

Biomolecular Interaction Centre

Annual Report 2022



Contents

- | | | | |
|---|--|----|----------------------------------|
| 1 | Director's Report | 7 | Profiling Postgraduate Research |
| 2 | Introducing our Kāhui Māori | 8 | BIC Collaborations and Spin Offs |
| 3 | BIC Research Stories | 9 | Our People |
| 5 | New Research Equipment | 13 | External Research Grants |
| 5 | BIC Symposium | 14 | BIC Grants Awarded |
| 5 | Profiling Postdoctoral Fellow Research | 15 | Financial Summary |
| | | 16 | Research Outputs |



Director's Report

The establishment of the Biomolecular Interaction Centre (BIC) fifteen years ago provided the opportunity to connect researchers across faculties and institutions to pursue collaborative projects related to interactions between biomolecules. Beginning with 27 investigators and initially led by Professors Juliet Gerrard and Conan Fee, the Centre has now grown to over 70 investigators including those based in cities around New Zealand and the world who continue to explore and apply biomolecular interactions.

This year Prof. Ren (Renwick) Dobson stepped down as Deputy Director in September. Ren has contributed to the success of BIC as Director, Co-Director, and Deputy Director roles over the past seven years, and will of course continue to do so as one of the centre's most successful researchers. Dr Vanessa Morris has now stepped into the role of Deputy Director, and I look forward to working with her to support the ongoing success of BIC and the BIC team.

This year also saw the establishment of the BIC Kāhui Māori group which provides strategic advice and support to BIC on Vision Mātauranga and wider Māori cultural matters. This will include enhancing BIC's cultural capabilities and engagement with Māori and creating an environment where all researchers and students including Māori can thrive. More information on the Kāhui Māori can be found on page 2 of this report.

During the year we retired the original four BIC research flagships and instead began describing BIC research in terms of five themes - environment, health, materials, sensors, and food. These themes provide a simpler explanation of what we do in BIC making it easier for a broader (non-academic) audience to understand the value and impact of BIC research. Examples of research across these five areas are described on pages 3 and 4 of this report.

In 2022, 240 publications were produced by BIC researchers. External funding in 2022 exceeded \$3,600,000, through MBIE, the Royal Society of New Zealand, Canterbury Medical Research Fund, and a range of other funds, including collaborations with other universities and industries. The development of new companies by BIC members continued with the establishment of Opo Bio, a B2B cultivated meat company by Dr Olivia Ogilvie and collaborators, and the conceptualisation of Winealyse as a company to rapidly assess wine samples by PhD student, Daniel Mak.

November 2022 saw the return of the BIC symposium which was held at the University of Canterbury. A diverse range of topics were presented which are summarised on page 5.

Where next?

In 2023, we will continue to play to our strength of connecting researchers with diverse expertise to explore, develop and apply new areas of science and technology to solve meaningful problems. This will include continuing to develop our network of collaborators and colleagues, with a particular emphasis on expanding our international connections, in alignment with UC's focus on internationalisation. We will also provide opportunities for BIC members to share and develop their skills through a range of activities including grant writing workshops, social events and the 2023 BIC Symposium.

Professor Matt Watson
BIC Director

From left to right:
Dr Abigail Sharrock,
Dr Elsie Williams (ex U Canterbury)
and Professor David Ackerley

Introducing our Kāhui Māori

The BIC Kāhui Māori was established in March 2022 to provide BIC with strategic advice and support on Vision Mātauranga and wider Māori cultural matters. The group meets four times a year with providing advice and supporting encompassing research, building Māori research capacity, and increasing BIC's cultural capabilities and engagement with Māori. It will also provide a greater focus on Māori needs and values while enhancing Māori contribution to New Zealand's scientific pursuits. In addition, the Kāhui will support the BIC's goal of ensuring it is a culturally safe environment for Māori researchers and students to thrive.

The Kāhui Māori includes the BIC Director (Professor Matt Watson) and Deputy Director (Dr Vanessa Morris), Professor Ren Dobson, and the BIC Manager (Dr Michael Edmonds) in addition to the following external members:

Henare Edwards

Te Rarawa, Te Aupouri, Ngati Kahu, Ngati Whatua, Nga Puhi, Ngati Maniapoto. Chair Te Runanga o Nga Maata Waka Inc, Iwi from the North Island and deputy Chair of Te Waipounanu Maori District Council.

Henare is a consultant to various New Zealand Government agencies and officials including (but not limited to) the Justice Department, Kiwi Rail, the Canterbury District Police Commander, and Corrections Commissioner, and is the Kaumatua Nga Hau E Wha National Marae in Otautahi, Kaumatua Rehua Marae. Henare is co-chair Bioprotection Aotearoa, a Centre of Research Excellence, Lincoln University, Te Reo Māori me ona tikanga, (Maori language and Protocols and processes) and provides cultural support to other tertiary institutions including The University of Canterbury (UC).

Professor Amanda Black

Tūhoe, Whakatōhea, Te Whānau-ā-Apanui (Lincoln University) is a Rutherford Discovery Fellow and Director of Bioprotection Aotearoa, a Centre of Research Excellence. Amanda brings her international expertise in co-developed, community-led research and considerable research leadership experience. Amanda has led work on public attitudes to novel pest control methods, public discussions on novel genetic technologies, and brings a wealth of experience in science and Te Ao Māori. Amanda was awarded Te Tupu-ā-Rangi Award for Health and Science at the Matariki Awards, in 2019 and the MPI NZ Biosecurity Award 2018.

Brendon Greene

Ngati Hikairo, Ngapuhi, Waikato Tainui. Brendon brings a broad background from a career spanning 30 years in NZ and offshore. His experience includes technical and commercial roles with NZ Dairy Board, Contact Energy, GE Energy, Mercury Energy and over the last decade has held advisory and governance roles with Watercare, Hiringa Energy, Scion, Tainui Kawhia Incorporation, Waikato Tainui and government's reforms for education where he is a member of Taumata Aronui, Workforce Development Council Construction-Infrastructure and is Co-Chair of the Waikato Regional Skills Leadership Group. Brendon brings deep experience developing power stations (thermal, wind, geothermal and solar), is active in hydrogen, Three Waters and Ironsands. He holds a degree in Chemical Engineering from Canterbury University and a Post Graduate Diploma in Dairy Science & Technology from Massey University.

Tipene Merritt

Ngāti Kauwhata, Ngāpuhi, Rangitāne and Ngāi Te Rangi, is Kaiārahi Rangahau Māori for UC's Research and Innovation Office. A goal as Kaiārahi (guides or mentors) is to boost mātauranga Māori (Māori knowledge) capability across the university by supporting researchers across colleges and working in partnership with UC's Ngāi Tahu Research Centre. Tipene has been working in research management for over 12 years, has a Bachelor and Master of Laws from the University of Waikato and is currently working on a PhD that's focused on improving mātauranga Māori outcomes.



BIC Research Stories

Developing a Better and Broader Understanding of Endometriosis

(Health)

Research being carried out by Assoc. Prof. Debbie Munro (Mechanical Engineering), Dr Rachael Wood (Chemical and Process Engineering (CAPE)) and PhD student Katie Ellis (CAPE) is providing a deeper understanding of the issues associated with the diagnosis and treatment of endometriosis, while also seeking to better understand the biology of endometriosis with an aim to find new treatments.

A survey of women affected by endometriosis carried out by the researchers identified significant shortcomings of how endometriosis is currently treated with women

suffering long delays (of up to 8 years), poor diagnosis and variability in the effectiveness of the treatments being used. The research received significant media interest.

<https://www.stuff.co.nz/national/health/129777936/dismissive-doctors-and-diagnosis-delays-worsening-endometriosis-suffering>

<https://www.abc.net.au/radio/newsradio/podcasts/news-specials/lengthy-wait-for-endometriosis-diagnosis/14063654>

The research team has also studied endometriosis cell line invasion relative to cancer cell lines, demonstrating that endometriosis has a comparatively high invasive capability. Research is ongoing with the hope of characterising the behaviour of endometrial cells and how they invade tissues.

TRAP Transporter Proteins

(Health)

One of the projects being explored by Prof. Renwick Dobson and his team is how pathogenic bacteria use TRAP membrane transport proteins to move different small molecules in and out of cells. Understanding of how these proteins function will support the development of new microbials to combat bacterial infections. The Dobson group recently determined the first atomic-resolution structure of a TRAP transporter, which has provided unique molecular insights into how these transporters work. The award of Marsden funding (\$937,000) in 2022 is now furthering this research to test their hypothesis that these proteins use a novel elevator-type mechanism and explore potential applications.



Non-invasive Sap Flow Measurement for Reliable Syrup Yield Predictions

(Sensors, Food, Environment)

New Zealand climatic conditions have the potential to support the development of a maple syrup industry in New Zealand, however, the mechanisms of sap flow are not well understood. This project explores the non-invasive study of sap flow mechanisms using enhanced imaging techniques to better understand sap flow. Earning a \$1 million grant from Ministry of Business, Innovation and Employment (MBIE)'s Smart Ideas in 2021, this research continued to grow in 2022. A Tree Syrup workshop in November 2022 was attended by 28 people allowing a sharing of diverse expertise from harvesting to syrup production and imaging. Attendees included Assoc. Prof. Abby van den Berg, who is Assistant Director of the University of Vermont Proctor Maple Research Centre.

As well as maple, the project is also exploring the potential of other trees, including birch and selected trees native to New Zealand as possible sources of valuable sap products.

A website to connect those interested in tree syrup research in New Zealand has also been established at <https://www.treesyrup.nz/>

Applications of Microfluidics to the Wine Industry

(Sensors, Food)

The initial exploration of the use of capillary microfluidic assays for wine diagnostics in 2021 continued to bear fruit in 2022 for PhD student, Daniel Mak and his supervisors Assoc. Prof. Volker Nock, Prof. Ren Dobson, and Dr Tanya Rutan (Bragato Research Institute).

With funding awarded by Kiwinet Emerging Innovator Programme, the Food, Fibre and Agritech Supernode Challenge, and the MacDiarmid Institute for further development and commercialisation of the technology, field trials are planned at wineries in Blenheim in 2023. The award of MBIE funding (\$1,000,000) to Prof. Dobson and Assoc Prof Nock has provided further support for this project, including the addition of Dr Azy Hashemi to the team, while funding from the New Zealand Winegrowers Research Centre and Bragato Research Centre is providing financial support for Daniel's PhD.

Menaquinone Biosynthesis Bacterial Enzyme Systems

(Health)

Dr. Jodie Johnston and her team continue to work on menaquinone biosynthesis (vitamin K2) bacterial enzyme systems developing a number of new insights on the conservation of feedback regulation across bacterial species (pathogens and biotechnology relevant bacteria included). They have also obtained insights into the allosteric regulatory mechanisms which have allowed them to successfully manipulate it by protein engineering. Some of this research has recently been published (<https://royalsocietypublishing.org/doi/10.1098/rstb.2022.0035>). This work has in part been funded from Canterbury Medical Research Fund (CMRF) and BIC funding sources.

Sustainable is Attainable Research Programme

(Food & Environment)

The Sustainable is Attainable research programme explores sustainable by-product management by a group of South Canterbury

food processors and manufacturers, with a focus on alternative uses to current waste and by-products.

Funded by Callaghan Innovation in collaboration with the New Zealand Product Accelerator the project began with analysis and quantification of the by-products produced by 22 businesses in South Canterbury in 2019/2020. This information was subsequently used to develop projects within the Biomolecular Interaction Centre to explore new uses for the waste and by-products. These include:

- developing cell culture nutrients from brewery spent yeast
- extracting nutraceuticals and cosmetic base materials from plant waste (apricot kernels)
- exploring the conversion of dairy and other industry waste into bio-hydrogen fuel
- the use of food waste materials as soil conditioners
- use of waste plastics and diatomaceous earth to produce non-slip paving tiles.

Building Devices to Explore Microbiome-Plant Communications

(Environment, Health, Food)

A multi-disciplinary collaboration between Dr. Artemio Mendoza (Lincoln University), Dr. Claudia Meisrimler (Biology, UC) and Assoc. Prof. Volker Nock (Electrical Engineering, UC) saw the development of Root-TRAP devices designed to study the molecular and cellular level communications that occur between plant roots and the microbes associated with them. BIC Seed funding supported this research in the construction and use of Root-TRAP devices, publication fees, and qPCR and gene sequencing of rhizosphere microbial community of plants inoculated with diverse endophytic microorganisms affected in secondary metabolism.

Analysis of Illicit Substances by Benchtop NMR

(Health, Environment)

Professor Daniel Holland received \$120k in funding from the Institute of Environmental Science and Research (ESR) to support a PhD student to study the *Automated NMR Analysis of Illicit Substances*. This research is a key step in establishing NMR as a tool in harm reduction and forensic analysis of illicit substances.



New Research Equipment

Drs Vanessa Morris and Christoph Goebel have recently established the Southern BioNMR Centre, with the purchase and installation of a Bruker 600 MHz Avance III NMR (Nuclear Magnetic Resonance) spectrometer with a triple-resonance probe and a cooled SampleJet, which allows for automated measurement of large numbers of samples.

This is an optimal set up for measurement of clinical samples and the only one of its kind in Aotearoa New Zealand currently. Our instrument also allows for analysis of large biological molecules, such as proteins, nucleic acids, and carbohydrates.

BIC Symposium



The BIC Symposium was held on the 21st of November at the University of Canterbury, attracting over 60 attendees. In addition to plenary talks by Prof. Dame Julia Gerrard (“Science & Government: How does it Work and can Science Make a Difference?”) and Assoc. Prof. Abby van den Berg (“Impacts of Membrane Separation of Maple Sap on Syrup Composition and Flavour”) other talks explored a broad range of topics as follows:

- “The Experiences and Priorities of Endometriosis Patients in New Zealand”
Katie Ellis, UC
- “Formulating Businesses: Using Surface Chemistry to Solve Problems with Entrepreneurs”
Dr Grant Bennett, Ara Institute of Canterbury

- “3D Printed TPMS Heat Exchange Structures”
Dr. Ben Reynolds
- “Research Commercialisation”
Dr. Ashwath Sundaresan, Pacific Channel
- “Solution NMR Spectroscopy for Biological Samples”
Dr. Christoph Goebel, Centre for Free Radical Research, University of Otago
- “Revolutionising Bio-separations using 3D Printing”
Dr. Sean Feast, Precision Chroma.

The symposium also provided an opportunity to collectively celebrate the 15th birthday of the Biomolecular Centre, with the adjacent photograph showing a celebratory cake being cut by some of the early members of the Centre.

Postdoctoral Fellow Research

We are lucky to have a large cohort of externally funded fellows working on a range of research projects and we have funded several short-term fellowships directly from our Centre. Here, we profile some of the 2022 cohort.

Dr Xin Qiu

Xin is working with Prof. Antony Fairbanks in the Carbohydrate Chemical Biology group. He 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.

Xin received his Master of Science degree at Maynooth University, Ireland. His thesis was titled: Synthesis and Evaluation of New Antimicrobial Agents and Novel Organic Fluorophores. He then completed his PhD in Chemistry at the University of Canterbury where he worked on the methodology development of protecting group free glycosylation of carbohydrates.

Dr Olivia Ogilvie

Olivia is working with Prof. Ren Dobson and Dr Laura Domigan on cultivated meat food matrix structure, interactions and allergens. She also works on celiac disease through Health Research Council (HRC) funding which examines the composition of the microbiome in people with and without celiac disease and the effect of the microbiome of gluten digestion.

Olivia completed her Undergraduate and Honours studies at University of Canterbury, then moved to the University of Auckland to complete her PhD under supervision of Prof. Dame Juliet Gerrard and Dr Laura Domigan.

Her PhD looked at gluten protein digestion and the effect of food matrix structure on the release of digestion resistant peptides that cause celiac disease.

Dr Ben Reynolds

Ben is working with Prof. Daniel Holland on the 3D printed porous media project, focusing on the heat transfer side. The aim of this part of the project is to utilise different 3D printing technologies to fabricate novel geometries, and experimentally test them to identify those with heat transfer capabilities beyond those of conventional designs. These geometries may then be incorporated into next-generation heat exchanger designs. Ben completed his undergraduate and PhD studies here in CAPE at UC and has remained with the group as a postdoctoral fellow.

Dr Heather Shearer

Heather is working with Prof. Ren Dobson at the University of Canterbury and Dr. Nina Dickerhof and Prof. Mark Hampton in the Centre for Free Radical Research at the University of Otago, Christchurch. Her research is investigating ways to sensitise human pathogens to oxidative stress by characterising key proteins involved in bacterial defence and identifying inhibitors thereof.

Prior to her Postdoctoral research, Heather completed her Bachelor and Master's degrees in Biological Sciences at the University of Canterbury. She then went on to complete her PhD at the University of Otago in the Department of Pathology and Biomedical Science in Christchurch.

Dr Azadeh (Azy) Hashemi

Azy is working with Prof. Renwick Dobson and Assoc. Prof. Volker Nock on an MBIE funded project developing a capillary platform for real-time diagnostic devices. She is working with BIC PhD student, Daniel Mak, to develop a wine-testing device as a proof of concept.

Azy finished her PhD at the University of Canterbury in 2018 in the Electrical and Computer Engineering Department, and since has completed a BIC and a Rutherford postdoctoral fellowship. Azy is originally from Iran and did her Undergraduate and Master's degrees in Iran prior to moving to New Zealand to do her PhD in 2014.

Dr Rachel Bennie

Rachel completed her undergraduate and postgraduate studies at the University of Canterbury. Her PhD was under the supervision of Prof. Ian Shaw and focussed on understanding the molecular interactions of estrogenic compounds found in our food and the environment with two key binding sites on estrogen receptor alpha. Rachel took up a post-doctoral position with Prof. Ren Dobson and is working on the New Zealand-Singapore Future Foods project funded by MBIE Catalyst Fund. Her work focuses on developing plant-based scaffolds to grow bovine, porcine and ovine satellite cells in to produce hybrid meat products. This work will contribute to our understanding of the interactions between plant-based proteins and cultured livestock cells in a food matrix to improve the nutritional value and processability of hybrid meats.

Profiling Postgraduate Research

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 scholarships. Some of the BIC postgraduate students are profiled below.

Matt Rennie

Sap flow characterisation of *Acer saccharum* in NZ

Matt Rennie is a PhD student, co-supervised by Prof. Matt Watson and Assoc. 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 test sites planted outside of Hanmer Springs and Geraldine, 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.

Te-Rina King-Hudson

(Whakatōhea, Ngāti Pikiao)

Redox homeostasis and regulation of peroxiredoxin-2 in red blood cells

Te-Rina King-Hudson is a PhD student whose research centres around the redox protein peroxiredoxin-2 in red blood cells and exploring applications of a novel assay based on its unique redox properties.

Their research is based within the Centre for Free Radical Research group at the University of Otago, Christchurch, but involves several researchers from the Biomolecular Interaction Centre at University of Canterbury, and ongoing collaboration with the Dunedin Study Multidisciplinary Health and Development Study Research Unit.

Before starting their PhD, Te-Rina also completed a Bachelor of Science with Honours at the University of Canterbury under the supervision of Ren Dobson, with a focus on structural biology.

Passionate about health research and innovation, hauora Māori, and equity within science, they became Kaitohutohu ahurea for the Centre for Free Radical Research in 2022 and hope to develop this kaupapa further after completing their PhD.

Navid Erfani

A novel method to design monolithic catalysts for non-isothermal packed-bed reactors using topology optimisation

This research investigates the application of topology optimisation to the design of

monolithic catalysts for packed-bed reactors with endothermic reactions. Using the density-based method, the optimisation problem is formulated as a catalyst distribution problem. The catalyst volume fraction of elements in the discretised design domain determines the geometry of the monolithic structure and consequently the momentum, heat, and mass transfer characteristics of the reactor. The Globally Convergent Method of Moving Asymptotes (GCMMA) was employed to solve the optimisation problem. The effects of initial guesses, the energy dissipation constraint, and the Peclet number on the design are investigated in a 2D framework. Then through a 3D optimisation, a complex structure with enhanced mass transfer, thermal, and hydraulic behaviour is developed. Compared to a reference honeycomb geometry with the same catalyst volume fraction, the resulting 3D optimised geometry shows quantitative improvements in terms of the conversion and pressure drop. The research resulted in a peer-reviewed paper published in Chemical Engineering Science journal.

Navid completed his undergraduate and masters' studies at Azad University before moving to the University of Canterbury to pursue his PhD under the guidance of Professor Matt Watson. His research focused on applying topology optimisation to the design of monolithic catalysts for packed-bed reactors. Currently, Navid is a postdoctoral fellow at the Department of Chemical and Process Engineering, where he is working on expanding his approach for industrial applications.

Daniel Mak

Winealyse – Development and commercialisation of capillary microfluidic devices for wine industry diagnostic

Daniel is working on developing new testing devices for the wine industry using capillary microfluidics. These devices will be able to test for analytes in samples during the winemaking process easier, faster, and cheaper than other testing methods. Additionally, they have the benefit of being small, portable, and automated, meaning they can be used by anyone, anywhere. Daniel is also focusing on the development of a business around this new technology, aiming to commercialise the research and drive impact through innovation.

During his PhD, Daniel has received multiple awards/grants (UC Innovation Jumpstart, FFA Challenge research runner-up, MacDiarmid Institute Seed Funding, and MBIE Smart Ideas) and been invited to participate in professional and business development programmes (Kiwinet Emerging Innovator, Food, Fibre and Agritech Challenge, Sprout Agritech Accelerator, and Exp90).

BIC Collaborations and Spin Offs

One of the strengths of the Biomolecular Interaction Centre is its' collaborations with other groups. Below we profile two very different collaborations with BIC – a spin off company and our long-term collaboration with Callaghan Innovation

Callaghan Innovation

2022 marked ten years since Callaghan Innovation's Protein Science and Engineering team co-located at the University of Canterbury alongside the Biomolecular Interaction Centre. It also saw the departure of founding Team Leader Dr Andrew Muscroft-Taylor to Leaft Foods.

The co-location of the Protein Science and Engineering team with BIC provides the opportunity for both groups to share expertise and equipment, and a valuable connection for BIC staff and students with industry. The Callaghan Innovation team regularly interact with BIC PhD students with many of the current team being former BIC students and/or UC graduates.

Research carried out by the Protein Science and Engineering team include recombinant protein design, production and purification, synthetic biology, DNA assembly and metabolic pathway engineering, biochemical and biophysical protein analysis, enzyme and immunological assay development and cell-based bioassays.

Current team members include Drs Elizabeth Dunn, Jenna Gilkes, Craig van Dolleweerd, Dion Thompson and Campbell Sheen.

Precision Chroma

Precision Chroma is a UC spin out company, developing a 3D printed bio-separation technology to simplify the manufacturing processes used to produce biologically derived pharmaceuticals, such as monoclonal antibodies for immunotherapy. The bio-separation technology involved was first envisaged by Prof. Conan Fee (University of Canterbury) and aspects of its development were supported first in 2013 by a \$2 million Smart Ideas grant followed by a \$9.8 million MBIE Endeavour grant in awarded in 2019. This technology is being scaled up and tested for a variety of uses in the biological purification and separation industry, under the guidance of Precision Chroma CEO, Dr Sean Feast.

The Precision Chroma team include:

Dr Sean Feast

Sean is the founder and CEO of Precision Chromatography (Precision Chroma). Sean completed both his undergraduate degree and PhD in Chemical and Process Engineering at the University of Canterbury. Sean worked on the 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 focused on developing 3D printed chromatography columns with applications across life sciences.

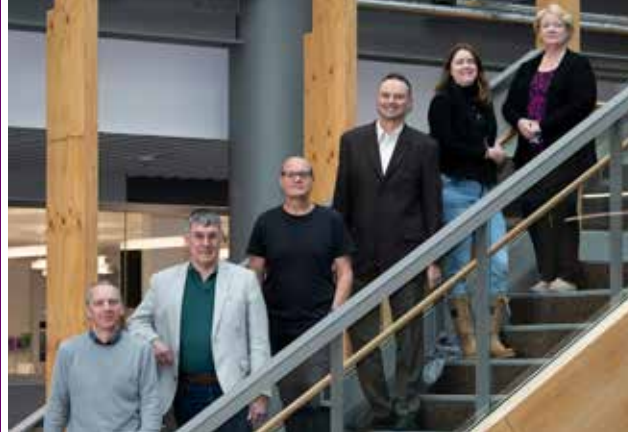
Dr Fabian Dolamore

Fabian holds the role of Principal Scientist at Precision Chromatography where he is focused process development and scale up of 3D printed chromatography columns. Fabian completed both his undergraduate degree and PhD in Chemical and Process Engineering at the University of Canterbury.

Vivek Menon

Vivek Holds the role of Research Assistant at Precision Chroma where he helps develop and test our 3D printed chromatography columns, focusing on optimising the separations process. Vivek completed both his undergraduate degree in Chemical and Process Engineering at the University of Canterbury.

Our People



BIC Management team
Left to right: Stuart Lansley,
Michael Edmonds,
Ren Dobson, Matt Watson,
Vanessa Morris and
Penny Moore

Principal Investigators

Prof. Matt Watson, BIC Director, Chemical & Process Engineering, University of Canterbury

Dr Vanessa Morris, Deputy BIC Director, School of Biological Sciences, University of Canterbury

A/Prof. Deborah Crittenden, Physical and Chemical Sciences, University of Canterbury

Prof. Antony Fairbanks, Physical and Chemical Sciences, University of Canterbury

Prof. Conan Fee, Head, School of Product Design, University of Canterbury

A/Prof. Paul Gardner, School of Biomedical Sciences, University of Otago

Prof. Juliet Gerrard, Biological Sciences, University of Auckland

Prof. Renwick (Ren) Dobson, School of Biological Sciences, University of Canterbury

A/Prof Debbie Munro, Mechanical Engineering, University of Canterbury

A/Prof. Volker Nock, Electrical and Computer Engineering, University of Canterbury

Prof. Emily Parker, Wellington Faculty of Science

Dr Grant Pearce, School of Biological Sciences, University of Canterbury

Prof. Anthony Poole, Biological Sciences, University of Auckland

Associate Investigators

Dr Pram Abhayawardhana, School of Product Design, University of Canterbury

A/Prof. David Ackerley, School of Biological Sciences, Victoria University of Wellington

A/Prof. Azam Ali, Faculty of Dentistry, Division of Health Sciences, University of Otago

Prof. Maan Alkaisi, 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

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

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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, Plant & Food Research

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

Dr Daniel Foley, School of Physical and Chemical Sciences, University of Canterbury

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

Prof. Peter Gostomski, Department of Chemical and Process Engineering, University of Canterbury

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

Dr Duane Harland, AgResearch

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

A/Prof. Shaun Lott, School of Biological Sciences, University of Auckland

A/Prof. Peter Mace, Department of Biochemistry, University of Otago

Dr Evelyne Maes, AgResearch

A/Prof. Aaron Marshall, Department of Chemical and Process Engineering, University of Canterbury

Dr Claudia Meisrimler, School of Biological Sciences, University of Canterbury

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

A/Prof. Ken Morison, Department of Chemical and Process Engineering, University of Canterbury

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

Dr Andrew Muscroft-Taylor, Callaghan Innovation

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

Dr Ali Reza Nazmi, School of Product Design, University of Canterbury

Dr Leonardo Negrón, Callaghan Innovation

Dr Amy Osborne, School of Biological Sciences, University of Canterbury

Prof. David Palmer, Faculty of Agriculture and Life Sciences, Lincoln University

Dr Liping Pang, Institute of Environmental Science & Research

Dr Heon Park, Department of Chemical and Process Engineering, University of Canterbury

A/Prof. Wayne Patrick, School of Biological Sciences, Victoria University of Wellington

Dr Steve Pawson, School of Forestry, University of Canterbury

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

Dr Phillip Rendle, Ferrier Research Institute, Victoria University of Wellington

Prof. Brett Robinson, School of Physical and Chemical Sciences, University of Canterbury

Dr Mak Sarwar, Obstetrics and Gynaecology, University of Otago

A/Prof. Mark Staiger, Department of Mechanical Engineering, University of Canterbury

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

Dr Adele Williamson, Department of Biological Sciences, University of Waikato

Dr Rachael Wood, Chemical and Process Engineering, University of Canterbury

A/Prof. Tim Woodfield, Department of Orthopaedic Surgery & Musculoskeletal Medicine, University of Otago

Management Staff & Research Staff

Dr Michael Edmonds, Institute Manager

Penny Moore, Administrator

Postdoctoral Researchers

Dr Clara Bah

Dr Feng Cao

Dr Michael Coe

Dr Michael Currie

Dr Navid Erfani

Dr Azadeh Hashemi

Dr Thu Ho

Dr Juby Math

Dr Olivia Ogilvie

Dr Ben Reynolds

Dr Heather Shearer

Dr Yiling Sun

Dr Ayelen Tayagui

Dr Joshua Wright

Other Research Related Roles

Dr Joshua Leung (Software Engineer)

Vince Verwilligen (Software Developer)

Postgraduate Students

Claudia Allan - PhD with Volker Nock and Claudia Meisrimler

Jin Ang - PhD with Ren Dobson and Olivia

Ogilvie

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 Leafit 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

Katie Ellis - PhD with Rachael Wood

Jemima Ganderton - Masters with Vanessa Morris

Dylan Goldsmith - PhD with Vanessa Morris

Shelby Gray - Masters with Vanessa Morris

Honey Gupta - PhD with Mark Staiger

Aimee Harper - PhD with Renwick Dobson

Matthew Hawken - PhD with Daniel Holland

Sarah Heath - PhD with Vanessa Morris and Christoph Goebel

Sebastian Jones - Masters with Debbie Munro

Aditya Joshi - PhD with Mark Staiger

Luckmore Kadzungura - PhD with Ken Morison and Fabian Dolamore

Te-Rina King-Hudson - PhD with Renwick Dobson

Anastasia Lazareva - Masters with Conan Fee

Michael Love - PhD with Renwick Dobson, in partnership with ESR

Daniel Mak - PhD with Volker Nock and Renwick Dobson

Andrea Mascherpa - PhD with Antony Fairbanks

Hannah Mc Kerchar - 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 Schwartzfeger - 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

New BIC Team Members

New Associate Investigators

Dr Hossein Najaf Zadeh joined the University of Canterbury as a lecturer in February 2022 in the School of Product Design. His expertise includes the additive manufacturing of hydrogels.

Dr Christoph Goebel is a Principal Investigator at the Centre for Free Radical Research, Department of Pathology and Biomedical Science, University in Otago who specialises in solution NMR spectroscopy for measurements of proteins and small molecules

New Managers & Administrative Support

Dr Michael Edmonds joined the Biomolecular Interaction Centre as Manager in June 2022. Michael has a PhD in organic chemistry, and spent the last 20 years in the polytechnic sector as a lecturer, researcher and head of department before resigning in 2020 to complete his Master's degree in Industrial and Organisational Psychology.

Dr Stuart Lansley started as Programme Manager for the the 3D Printed Porous Media MBIE Endeavour-funded project in April 2022. Stuart manages the Clean Water Technology SFTI-funded project in the Department of Civil & Natural Resources Engineering He has a PhD in Electrical & Electronic Engineering (Electronic Materials). He has taught Electrical Engineering and worked in the innovation, commercialisation, and investment space.

Penny Moore rejoined the BIC team in 2022 to support the day to day running of BIC. Penny has come full circle having been involved in the initial set up of BIC 15 years ago.

Our Network

New Zealand

Aeroqual
AgResearch
Air New Zealand
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
Rhandegund Life Sciences
Riddet Institute, Massey University
Scion
Syft Technologies Ltd
Te Roroa
UC Motorsport
University of Auckland
University of Otago
University of Waikato
Venture Timaru
Victoria University of Wellington

Australia

Michael Gorman, ACRF Rational Drug Discovery Centre
Marat Sibae, Australian National University
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
Craig Morton, Bio21 Molecular Science and Biotechnology

Institute, University of Melbourne
Heung-Chin Cheng, Bio21 Molecular Science and Biotechnology Institute, University of Melbourne
Paul Gooley, Bio21 Molecular Science and Biotechnology Institute, University of Melbourne
Michael Griffin, Bio21 Molecular Science and Biotechnology Institute, University of Melbourne
Michael Parker, Bio21 Molecular Science and Biotechnology Institute, University of Melbourne
Mark Chadderton, Chevron
Jared Raynes, CSIRO Agriculture and Food
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
Céline Valéry, RMIT University
Rebecca Soffe, RMIT University
Evgeny Sagulenko, SOSBio
Oliver Sterritt, Telix Pharmaceuticals
James Murphy, The Walter and Eliza Hall Institute of Medical Research
David Adelson, University of Adelaide
Tracy Putoczki, University of Melbourne
David Collings, University of Newcastle
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

Austria

Alois Jungbauer, Austrian Centre of Industrial Biotechnology, University of Natural Resources and Life Sciences

Canada

Erika Plettner, Simon Fraser University
Avijit Chakrabarty, University Health Network
Borries Demeler, University of Lethbridge
Derek J Wilson, York University

Denmark

Stinus Lindgreen, Lundbeck A/S
Rute R da Fonseca, University of Copenhagen

France

Mathieu Sollogoub, Sorbonne Université

Germany

Marc P Hoepfner, Christian-Albrechts-University of Kiel
Maud Bernard-Verdier, Freie Universität Berlin
Robert Weiss, Friedrich-Alexander-Universität Erlangen-Nürnberg
Thomas Brenner, Friedrich-Alexander-Universität Erlangen-Nürnberg
Alexandra Stolz, Goethe University
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 Systems
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

India

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
Henriette Meijer, Micronit

Portugal

Cristina Piexoto, Instituto de Biologia Experimental e Tecnológica (iBET)
Ricardo Silva, Instituto de Biologia Experimental e Tecnológica (iBET)
Ana Moreira, Instituto de Biologia Experimental e Tecnológica (iBET)
Mafalda Moleirinho, Instituto de Biologia Experimental e Tecnológica (iBET)
Manuel Carrondo, Instituto de Biologia Experimental e Tecnológica (iBET)
Paula Alves, Instituto de Biologia Experimental e Tecnológica (iBET)
Cláudio Gomes, University of Porto

Russia

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
Sean R A Devenish, University of Cambridge

David G McEwan, University of Dundee

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 & Chemicals
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 Polytechnic Institute (RPI)
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
Moirá Lynch, Thermo Fisher Scientific
Luke P Lee, University of California, Berkeley
Albert J Mach, University of California, Los Angeles
Shuqi E. Wang, University of California, Los Angeles
Adam J Engler, University of California, San Diego
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

External Research Grants

Ongoing Grants

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)

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)

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. 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)

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

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)

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)

Dr Timothy Allison: Structural studies of membrane protein targets from pathogens. NZ Synchrotron Group Ltd. \$20,000 (2021 - 2024)

Prof. Renwick Dobson, Dr Claudia Meisrimler: RA₃ RNAi for myrtle rust control. Plant & Food Research. STBA (2022 - 2024)

Prof. Renwick Dobson, A/Prof. Volker Nock: Developing diagnostic devices for the wine industry and other users. New Zealand Winegrowers Research Centre Ltd & Bragato Research Institute. \$50,000 (2022 - 2024).

Prof. Renwick Dobson: Structural studies of membrane protein targets from pathogens. New Zealand Synchrotron Group Ltd. \$20,000 (2022 - 2024).

Professor Renwick Dobson: Project 3.2: Recombinant technology for food protein production. Massey University. \$227,500 (2022 - 2024)

Prof. Renwick Dobson: Novel antibacterial enzyme for Gram-negative pathogens. Institute of Environmental Science & Research Ltd. (ESR). \$102,000 (2022 - 2025)

Prof. Renwick Dobson: Trapped in an elevator" project will study membrane transport proteins as potential targets for new antimicrobial drugs. Te Pūtea Rangahau a Marsden grant \$937,000 (2022 - 2025)

Prof. Renwick Dobson, A/Prof. Volker Nock: Commercialisation SEED funding development of microfluidic devices targeted at the wine industry. Victoria University of Wellington. \$25,000 (2022 - 2024)

Prof. Renwick Dobson, Assoc. Prof Volker Nock: A simple capillary platform for real-time diagnostic devices: In-house wine testing as proof-of-principle. Ministry of Business, Innovation & Employment. \$1,000,000 (2022 - 2025).

Dr Renwick Dobson, Dr Michael Currie: Developing inhibitors to bacterial TRAP transporters. Canterbury Medical Research Foundation. \$110,000 (2023 - 2024)

Prof. Conan Fee, Prof. Richard Green, Prof. Daniel Holland, Prof. Matt Watson, Dr Don Clucas, Dr Digby Symons, Dr Hossein Najaf Zadeh, Dr Ken Morison: 3D printed chromatography columns. Precision Chromatography Ltd. \$84,800 (2022 - 2023)

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

Prof. Daniel Holland: Understanding maple sap exudation using micro computed tomography. New Zealand Synchrotron Group Ltd \$12,000 (2021 - 2023)

Dr Jodie Johnston: Understanding internal communications with proteins. Royal Society of New Zealand. \$703,167 (2018 - 2023)

Dr Vanessa Morris, Dr Christoph Goebel: Understanding the role of the aryl hydrocarbon receptor in cancer. University of Otago. \$20,000 (2022 - 2023)

Dr Olivia Ogilvie: Investigating the diet-microbiome connection in paediatric coeliac disease. Health Research Council. \$229,098 (2022 - 2025)

Assoc. Prof. Matthew Stott: Waerau waikawa iti rongoā patuopoi: New Generation peptide antibiotics. University of Auckland. \$390,621 (2020 - 2025)

Grants completed in 2022

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

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

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)

Dr Renwick Dobson: The bifunctional proteins of candidatus liberibacter solanacearum. University of Canterbury. \$49,500 (2019 - 2022)

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

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

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

Prof. Conan Fee: Biacore T200 Surface Plasmon Resonance (SPR) instrument. Lottery Grants Board. \$40,000 (2022)



BIC Grants Awarded

Seed Funding

Assoc Prof. Debbie Munro: Development of a microfabricated system to measure and monitor stress fractures in racehorses. \$25,000

Dr Tim Allison, Dr Jodie Johnston, Dr Ali Reza Nazmi, Dr Fiona Given: Unravelling the regulation of bioplastic production by PhaC synthase. \$25,000

Dr Heon Park: iomedical sealants with biomimicry. \$25,000

Dr Artemio Mendoza Mendoza, Assoc Prof. Volker Nock, Dr Claudia Meisrimler: How does plant-microorganism communication drive the establishment of plant holobiont? \$25,000

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

Postgraduate Funding

Ramesha Soysa. Supervisor: Assoc Prof. Debbie Munro. PhD project title: Microfabricated sensor system to measure and monitor stress fractures in racehorses. \$28,000

BIC Summer Scholarships

Dr Rachael Wood: Development of cell-based 3D invasive assays. Student: Katie Ellis

Dr Vanessa Morris, Dr Christoph Goebel: Developing new methods for cancer diagnosis. Student: Briana Smith.

Assoc. Prof. Mark Staiger: A cadaveric study of real-time optimisation of the pull-out strength of biodegradable screws via in situ feedback of the insertion torque. Student: Zoe McFarlane

Dr Olivia Ogilvie: What microbes are found in the gut of children with celiac disease. Student: Peter Prendergast.

Dr Ali Reza Nazmi, Dr Carlo Carere, Dr Heather Hendrickson: Bacterial communities for plastic degradation. Student: Briar Collins.

Dr Heon Park: Biomedical sealants using biomimicry. Student: Joshua Paul.

Dr Daniel Foley: Development of selective inhibitors of the cdc2-like kinases. Student: Finlay Player

Prof. Renwick Dobson: Investigation into PA3 endolysin as novel antimicrobial shows promise in treatment against nosocomial *Pseudomonas aeruginosa* strains. Student: Mackenzie Aitken.

Prof. Renwick Dobson: How does transcription regulator NanR engage DNA? Student: Ashleigh Johns.

Dr Pram Abhayawardhana: Exploring the Recovery of Valuable and Beneficial Compounds from Selected Fruit/ Vegetable Waste Utilising a Greener Approach. Student: Chae Rin Lee.

Financial Summary

	2019	2020	2021	2022
	\$000	\$000	\$000	\$000
Externally funded research				
Funding received	2,162	3,676	4,100	3,653
Expenditure	2,166	3,393	4,095	3,660
Surplus (deficit)	(3)	283	5	(6)
Operations				
Income				
Overheads	275	515	689	619
PBRF	237	237	270	292
Other	518	462	458	500
Total income	1,032	1,214	1,417	1,412
Expenditure	1,043	1,079	1,275	1,399
Surplus (deficit)	(10)	135	142	12

Research Outputs

The following publications have been produced by members of BIC in 2022

Seven book contributions

- Bhat, Z. F., Morton, J. D., Bekhit, A. E.-D. A., Kumar, S., & Bhat, H. F. (2022). Cultured meat: Challenges in the path of production and 3D food printing as an option to develop cultured meat-based products. In *Alternative proteins* (pp. 271-295). CRC Press.
- Fitzgibbon, C., Meng, Y., & Murphy, J. M. (2022). Co-expression of recombinant RIPK3: MLKL complexes using the baculovirus-insect cell system. *Methods in Enzymology*, 667, 183-227.
- Forsdick, N. J., Adams, C. I., Alexander, A., Clark, A. C., Collier-Robinson, L., Cubrinovska, I., Dowgray, M. C., Dowle, E., Duntsch, L., & Galla, S. J. (2021). Current applications and future promise of genetic/genomic data for conservation in an Aotearoa New Zealand context.
- Jacobsen, A. V., & Murphy, J. M. (2022). CRISPR deletions in cell lines for reconstitution studies of pseudokinase function. *Methods in Enzymology*, 667, 229-273.
- Jamieson, S. A., McMillan, H. D., & Mace, P. D. (2022). Structural and biophysical characterization of Tribbles homolog 1. *Methods Enzymol.*, 667, 37-58.
- Jayawardena, R., Morton, J. D., Brennan, C. S., Bhat, Z. F., & Bekhit, A. E.-D. A. (2022). Meat co-products. In *Alternative Proteins* (pp. 329-359). CRC Press.
- Stevenson, L. J., Ackerley, D. F., & Owen, J. G. (2022). Preparation of Soil Metagenome Libraries and Screening for Gene-Specific Amplicons. *Enzyme Engineering: Methods and Protocols*, 3-17.

Six conference proceedings

- Allan, C., Tayagui, A., Nock, V., & Meisrimler, C.-N. (2022). Novel Bi-Directional Dual-Flow-Rootchip to Study Effects of Osmotic Stress On Calcium Signalling in Arabidopsis Roots. 2022 IEEE 35th International Conference on Micro Electro Mechanical Systems Conference (MEMS)
- Andrew, P.-K., Raudsepp, A., Nock, V., Fan, D., Williams, M. A., Stauffer, U., & Avci, E. (2022). Developing an Optical Microlever for Stable and Unsupported Force Amplification. 2022 International Conference on Manipulation, Automation and Robotics at Small Scales (MARSS)
- Coutts, E., Yorke, A., & Mower, T. (2022). An integrated approach to stem and sustainability education within the New Zealand context. DS 117: Proceedings of the 24th International Conference on Engineering and Product Design Education (E&PDE 2022), London South Bank University in London, UK. 8th-9th September 2022.
- Meffan, R. C., Mak, D., Menges, J., Dolamore, F., Fee, C., Dobson, R. C., & Nock, V. (2022). Field Effect Transistor-Like Control of Capillary Flow Using Off-Valves. 2022 IEEE 35th International Conference on Micro Electro Mechanical Systems Conference (MEMS).
- Petrakis, K., Wodehouse, A., Grierson, H., Coutts, E., Liikkanen, J., & Parkkamäki, H. (2022). The application of a prototyping support tool in a student design project. 24th International Conference on Engineering and Product Design Education,

Sarkar, D., Sun, Y., Tayagui, A., Adams, R., Garrill, A., & Nock, V. (2022). Microfluidic Platform to Study Electric Field Based Root Targeting by Pathogenic Zoospores. 2022 IEEE 35th International Conference on Micro Electro Mechanical Systems Conference (MEMS),

222 journal articles

- Abeysekera, G. S., Love, M. J., Manners, S. H., Billington, C., & Dobson, R. C. (2022). Bacteriophage-encoded lethal membrane disruptors: Advances in understanding and potential applications. *Frontiers in Microbiology*, 13.
- Alcala-Orozco, C. R., Mutreja, I., Cui, X., Hooper, G. J., Lim, K. S., & Woodfield, T. B. (2022). Hybrid biofabrication of 3D osteoconductive constructs comprising Mg-based nanocomposites and cell-laden bioinks for bone repair. *Bone*, 154, 116198.
- Aleamotu'a, M., Baker, J. K., McCurdy, D. W., & Collings, D. A. (2022). Phi thickenings in Brassica oleracea roots are induced by osmotic stress and mechanical effects, both involving jasmonic acid. *Journal of Experimental Botany*, 73(3), 756-769.
- Allan, C., Morris, R. J., & Meisrimler, C.-N. (2022). Encoding, transmission, decoding, and specificity of calcium signals in plants. *Journal of Experimental Botany*, 73(11), 3372-3385.
- Allison, T. M., Degiacomi, M. T., Marklund, E. G., Jovine, L., Elofsson, A., Benesch, J. L., & Landreh, M. (2022). Complementing machine learning – based structure predictions with native mass spectrometry. *Protein Science*, 31(6), e4333.
- Alster, C. J., Robinson, J. M., Arcus, V. L., & Schipper, L. A. (2022). Assessing thermal acclimation of soil microbial respiration using macromolecular rate theory. *Biogeochemistry*, 158(1), 131-141.
- Al-Zubaidi, A., Cheung, C.-Y., Cook, G. M., Taiaroa, G., Mizrahi, V., Lott, J. S., & Dawes, S. S. (2022). RNase HI depletion strongly potentiates cell killing by rifampicin in mycobacteria. *Antimicrobial Agents and Chemotherapy*, 66(10), e02091-02021.
- Andrews, E. S., & Patrick, W. M. (2022). The hypothesized role of YbeZ in 16S rRNA maturation. *Archives of Microbiology*, 204(1), 114.
- Ariyadasa, S., Billington, C., Shaheen, M., Ashbolt, N. J., Fee, C., & Pang, L. (2022). Use of a Novel DNA-Loaded Alginate-Calcium Carbonate Biopolymer Surrogate to Study the Engulfment of Legionella pneumophila by Acanthamoeba polyphaga in Water Systems. *Microbiology Spectrum*, 10(4), e02210-02222.
- Ariyadasa, S., Daear, W., Abeysekera, G., Billington, C., Fee, C., Prenner, E., & Pang, L. (2022). Evaluation of Biopolymer Materials and Synthesis Techniques to Develop a Rod-Shaped Biopolymer Surrogate for Legionella pneumophila. *Polymers*, 14(13), 2571.
- Ashby, L. V., Springer, R., Van Loi, V., Antelmann, H., Hampton, M. B., Kettle, A. J., & Dickerhof, N. (2022). Oxidation of bacillithiol during killing of Staphylococcus aureus USA300 inside neutrophil phagosomes. *Journal of Leukocyte Biology*, 112(4), 591-605.
- Ashoorzadeh, A., Mowday, A. M., Guise, C. P., Silva, S., Bull, M. R., Abbattista, M. R., Copp, J. N., Williams, E. M., Ackerley, D. F., & Patterson, A. V. (2022). Interrogation of the Structure-Activity Relationship of a Lipophilic Nitroaromatic Prodrug Series Designed for Cancer Gene Therapy Applications. *Pharmaceuticals*, 15(2), 185.

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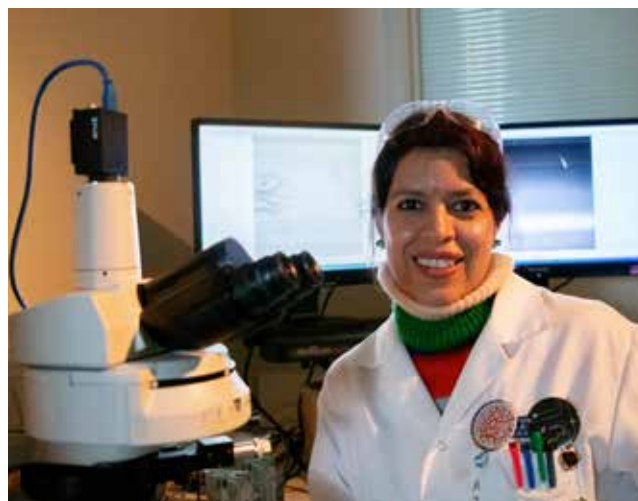
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