cells. His research is part of a collaborative project between the Riddet Institute and BIC, working to develop methods for producing safe, viable alternatives to traditional agriculture products. He has additional support from the University of Auckland and the MacDiarmid Institute. He hopes his research will provide an analysis of the potential impacts of cell culture on food safety.

Before beginning his PhD at the University of Canterbury, Hamish completed his undergraduate and master's degrees at Victoria University of Wellington, with a focus on biotechnology. He is interested in the potential applications of biological sciences in product development, and believes that, following completion of his doctoral dissertation, his skills will be best suited to developing sustainable alternatives to everyday products.



Dr Sean Feast, holding a 3D printed immobilised metal affinity chromatography column



Postdoctoral Fellows

We are lucky to have a large cohort of externally funded fellows working on a range of research projects and we have funded a number of short-term fellowships directly from our Centre. Here, we profile some of the 2021 cohort.

Dr Juby Mathew

Juby is working with Prof. Antony Fairbanks in the Carbohydrate Chemical Biology group. She is working on an MBIE funded Smart Ideas project entitled “Manufacture of structure-optimised homogenous glycoprotein therapeutics”. The focus of the project is to utilise a multidisciplinary approach – synthetic carbohydrate chemistry and bio-catalysis for the cost-effective yet efficient production of bespoke and homogenous glycoproteins.

Juby completed her PhD in Biomedical Sciences at the Victoria University of Wellington where she developed peptide based-subunit vaccines for the treatment of cancer and viral infectious diseases. She received her Master’s degree in Biotechnology from St. Xavier’s College, Kolkata (India). She has had the privilege to work in varied disciplines (immunology and drug development, oncology, molecular and cell biology, human genetics and gastrointestinal clinical studies) and multiple labs across two countries. Outside work you will either find her reading a book, walking/hiking/camping in the beautiful NZ landscape or managing her partner’s small photography business.

Dr Joshua Wright

Joshua completed his undergraduate study at UC. He then moved to Dunedin to complete his PhD in biochemistry under the supervision of Prof.

Catherine Day at the University of Otago. Joshua’s PhD focussed on understanding the molecular mechanisms that underpin ubiquitylation, a protein post-translational modification.

Joshua took up a Postdoctoral position at the Francis Crick Institute in London working under Dr Ian Taylor in the Macromolecular Structure Laboratory. While at the Crick Institute, Joshua investigated the immune-escape role of the HIV gene, Vpr, which hijacks host-cell ubiquitylation machinery.

Joshua has now come full circle, returning to UC to work under Prof. Ren Dobson. Here, Joshua’s research is focussed on understanding the structure and function of bacterial membrane transport proteins, which have been identified as good targets for novel antibiotic development.

Dr Ayelen Tayagui

Ayelen is working with Prof. Antony Fairbanks on an MBIE funded project looking at targeting therapeutic agents to the lysosome. Prior to this, she completed a Licentiate in Genetics at the National University of Misiones, Argentina and a PhD in Cellular and Molecular Biology at UC. Her PhD work was funded by BIC and involved the design and testing of Lab-on-a-Chip devices to study protrusive forces in pathogenic microorganisms.

Since graduating, Ayelen has held Postdoctoral and Research Associate positions within BIC and

the MacDiarmid Institute working alongside A/Prof. Volker Nock. These positions enabled Ayelen to travel to the Netherlands to work for two summers at the University of Wageningen. In addition, she has worked on collaborative projects with Prof. Geoff Wilmott and Prof. Bill Williams at the University of Auckland and Massey University respectively. Ayelen is also responsible for running the confocal microscope and training new users of the microscope in the School of Biological Sciences at UC.

Dr Sean Feast

Sean is working on an MBIE funded Endeavour project titled ‘3D printing porous media for process engineering’ led by Prof. Conan Fee. As an extension of his PhD project, Sean is focused on developing 3D printed chromatography columns with applications across life sciences.

Sean was awarded an Emerging Innovator grant to explore commercialisation of the technology and is currently working with Bridgewest Ventures, to launch a new spin-out company. Sean completed both his undergraduate degree and PhD in Chemical and Process Engineering at UC

Our People

Principal Investigators



Prof. Matt Watson, Director



Prof. Ren Dobson, Deputy Director



A/Prof. Deborah Crittenden



Prof. Antony Fairbanks



Prof. Conan Fee



A/Prof. Paul Gardner



Prof. Juliet Gerrard



Dr Vanessa Morris



Dr Debbie Munro



A/Prof. Volker Nock



Prof. Emily Parker



Dr Grant Pearce



Prof. Ant Poole

Management staff

Dr Ria Chapman, Acting Institute Manager

Dr Jennifer Crowther, Research Advisor

Associate Investigators

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A/Prof. Azam Ali, Department of Food Science, University of Otago

Prof. Maan Alkai, Department of Electrical and Computer Engineering, University of Canterbury

A/Prof. Jane Allison, School of Biological Sciences, University of Auckland

Dr Timothy Allison, School of Physical and Chemical Sciences, University of Canterbury

Prof. Vic Arcus, School of Biological Sciences, University of Waikato

Dr Craig Billington, Institute of Environmental Science and Research

Prof. Stephen Brennan, Molecular Pathology Laboratory, Canterbury Health Laboratories

Dr Carlo Carere, Department of Chemical and Process Engineering, University of Canterbury

Dr Stefan Clerens, AgResearch Ltd

A/Prof. David Collings, School of Environmental and Life Sciences, University of Newcastle

Dr Euan Coutts, School of Product Design, University of Canterbury

Dr Simone Dimartino, School of Engineering, University of Edinburgh

Dr Laura Domigan, Department of Chemical and Materials Engineering, University of Auckland

Dr Jolon Dyer, AgResearch Ltd

Prof. Gary Evans, Ferrier Research Institute, Victoria University of Wellington

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A/Prof. Ashley Garrill, School of Biological Sciences, University of Canterbury

Dr Monica Gerth, School of Biological Sciences, Victoria University of Wellington

Dr Brent Gilpin, Institute of Environmental Science & Research

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Prof. Mark Hampton, Department of Pathology and Biomedical Science, University of Otago

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Prof. Richard Hartshorn, School of Physical and Chemical Sciences, University of Canterbury

Dr Heather Hendrickson, School of Natural and Computational Sciences, Massey University

Prof. Daniel Holland, Department of Chemical and Process Engineering, University of Canterbury

Dr Tim Huber, School of Product Design, University of Canterbury

Prof. Geoff Jameson, School of Fundamental Sciences, Massey University

Dr Jodie Johnston, School of Physical and Chemical Sciences, University of Canterbury

Dr Natalia Kabaliuk, Department of Mechanical Engineering, University of Canterbury

Dr William Kelton, University of Waikato

Prof. Martin Kennedy, Department of Pathology and Biomedical Science, University of Otago

Dr Sarah Kessans, School of Product Design, University of Canterbury

Prof. Tony Kettle, Centre for Free Radical Research, University of Otago

Dr Khoon Lim, Department of Orthopaedic Surgery and Musculoskeletal Medicine, University of Otago

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Dr Evelyne Maes, AgResearch

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Dr Artemio Mendoza, Bio-Protection Research Centre, Lincoln University

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A/Prof. Jim Morton, Faculty of Agriculture and Life Sciences, Lincoln University

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A/Prof. James Murphy, Walter and Eliza Hall Institute of Medical Research

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Prof. Dr Mitja Remus-Emsermann, Microbiology, The Free University of Berlin

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A/Prof. Tammy Steeves, School of Biological Sciences, University of Canterbury

A/Prof. Matthew Stott, School of Biological Sciences, University of Canterbury

Prof. Peter Tyler, Ferrier Research Institute, Victoria University of Wellington

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Dr Fabian Dolamore

Dr Sean Feast

Dr Azadeh Hashemi

Dr Thu Ho

Dr Joshua Leung

Dr Juby Mathew

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Dr Ben Reynolds

Dr Yiling Sun

Dr Ayelen Tayagui

Dr Joshua Wright

Gayan Abeysekera

Forogh Dashtestani

Tenaya Driller

Sam Dunbar

Navid Erfani

Matt Rennie

Postgraduate students

Claudia Allan - PhD with Volker Nock and Claudia Meisrimler

Nicola Altenhuber - PhD with Volker Nock

Michal Bernach - PhD with Mitja Remus-Emsermann

Simon Blue - PhD with Debbie Munro

Amanda Board - PhD with Renwick Dobson, Jennifer Crowther and Geoff Jameson, in partnership with Riddet Institute

Jack Brough - Masters with Debbie Munro

Joel Brunke - Masters with Grant Pearce, in partnership with Leaft Foods

Hazel Clemens - PhD with Matt Stott

David Coombes - PhD with Renwick Dobson

Michael Currie - PhD with Renwick Dobson

James Davies - PhD with Renwick Dobson

Pavithran Devananthan - PhD with Natalia Kabaliuk and Paul Docherty

Jemima Ganderton - Masters with Vanessa Morris

Dylan Goldsmith - PhD with Vanessa Morris

Shelby Gray - Masters with Vanessa Morris

Aimee Harper - PhD with Renwick Dobson

Matthew Hawken - Masters with Daniel Holland

Sarah Heath - PhD with Vanessa Morris and Christoph Goebel

Sebastian Jones - Masters with Debbie Munro

Luckmore Kadzungura - PhD with Ken Morison and Fabian Dolamore

Te-Rina King-Hudson - PhD with Renwick Dobson

Anastasia Lazareva - Masters with Conan Fee

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Daniel Mak - PhD with Volker Nock and Renwick Dobson

Andrea Mascherpa - PhD with Antony Fairbanks

Hannah McKerchar - PhD with Renwick Dobson and Juliet Gerrard, in partnership with AgResearch

Moritz Miebach - PhD with Mitja Remus-Emsermann

Natasha Milton - Masters with Conan Fee

Dian Munoz - PhD with Renwick Dobson and Olivia Ogilvie

Michael Newton-Vesty - PhD with Renwick Dobson

Sevgi Onal - PhD with Volker Nock

Yuanjun (Bessie) Pei - PhD with Conan Fee

Nina Pernus - PhD with Debbie Munro

Simon Reid - PhD with Matt Watson

Matthew Rennie - Masters with Matt Watson

Sarah Sale - PhD with Ashley Garrill and Volker Nock in partnership with Landcare Research

Debolina Sarkar - PhD with Volker Nock

Rudolph Schlecter - PhD with Mitja Remus-Emsermann

Abigail Schwartfeger - Hons with Vanessa Morris, starting PhD next year

Hamish Trlin - PhD with Renwick Dobson and Olivia Ogilvie

Serena Watkin - PhD with Grant Pearce, Renwick Dobson and Volker Nock

Jerram Wood - Masters with Daniel Foley

David Wood - PhD with Renwick Dobson and Timothy Allison

Ziqi Yu - PhD with Grant Pearce, in partnership with AgResearch

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Aspiring Materials
Auckland Bioengineering Institute
Biomatters
Brain Research Institute
Bragato Research Institute
Callaghan Innovation
Canterbury Health Laboratories
Dawn Aerospace
Engender Technologies
Ferrier Research Institute, Victoria
University of Wellington
Fonterra Research Centre
GNS Science
Graymont Limited
Icehouse Ventures
Institute of Environmental Science & Research (ESR)
Kaitiaki Advisory Ltd
Landcare Research
Ligar
Lincoln University
MacDiarmid Institute for Advanced Materials and Nanotechnology
Massey University
Maurice Wilkins Centre for Molecular Biodiscovery, University of Auckland
Methanex
Mint Innovation
New Zealand Food Safety Science and Research Centre

New Zealand Institute for Plant and Food Research
New Zealand Product Accelerator
New Zealand Steel
Nilo Global Ltd
Pacific Aerospace
Pratt & Whitney
RAM3D
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Scion
Syft Technologies Ltd
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Venture Timaru
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Steve Lee, Australian National University
Kathleen Wood, Australian Nuclear Science and Technology Organisation
David Aragão, Australian Synchrotron
Timothy Ryan, Australian Synchrotron
Santosh Panjekar, Australian Synchrotron
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Heung-Chin Cheng, Bio21 Molecular Science and Biotechnology Institute, University of Melbourne
Paul Gooley, Bio21 Molecular Science and Biotechnology Institute, University of Melbourne

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David Croucher, Garvan Institute of Medical Research
Jon Ince, GE Healthcare Life Sciences
Daniel Kolarich, Griffith University
Matthew Perugini, La Trobe University
Tatiana Soares da Costa, La Trobe University
Ashley Buckle, Monash University
Georg Ramm, Monash University
Hariprasad Venugopal, Monash University
Milton Hearn, Monash University
Sarah Atkinson, Monash University
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Rebecca Soffe, RMIT University
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Tracy Putoczki, University of Melbourne
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Renee Goreham, University of Newcastle
Alistair McTaggart, University of Queensland
Emma Livingstone, University of Queensland
Justin Cooper-White, University of Queensland
Gareth Denyer, University of Sydney
Joel Mackay, University of Sydney

Margaret Sunde, University of Sydney

Richard Payne, University of Sydney

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Avijit Chakrabartty, University Health Network

Borries Demeler, University of Lethbridge

Derek J Wilson, York University

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Stinus Lindgreen, Lundbeck A/S

Rute R da Fonseca, University of Copenhagen

France

Matthieu Sollogoub, Sorbonne Université

Germany

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Maud Bernard-Verdier, Freie Universität Berlin

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Thomas Brenner, Friedrich-Alexander-Universität Erlangen-Nürnberg

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Ivan Dikic, Goethe University

Julian Menges, Hahn-Schickard

Lars Barquist, Helmholtz-Centre for Infection Research (HZI)

Matthias Franzreb, Karlsruhe Institute of Technology

Anne-Laure Boulesteix, Ludwig-Maximilians-University

Michael Woolf, Max Planck Institute for Dynamics of Complex Technical

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Muge Kasanmascheff, Technical University of Dortmund

Hans Haase, Technische Universität Kaiserslautern

Bernd Reif, Technical University of Munich

Arman Nejad, University of Göttingen

Martin Suhm, University of Göttingen

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Sucharita Bose, Institute for Stem Cell Biology and Regenerative Medicine

Thanuja G. Setty, Institute for Stem Cell Biology and Regenerative Medicine

Vinod Nayak, Institute for Stem Cell Biology and Regenerative Medicine

Ireland

David Croucher, University College Dublin

Italy

Cesare Indiveri, University of Calabria

Japan

Claude Meffan, Kyoto University

Netherlands

Hans Aerts, Leiden University

Hermen Overkleeft, Leiden University

Sander van Kasteren, Leiden University

Francine Govers, Wageningen University & Research

Tijs Ketelaar, Wageningen University & Research

Fabien Abeille, Micronit

Henriëke Meijer, Micronit

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Experimental e Tecnológica (iBET)

Ana Moreira, Instituto de Biologia Experimental e Tecnológica (iBET)

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Sergey Krasnoshchekov, Lomonosov Moscow State University

Singapore

Ashar Malik, A*STAR

David Wardle, Nanyang Technological University

Rajkumar Velu, Singapore University of Technology and Design

Slovenia

Ales Podgornik, University of Ljubljana

Sweden

Ulf J Nilsson, Lund University

Rachel North, Stockholm University

James Davies, Stockholm University

Rosmarie Friemann, University of Gothenburg

Alexander Suh, Uppsala University

Inger Andersson, Uppsala University

Karin Valegård, Uppsala University

Switzerland

Edouard Boujo, Ecole polytechnique fédérale de Lausanne (EPFL)

Mark D Robinson, University of Zurich

United Kingdom

John Pieracci, Biogen

Meisam Bakhshayeshi, Biogen

Robert D Finn, European
Bioinformatics Institute (EMBL-EBI)

Richard Morris, John Innes Centre

Hannah Bridges, MRC Mitochondrial
Biology Unit

Pete Wallroth, Mummy's Star

David G Doak, Norwich University of
Arts

Patrick Gilbert, Purolite

Angela Yulia, University College
London Hospitals NHS Foundation
Trust

Arti Kara, University College London
Hospitals NHS Foundation Trust & UCL

Owen Thomas, University of
Birmingham

Eric Lang, University of Bristol

Ian Wilson, University of Cambridge

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Cambridge

David G McEwan, University of
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Adam Kirrander, University of
Edinburgh

Andrés Moreno Carrascosa,
University of Edinburgh

Simone Dimartino, University of
Edinburgh

Elena Sugrue, University of Glasgow

Carol V Robinson, University of
Oxford

Frances Platt, University of Oxford

Jeremy Keown, University of Oxford

James W. B. Moir, University of York

Nicole Wheeler, Wellcome Trust
Sanger Institute

United States of America

Roger Whitley, Air Products &
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Soichi Wakatsuki, Beckman Center

J Tanner Nevill, Berkeley Lights, Inc.

Daniel Patience, Biogen

Tadeu Carniero, Boston Metal

Haiwang Yong, Brown University

Peter M Weber, Brown University

Katherine Donovan, Harvard
University

Scott V Edwards, Harvard University

Timothy B Sackton, Harvard
University

Marty Sewick, JSR Life Sciences

Antoine Allanore, Massachusetts
Institute of Technology

Gregory P Fournier, Massachusetts
Institute of Technology

Vince Liotta, Merck

Nico Tjandra, National Institutes of
Health

Norman C Craig, Oberlin College

Elisar J Barbar, Oregon State
University

Sarah Clark, Oregon State University

Ramaswamy Subramanian, Purdue
University

Pankaj Karande, Rensselaer
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Steven Cramer, Rensselaer
Polytechnic Institute (RPI)

Roman S Schutski, Rice University

André O Hudson, Rochester Institute
of Technology

Anutthaman Parthasarathy, Rochester
Institute of Technology

Gregory A Babbitt, Rochester Institute
of Technology

Jamie S Mortensen, Rochester
Institute of Technology

Patrick Rynkiewicz, Rochester
Institute of Technology

Thomas Leustek, Rutgers University

Andy Tomlinson, Thermo Fisher
Scientific

Maira Lynch, Thermo Fisher Scientific

Luke P Lee, University of California,
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Chris Wilson, University of California,
San Francisco

Emre Brookes, University of Montana

Tom Laue, University of New
Hampshire

Abby van den Berg, University of
Vermont

Steven Gray, University of Texas
Southwestern Medical Center

Outputs

51 refereed
journal articles

26 conference
presentations

1 book chapter

1 patent

Journal Articles

Arif T., Currie M.J., Dobson R.C.J., Newson H.L., Poonthiyil V., Fairbanks A.J., North R.A., Rendle P.M. 2021. Synthesis of N-acetylmannosamine-6-phosphate derivatives to investigate the mechanism of N-acetylmannosamine-6-phosphate 2-epimerase. *Carbohydrate Research* 510

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Patents

Fee, C., Dimartino, S., Huber T. (2021) Separation medium

Conference presentations

Claude Meffan, Julian Menges, Fabian Dolamore, Conan Fee, Renwick Dobson, Volker Nock. 'Transistor off-Valve Based Feedback, Metering and Logic Operations in Capillary Microfluidics'. Oral presentation, 34th International Conference on Micro Electro Mechanical Systems (MEMS), Virtual, 25-29 January 2021

Sevgi Onal. Oral presentation, Fluids in New Zealand, Virtual, 27-29 January 2021

Yiling Sun. Oral presentation, MacDiarmid Institute Annual Symposium, Rotorua, New Zealand, 9 - 12 February 2021

Sevgi Onal. Oral presentation, MacDiarmid Institute Annual Symposium, Rotorua, New Zealand, 9 - 12 February 2021

Azadeh Hashemi. Poster presentation, MacDiarmid Institute Annual Symposium, Rotorua, New Zealand, 9 - 12 February 2021

Nicola Altenhuber. Oral presentation, MacDiarmid Institute Annual Symposium, Rotorua, New Zealand, 9 - 12 February 2021

Fairbanks, A. J. 'Protecting Group Free Transformations of Reducing Sugars

in Aqueous Solution'. Ferrier Institute, University of Victoria, Wellington, NZ. 13 April 2021

Fairbanks, A. J. 'Sugars and viruses; the roles that carbohydrates can play in both viral infection and immune evasion'. Ferrier Public Lecture, University of Victoria, Wellington, NZ. 14 April 2021

Conan Fee. Keynote address "Creative Engineering with a Product Focus", NZAIMS Annual Conference (NZ Association of Intermediate and Middle Schools) Beyond Buzzy Bees and Number 8 Wire, Christchurch, 27 May 2021

Fairbanks, A. J. 'Sugars and viruses; the roles that carbohydrates can play in both viral infection and immune evasion'. New Zealand Institute of Chemistry Branch Meeting, Christchurch, New Zealand. 3 June 2021

Sarah Sale. Oral presentation, Beyond Myrtle Rust AGM, Virtual, 13 July 2021

Nicola Altenhuber. Oral presentation, 72nd Annual Meeting of the International Society of Electrochemistry, Virtual/Jeju, South Korea, 29 August - 3 September 2021

Sevgi Onal. Oral presentation, 47th International Conference on Micro and Nanoengineering (MNE), Virtual/Turin, Italy, 20-23 September 2021

Kathryn Ford, Rebecca Newport, Catherine Bishop, Aaron Marshall, Matthew Watson. 'Metal extraction via molten oxide electrolysis – Preliminary research into decarbonising primary metal production'. Chemeca 2021 Virtual Conference. 27-28 September 2021

Yiling Sun. Poster presentation, 25th International Conference on Miniaturized Systems for Chemistry and Life Sciences, Virtual/Palm Springs, US, 10-14 October 2021

Conan Fee. UC Connect public lecture "The Art and Science of Perfumery", 20 October 2021

Sarah Sale. Oral presentation, 16th Congress of the Federation of Asian and Oceanian Biochemists and Molecular Biologists, Virtual, 22-25 November 2021

Debolina Sarkar. Oral presentation, 16th Congress of the Federation of Asian and Oceanian Biochemists and Molecular Biologists, Virtual, 22-25 November 2021

David Wood, the Federation of Asian and Oceanian Biochemists and Molecular Biologists, Virtual, 22-25 November 2021

Claudia Allan. Poster presentation, 16th Congress of the Federation of Asian and Oceanian Biochemists and Molecular Biologists, Virtual, 22-25 November 2021

Dylan Goldsmith. Poster presentation, 16th Congress of the Federation of Asian and Oceanian Biochemists and Molecular Biologists, Virtual, 22-25 November 2021

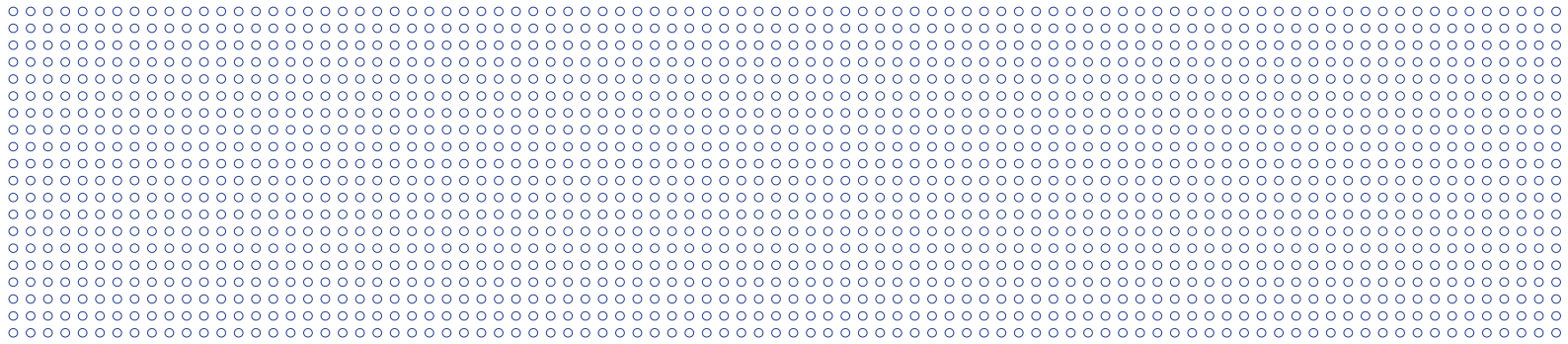
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Vanessa Morris. 'Amyloid fibril formation of the tumour suppressor p16'. Pacificchem 2021. 19 December 2021



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