The Biomolecular Interaction Centre is a multi-disciplinary centre dedicated to the study of molecular interactions critical to biological function.

Understanding biomolecular interactions is central to a range of fundamental sciences, new treatments for disease, and a wide range of functional products. This gives us a variety of pathways through which we can connect to industry.
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A DECADE AS A PREMIER RESEARCH CENTRE

The Biomolecular Interaction Centre will, in 2017, mark its tenth anniversary. Over the past two years, the Centre has undergone extensive changes in leadership as it has sought to redefine what makes it one of the University of Canterbury’s Premier Research Institutes. I am pleased to say that this exercise, while challenging at times, has resulted in our centre evolving into a stronger unit with focused, team-based leadership.

The Centre has welcomed in new blood, in the form of a superb Institute Manager, Rebecca Hurrell, and has developed and implemented a management team model, which has created much-needed robustness and continuity at the helm.

That said, the Centre is still undergoing change, with former Director, Professor Emily Parker and myself both leaving UC for new challenges in early 2017. At the same time, we have expanded our UC-based PI community, with Associate Professor Paul Gardner and Professor Antony Fairbanks adding to the PI base. We expect several new AIs and PIs to join BIC’s ranks in the coming year, and our investigator community is now bigger and more diverse than in the past.

We continue to be successful in winning grants, with more than 40 grants worth $5.8 million having come into BIC over the past two years. A key feature of our success here can be traced to the strong culture of mentoring that BIC has developed, both for emerging scientists to begin applying for their own funding (for example, two BIC postdocs made it through to the second round of the 2016 Marsden Fund) and for established and emerging scientists to get feedback on their draft applications. Through 2015 and 2016, we have seen a marked growth in successful applications for MBIE and other funding.

We finish 2016 the news that BIC PI Professor Antony Fairbanks has secured Marden funding and Dr Duncan McMillan, currently at the University of Tokyo, has gained a Rutherford Discovery Fellowship. Duncan will join BIC in late 2016. Moreover, the successes are forging an exciting path from basic research through to near-to-market breakthroughs. We are very excited by this development, and believe we are likely to see the formation of at least one spin-out company over the next two years.

Ant Poole
Biomolecular Interaction Centre income (all sources)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016*</th>
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<tr>
<td>University Institute Support</td>
<td>$1,076,575</td>
<td>$384,551</td>
<td>$470,453</td>
<td>$182,648</td>
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<td>$3,569,339</td>
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<tr>
<td>Total</td>
<td>$2,545,233</td>
<td>$3,038,237</td>
<td>$3,242,632</td>
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</tbody>
</table>

*Forecast as at 31 October 2016

BIC’s external revenue has remained significant.
EVOLVING AND ENGINEERING BIOMOLECULES

FLAGSHIP LEADER – RENWICK DOBSON

“Nothing in Evolution makes sense except in the light of Biology” (Professor Tony Dean, University of Minnesota). This cheeky rewording of Theodosius Dobzhansky’s famous quote makes the point that the molecular consequences of evolution (the molecular phenotype) are often overlooked. BIC researchers involved in the Evolving and Engineering Biomolecules flagship theme are changing this view of molecular evolution. Current research includes enzyme evolution, RNA (co)evolution, and how evolution can be harnessed to engineer enzymes with novel properties. 2015 and 2016 have been productive and exciting, producing a slew of high impact publications.

FLAGSHIP HIGHLIGHTS

AVOIDING UNWANTED RNA INTERACTIONS

Translation is the process by which the genetic information in a molecule of messenger RNA (mRNA) produces a protein, and the translation efficiency is the rate at which protein is produced from a given mRNA molecule. This rate is different for different mRNA molecules, which is why researchers are trying to determine the features of these molecules that affect translation efficiency. In eLife, first author and BIC PhD student Sinan Umu along with BIC PIs Paul Gardner, Anthony Poole, and Renwick Dobson report that the translation efficiency in bacteria and archaea is influenced by a phenomenon called “avoidance”1. Avoidance is the degree to which an mRNA molecule avoids random interactions with noncoding RNA molecules in the cell. Noncoding RNAs, as their name suggests, do not code for proteins, but they make up a majority of the RNA in any given cell. Indeed, the BIC team show that the levels of noncoding RNAs in bacterial cells are two orders of magnitude greater than the levels of mRNAs. This work was supported by a BIC Seed grant in 2014 to PIs Gardner and Dobson ($6,000) and a BIC-BlueFern PhD scholarship for Sinan.


ENGINEERING NEW ENZYMES FOR THE PRODUCTION OF NEW GLYCOPROTEINS

PI Antony Fairbanks and his team have been engineering ENGase (endo-β-N-acetylglucosaminidases) enzymes as biocatalysts for the production of homogenous glycopeptides and glycoproteins. They published two recent standout publications 3,4 in this area. In Angewandte Chemie they report the first-ever production of a glycoprotein bearing mannose-6-phosphate residues using ENGases. Mannose-6-phosphate is an important biomarker, the addition of which results in protein transport to the lysosome. This project, which has significant implications for the development of better treatments for lysosomal storage disorders by enzyme replacement therapy, has just been supported by the awarding of $870,000 of Marsden funding. This will see Antony collaborate with Dr Antonia Miller, of Callaghan Innovation’s UC-based Protein Science and Engineering Team; along with Professor Fran Platt, University of Oxford, and Professor Matthieu Sologoub from the Pierre and Marie Curie University, Paris, France.

The second publication in Chemical Science relates to a collaborative project undertaken with the research groups of Margaret Brimble and Rod Dunbar (University of Auckland). In this landmark study ENGase enzymes were used to produce glycopeptide vaccine candidates decorated with homogeneous high-mannose glycans, which they then demonstrated were more effectively taken up by dendritic cells than non-glycosylated versions.


UNTANGLING HOW A GOLIATH EPIGENETIC REPRESSOR HAS A TENDER TOUCH ON DNA

Structural maintenance of chromosomes flexible hinge domain containing 1 (Smchd1) is an epigenetic repressor. It has been shown to play an essential role in autosomal and X-linked gene repression, with critical consequences for normal biology and disease, particularly facioscapulohumeral muscular dystrophy. BIC researcher Dr Sarah Kessans and PI Ren Dobson, along with collaborators from Australia and the Netherlands, published a featured article in PNAS. The underlying molecular mechanism by which Smchd1 functions is unknown. The work provides the first biochemical and biophysical evidence that Smchd1–chromatin interactions are established through the homodimeric hinge domain of Smchd1 and, intriguingly, that the hinge domain also has the capacity to bind DNA and RNA. The results suggest Smchd1 imparts epigenetic regulation via physical association with chromatin, which may antagonize other chromatin interactions, resulting in coordinated transcriptional control.

CONTROLLING ENZYME ACTIVITY

The work on the understanding of complex allosteric mechanisms for the control of enzyme activity has continued in the lab of BIC PI Emily Parker. A new collaboration with Eileen Jaffe (Fox Chase Cancer Center, Philadelphia) assisted with the understanding of the way in which the human enzyme phenylalanine hydroxylase operates. Mutations to this enzyme are the cause of the phenylketonuria, the most common inborn error of amino acid metabolism.

Research has also continued with understanding the complexity of regulation for the shikimate pathway. Complex domain movements were shown for the Geobacillus sp. 3-deoxy-D-arabino-heptulosonate 7-phosphate synthase (DAH7PS), and this work was highlighted as “Paper of the Week” in the Journal of Biological Chemistry. PhD students Eric Lang and Logan Heyes study of the dynamic networks involved in the allostery was published in the Journal of the American Chemical Society.


The focus of funding support is on projects to obtain preliminary data for future grant applications by BIC PIs and AIs, particularly those that involve collaboration between AIs and PIs together. $40,000 has been dispersed across 2015 and 2016.

Pls Ant Poole and Paul Gardner were granted $5,000 to support an experimental evolution experiment that provided preliminary data for a Marsden application in 2016.

Pls Volker Nock, Ren Dobson and Grant Pearce gained $10,000 to support a shared studentship on membrane studies. This was funding that crossed flagships one and two to encourage interactions across engineering and science. This work led to new PhD scholarship funding from Callaghan Innovation to support Serena Watkin to develop “labs-on-a-chip” for protein interaction characterisation and cell studies.

New academic in September 2016 in the School of Biological Sciences, Dr Mitja Remus-Emsermann was granted $5,000 to support him in establishing his research at UC. Dr Remus-Emsermann, a microbiologist, has been active in establishing new connections within the BIC community.

Pls Grant Pearce and Paul Gardner received funding of $5,000 to study evolutionary relationships between DHDPS like enzymes.

PI Antony Fairbanks was funded to obtain preliminary data for an MBIE application (to be submitted in 2016), which revolves around untangling how endo-N-acetylglucosaminidases function and how they may be repurposed for bespoke synthetic chemistry.

$3,000 was provided to establish a collaboration between BIC PI Ren Dobson and ESR’s Dr Craig Billington. The project will investigate the biological function of novel bacteriophage endolysins—enzymes that punch holes in bacterial cell walls. ESR have committed $46,500 in new funding for the project.

Al Deb Crittenden and PI Emily Parker requested funding ($5,000) for “Enhanced conformational sampling along torsional coordinates”. The aim is to develop a computational method to enable modelling of biomolecules on experimentally realistic time and length scales.

Funding of $2,000 was provided to Grant Pearce for travel to the University of Otago to use the CryoEM instrument for the purpose of determining protein structures. CryoEM is fast becoming a central experimental technique in the field of structural biology.

PI Paul Gardner has received funding from the BioProtection CoRE for two projects: “To identify determinants of virulence and adaptation in the kiwifruit pathogen Pseudomonas syringae pv. actinidiae”, and “Provide bioinformatics expertise to allow genomic comparisons” ($91,000; 2016-2019).

PI Antony Fairbanks secured Marsden Funding from the Royal Society of New Zealand (2017-2020) to study “A new paradigm for organelle targeting” ($870,000).

PI Ren Dobson was successful in securing Marsden Funding from the Royal Society of New Zealand (2016-2019) to study bacterial sialic acid metabolism ($770,000). This work was initiated by a 2014 BIC seed grant $5,000.

International collaborator A/Prof Andre Hudson (Rochester Institute) and PI Ren Dobson secured NIH funding (US$413,000) to explore inhibitors of enzymes in the lysine biosynthetic pathway. The grant is entitled “Genetic and structural analysis of L,L-diaminopimelate aminotransferase (DapL); An attractive target for the development of narrow-spectrum antibiotics” (2016-2019).

Pls Ren Dobson and Conan Fee secured funding from the Riddet CoRE at Massey University. Funding of $123,000 over two years will support projects of mutual interest to BIC and the Riddet Institute (2016-2018).

PI Ren Dobson obtained $49,000 from the Lotteries Health Research fund to upgrade facilities of the New Zealand Centre for Analytical Ultracentrifugation (NZAUC). This provided for the purchase of a 4-hole rotor, which allows samples to be centrifuged at greater speeds (2015).
ENGINEERING BIOTECHNOLOGY

FLAGSHIP LEADER - DR VOLKER NOCK

We bring 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 focusing on the following broad areas of activity: 3D printed devices for bioseparations, biomolecular interactions on surfaces, biomolecular interactions related to disease, biochemistry on chips and sourcing of advanced materials from nature’s pantry. In a drive to increase cross-disciplinary research, several major projects are currently being funded under this Flagship.

FLAGSHIP HIGHLIGHTS

3D PRINTING OF MICROSTRUCTURED MATERIALS

The Biomolecular Engineering Research Group in the Department of Chemical & Process Engineering (CAPE), led by PI Professor Conan Fee and Associate Professor Matt Watson of CAPE, have continued BIC’s world-first work on creating porous materials using 3D printing. This idea, funded through an MBIE Phase 2 ‘Smart Ideas’ grant, has wide applications, including for chromatographic purification of proteins, enzyme catalysis, chemical catalysis, filtration, reactors and even heat exchangers and batteries. In the context of BIC, the major focus has been on protein chromatography and the group has been successful in creating printed agarose monoliths that can separate proteins in the presence of yeast cells. This new approach will eliminate at least two process steps from recombinant and therapeutic protein production processes, reducing cost while increasing yield and bioactivity. The 3D printing work has so far involved around nine doctoral students, 19 other research students, as well as 14 staff across five departments.

Dr Simone Dimartino (former BIC PI now at the University of Edinburgh) recently received the Csaba Horváth Young Scientist award for his presentation on aspects of Edinburgh (recently received the Csaba Horváth Young Scientist award for his presentation on aspects of Edinburgh) recently received the Csaba Horváth Young Scientist award for his presentation on aspects of Edinburgh)

MEASURING THE DIFFUSION OF MACROMOLECULES AND THEIR INTERACTIONS ON CHIP

Biomolecular interactions of macromolecules are inherently difficult to characterise and measure, particularly in complex solutions. Emerging devices harnessing the unique physics of multi-stream microfluidic flow provide a promising platform technology for new analytical tools to study these interactions. BIC PIs Grant Pearce, Volker Nock and Ren Dobson, are setting out to design devices that characterise interactions in real time and in complex solutions. The team has recently been joined by PhD student Serena Watkin, who is co-funded by a BIC-Callaghan Innovation scholarship. Serena is using ultracentrifugation, SAXS and microfluidic flow devices to characterise biomolecule interactions.

FLEXIBLE MICROPILLAR ARRAYS FOR THE STUDY OF PROTRUSIVE FORCES IN HYPHAL INVASION

The role of the cytoskeleton in invasive hyphal growth of fungi and oomycetes is the focus of a successful collaboration between BIC PI Volker Nock and Associate Professor Ashley Garrill. Their aim is to develop a microfluidic platform for the study of protrusive forces in hyphal invasion based on flexible micropillars. Fungi and oomycetes grow as pathogenic species on both plants and animals. They can have significant effects on humans, either directly through infections or indirectly through loss of crops and other species. Using newly developed microfluidic devices the team was recently able to show the first on-chip measurement of protrusive force exerted by single hyphal tips of pathogenic microorganisms. The team hopes that better understanding of the molecular generation of protrusive force may impact on ways to address the many diseases and infections that occur due to invasive fungal and oomycete growth.

FLAGSHIP FUNDING SUCCESSES

PI Volker Nock was successful in securing funding from the Brian Mason Trust and Marsden Fast-Start Funding from the Royal Society of New Zealand to study protrusive forces in hyphal invasion. His Marsden grant is entitled: Hyphae-on-a-chip: a microfluidic platform for the study of protrusive forces in hyphal invasion. Volker has also been successful in securing National Science Challenge funding to develop insulin sensors and MBIE-project funding to develop sensors related to invasive species.

FLAGSHIP PROJECT SUPPORT

BIC Al Gabriel Visnovsky has been awarded funding to strengthen collaboration between the College of Engineering and the School of Biological Sciences.

BIC PI Volker Nock and University of Otago-based Al Dr Monica Gerth have funding to jump-start a joint project on chemotaxis in microfluidic devices. PIs Grant Pearce, Renwick Dobson and Volker Nock have funding for fluidic consumables for two doctoral projects to develop Labs-on-a-chip for protein interaction characterisation and cell studies.

PI Volker Nock will purchase consumables for joint projects with Ashley Garrill, Maan Alkaisi, Kenny Chitcholtan and Azam Ali.

There has also been general support given via the Flagship to purchase commercial microfluidic chips, O₂ sensors and to establish a chip alignment setup.
FROM INTERACTION TO APPLICATION

FLAGSHIP LEADER · DR ANTONIA MILLER

An established strength of BIC is our capacity to take ideas from the research laboratory into the real world. Our relationship with the Callaghan Innovation Protein Science and Engineering Team continues to be productive, and we have worked to widen the interactions between our researchers and industry. In addition, Dr Neil Pattinson (Board Chair of AuramerBio) has consulted with BIC PIs on commercialisation opportunities. We continue to progress initiatives to support the evaluation of current and future research in the context of application to industry.

FLAGSHIP HIGHLIGHTS

NZBIO

BIC Director Anthony Poole and Institute Manager Rebecca Hurrell attended the Annual NZBIO conference in Auckland in September. NZBIO is New Zealand’s industrial biotechnology conference and a key opportunity for BIC to engage with researchers, industry and research commercialisation professionals. Anthony and Rebecca gained insights into industry trends and formed new contacts. They also gained important knowledge around approaching commercialisation of BIC projects.

MBIE AND COMMERCIALISATION WORKSHOP

Organised by Institute Manager Rebecca Hurrell and Ren Dobson, BIC PIs, AIs and commercialisation experts got together for an afternoon to brainstorm potential commercialisation and MBIE opportunities. The workshop included former MBIE panel members, Heather Thomas (UC Research and Innovation), Neil Pattinson (CEO of AuramerBio), Nigel Harris (Māori Research Kāiārahi, UC), and George Slim (Rhadegund Life Sciences Ltd).

TECH JUMPSTART AWARD

BIC PIs Ren Dobson and Volker Nock, have been awarded a UC Tech Jumpstart prizes of $20,000 for their project “A point-of-care microfluidic device that tests for blood incompatibility”. A serious and sometimes lethal complication that can occur during blood transfusions is the infusion of an incorrect, incompatible blood type. Ren and Volker are aiming to develop a device to monitor blood at a patient’s bedside, to ensure the infusion of the correct blood type. This is an excellent example of BIC success in combining engineering and biochemistry to deliver applicable solutions to industry.

COMMERCIALISATION OF BIC RESEARCH

PI Paul Gardner, in collaboration with Ren Dobson and Ant Poole, recently published breakthrough research in the prestigious open-access *eLife* journal. Their work demonstrated that a previously overlooked mechanism controls additional variation in gene expression. They are exploring a number of potential biotech applications as a result of these research findings, particularly in the area of designing mRNAs for genes to improve protein production. Paul is working with colleagues at Callaghan Innovation and Powerhouse to realise the opportunities.
Outstanding facilities and equipment 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 in its ongoing maintenance.

In 2015, BIC supported the purchase of a ForteBio BlitZ instrument based in the School of Biological Sciences. The capabilities of this will complement those of the existing surface plasmon resonance (SPR) instrument (Fee) and the analytical ultracentrifuge (AUC) (Dobson). To support structural biology initiatives, we purchased two MacBookPro computers for running protein dynamics simulations and crystallography projects which are also supported through Flagship one (Parker and Dobson). To support the New Zealand Centre for Analytical Ultracentrifugation, BIC secured external funding from the Lotteries Health Research Fund ($48,000) to upgrade the AUC’s capabilities. In total in 2015, BIC funded $98,000 of research equipment through its CAPEX allocation and secured $49,000 in external funding.

In 2016, BIC purchased a replacement real-time PCR (polymerase chain reaction) instrument (Pearce), upgraded the Fluorescence Microscope (Nock), purchased a computer node to increase capacity on the biology cluster, and purchased a vibration free incubator to support the growing number of structural biology projects within BIC (Dobson). In total, we funded $80,000 for new capabilities, upgrades and replacements from the BIC CAPEX allocation.

In order to maintain BIC equipment and other equipment used heavily by BIC researchers we allocated over $45,000 in 2015-2016 to servicing and repairs.
RIDDLET FUNDING SUCCESS

BIC PIs Conan Fee and Ren Dobson have secured funding from the Riddet Centre of Research Excellence at Massey University. The funding ($123,000 over two years) will support projects of mutual interest to BIC and the Riddet Centre. Both Ren and Conan are Riddet Associate Investigators. Their initial work centres on the development of an affinity ligand for removing beta-lactoglobulin from bovine milk to reduce infant allergies. Previous work in Fee’s group discovered a promising ligand that appears to have biospecific affinity for beta-lactoglobulin, and on-going work is now associated with optimising the ligand conjugation technique through peptide engineering. If successful, this work will not only form a possible industrial processing method, but will enable collaborative work with PI Renwick Dobson to explore the role of beta-lactoglobulin in a range of biomolecular interactions through surface plasmon resonance (Fee) and analytical ultracentrifuge techniques (Dobson).

DR SARAH KESSANS, NASA ASTRONAUT CANDIDATE

In February 2016, BIC researcher Dr Sarah Kessans applied to become an Astronaut Candidate in NASA’s 22nd Astronaut Class. There were a record number of applicants in the selection cycle (18,300), but her application stood out enough to make it through to the highly qualified pool in July (the top 450 applicants). In August, she was notified she had been selected as an initial interviewee (the top 120 applicants). As part of this, Sarah was invited to the Johnson Space Centre (JSC) in Houston in late August for initial interviews. That week in Houston was hands down the best week of her life. Getting to interact with the current Astronaut Corps and tour the facilities at JSC solidified her desire to become an astronaut and contribute her skills to the inspiring missions of exploring our universe, pushing science forward, and connecting humanity on a global scale.

Sarah should find out in December 2016 if she has made it to the next selection round (the top 60). If she makes this cut, she will be invited back to Houston between January and April for another week of tests. In June 2017, NASA will choose 8-14 finalists to become the Astronaut Candidate Class of 2017, reporting for duty in August 2017 (conveniently when her current BIC contract concludes). The journey thus far has been an incredible one, and the support that Sarah received from the BIC community has been phenomenal. Regardless of the outcome of selection, she is thankful for the encouragement and inspiration every step of the way!

SERENA WATKIN, CHAPTER AUTHOR

Callaghan Innovation and BIC co-funded doctoral student Serena Watkin has written a book chapter titled “Microfluidics for Small-angle X-ray Scattering”. This will be published by InTech in “X-ray Scattering” in the near future. Serena’s research looks at ways protein biochemists can take advantage of microfluidic technology for studying protein function, interactions and dynamics, and she is working on developing new microfluidic tools for such purposes. The chapter is based on a literature review Serena carried while she was investigating the use of microfluidics for time-resolved measurements of protein size and shape changes, which can be readily monitored using small-angle X-ray scattering (SAXS). The team, which includes BIC PIs Volker Nock, Ren Dobson and Grant Pearce, along with beamline scientist Tim Ryan, is hoping to establish a microfluidic setup at the Australian Synchrotron SAXS beamline to enable rapid-mixing and time-resolved data to be acquired with ease.

CUSTOM SCIENCE NZSBMB AWARD

The Custom Science NZSBMB Award is the New Zealand Society of Biochemistry and Molecular Biology’s premier prize for research excellence. The award is based upon nominated papers published in the previous three years, contribution statements for these and the applicant’s CV. Paul Gardner (BIC PI) has been awarded the 2016 Custom Science NZSBMB Award. And is really happy about it!

STRENGTHENING COLLABORATION

BIC PI Grant Pearce has secured co-funding from AgResearch and BIC to fund a doctoral student for three years. The project will focus on linking the consumer-relevant properties of foods to the modification profile of their constituent proteins and the oxidative influence of lipids. Ziqi Yu has previously carried out an MSc at Wageningen University studying ingredient functionality. She is expected to start the project before the end of 2016.

SUMMER SCHOLARS

At the end of 2016 BIC will co-fund up to twelve UC Summer Research Scholarships. These scholarships are worth up to $5000 to students to undertake ten weeks of research on a project over the summer period. The key purpose of the programme is to give senior students experience in research and to encourage them to pursue postgraduate study. The scholarships are co-funded by the UC Foundation. The BIC-supported projects are on a broad range of topics including: sweaty robots, developing protein cross-linking technologies, isolating and testing new bioactives, groundwater index of health and nanomaterials from waste. Students will have the opportunity to work with BIC AIs and PIs, both UC and non UC-based, including projects in collaboration with Callaghan Innovation and ESR.

UC DOCTORAL SCHOLARSHIP SUCCESS

Mohammad Firoozinia has been awarded a UC doctoral scholarship for his studies. This scholarship is awarded annually to the top BIC doctoral student.

SUPPORTING POSTGRADUATE STUDY

BIC acknowledges that there are a number of postgraduate students at masters and doctoral level who are self-funded and, in order to support them, we have set aside a small pool of funding. The funding is directed towards students who are carrying out research in areas BIC sees as fitting the scope of BIC research and is strategically important.

In 2015, $38,000 was distributed to seven UC students of BIC AIs and PIs, and in 2016 $27,000 was distributed to eight students.
BEST POSTER PRIZE

Congratulations to PhD student Azadeh Hashemi (co-supervised by Volker Nock and Professor Maan Alkaisi) for taking out best poster prize at the 42nd International Conference on Micro and Nano Engineering in Vienna with her work on “Enhancing the resolution and stability of bioimprinted casein microdevices”. This is a major European conference and Azadeh’s poster was chosen from ~300. Well done! The work was supported in part by BIC.

BIC DOCTORAL SCHOLARSHIP SUCCESS

Alannah Rickerby has commenced a BIC-funded PhD with BIC PI Ant Poole on the topic of Using synthetic evolution to streamline translation. Funding of $21,000 per annum, plus tuition fees for three years has been awarded.

BIC POSTDOCTORAL FELLOWS

Over 2015 and 2016, BIC has funded nine postdoctoral fellows to undertake research with BIC PIs. Each received between six and 13 weeks of funding to carry out specific targeted research. Projects included investigating the synthesis of phosphorylated glycoproteins; RNA vs protein - investigating evolutionary robustness; and studying gelation properties of self-assembling peptides. BIC funds the equivalent of one full-time postdoctoral fellow each year.

SPONSORSHIP

The Canterbury Omics Symposium is a regular fixture in the Canterbury science calendar. It evolved out of a BIC research symposium that BIC PI Paul Gardner organised in November 2014. BIC has sponsored and had strong representation at every subsequent meeting:

• Canterbury ‘Oomics Symposium II, Lincoln University, Friday 1 May 2015
• Canterbury ‘Oomics Symposium III, University of Otago, Christchurch, Wednesday 4 November 2015
• Canterbury ‘Oomics Symposium IV, Plant & Food Research, Lincoln, Wednesday 30 March 2016
• Canterbury ‘Oomics Symposium V, University of Canterbury, Thursday 27 October 2016

BIC also sponsored the following conferences:

• Queenstown Molecular Biology Main Meeting 2016, Rutherford Hotel, Nelson, 29 - 31 August 2016
• Big Data, Little Organisms, Joint Conference of the New Zealand Microbiological Society and NZ Society for Biochemistry and Molecular Biology, University of Canterbury, 14 - 17 November 2016

NZSBMB SUCCESS

New Zealand Society for Biochemistry and Molecular Biology (NZSBMB) awarded prizes to three BIC-associated doctoral students at the Big Data, Little Organisms conference in Christchurch, 2016. Alicia Lai (Anthony Poole) was awarded first place in the oral competition and Nicole Wheeler (Paul Gardner) was awarded second place. Fatemeh Ghomi (Paul Gardner) was awarded third prize in the poster competition.
Our Growing Capability

**BETHANY JOSE**

**TACKLING PATHOGENS WITH COMPUTERS**

Pathogenic bacteria impact human health, livestock, horticulture, and our native species. While DNA sequencing is now routine, we may be missing large swathes of important genetic information hidden in the genomes of pathogens. This so-called genomic ‘dark matter’ includes genes that encode small RNA molecules. These may well hold the key to understanding how pathogens fine tune their genetic systems during infection. PhD student Beth Jose is developing state-of-the-art bioinformatics tools to illuminate genomic dark matter RNAs using the power of comparative analysis. This is crucial if we are to better combat pathogens, but the task is tricky because RNAs evolve very quickly, making small RNA identification akin to finding a needle in a haystack. Beth’s new approach is already bearing fruit, and is a critical first step towards meeting the pathogen challenge head on.

**ALANNAH RICKERBY**

**HARNESSING THE BRAVE NEW WORLD OF SYNTHETIC BIOLOGY**

Understanding how biological systems evolved is critical if we are to control or alter them for biotech. PhD student Alannah Rickerby is looking at how DNA, the molecule at the centre of all life, evolved, to better understand whether other genetic systems might operate as well as natural systems. To do this, she is combining the emerging tools of synthetic biology and gene editing with the power of experimental evolution to see if she can create a genetic throwback - an organism that lacks T, the fourth letter in the genetic alphabet. If she can pull this off, it will help her understand whether there is anything special about T, which appears to have been a late addition to the DNA alphabet. This will enable us work out whether modern DNA is optimal for genetic storage, or whether other versions of DNA could be just as good. With IT giants now talking about storing online information in DNA, the implications of this work could be profound.

**HELEN ASHMEAD**

**FROM BIC TO INDUSTRY**

Former Callaghan Innovation funded BIC doctoral student Helen Ashmead has secured employment at Arotec Diagnostics Ltd, Wellington.

Helen completed her PhD under the supervision of BIC PI Professor Juliet Gerrard (now at the University of Auckland) on “Proteins as building blocks for biological nanomaterials”. She defended her thesis in August 2016 and was awarded her PhD in September. Helen received the Callaghan Innovation graduate careers grant in July and now works developing methods for producing recombinant antigens to be used in autoimmune disease diagnostics.
Our People

PRINCIPAL INVESTIGATORS

ASSOCIATE PROFESSOR ANTHONY POOLE

PROFESSOR EMILY PARKER

DR RENWICK DOBSON

PROFESSOR CONAN FEE

DR GRANT PEARCE

DR VOLKER NOCK

ASSOCIATE PROFESSOR PAUL GARDNER

PROFESSOR JULIET GERRARD

PROFESSOR ANTONY FAIRBANKS
ADVISORY BOARD
Professor Edward Baker, Chair
Dr Richard Furneaux, Deputy Chair
Professor David Beebe

MANAGEMENT STAFF
Dr Susie Meade (until July 2015)
Rebecca Hurrell (from July 2016)

TECHNICAL STAFF
Ms Rayleen Fredericks
Mrs Jackie Healy

ASSOCIATE INVESTIGATORS
Dr David Ackerley, School of Biological Sciences, Victoria University
Dr Jane Allison, Centre for Theoretical Chemistry and Physics, Massey University
Prof Vic Arcus, Department of Biological Sciences, University of Waikato
Prof Stephen Brennan, Molecular Pathology Laboratory, Canterbury Health Laboratories
Prof Mark Billinghurst, HITLAB, UC
Dr Stefan Clerens, Food and Bio-Based Products, AgResearch
Dr Deb Crittenden, Chemistry Department, UC
Dr Jolon Dyer, Food and Bio-Based Products, AgResearch
Dr Gary Evans, Ferrier Research Institute, Victoria University
Dr Monica Gerth, Department of Biochemistry, University of Otago
Dr Brent Gilpin, Institute of Environmental Science & Research
Assoc Prof Pete Gostomski, Chemical & Process Engineering, UC
Prof Mark Hampton, Centre for Free Radical Research, University of Otago
Assoc Prof Richard Hartshorn, Chemistry Department, UC
Prof Geoff Jameson, Institute of Fundamental Sciences, Massey University
Prof Tony Kettle, Centre for Free Radical Research, University of Otago

Dr Nigel Larsen, Plant and Food Research
Dr Shaun Lott, School of Biological Sciences, University of Auckland
Dr Aaron Marshall, Chemical & Process Engineering, UC
Assoc Prof Ken Morison, Chemical & Process Engineering, UC
Dr Antonia Miller, Protein Science and Engineering Team, Callaghan Innovation
Assoc Prof Jim Morton, Lincoln University
Dr Andrew Muscroft-Taylor, Protein Science and Engineering Team, Callaghan Innovation
Dr Wayne Patrick, Department of Biochemistry, University of Otago
Dr Phillip Rendle, Ferrier Research Institute, Victoria University
Prof Ian Shaw, Chemistry Department, UC
Dr Mark Staiger, Mechanical Engineering Department, UC
Dr Peter Tyler, Ferrier Research Institute, Victoria University
Dr Gabriel Visnovsky, Chemical & Process Engineering, UC
Dr Tim Woodfield, Department of Orthopaedic Surgery and Musculoskeletal Medicine, University of Otago

Dr Nigel Larsen, Plant and Food Research
Dr Shaun Lott, School of Biological Sciences, University of Auckland
Dr Aaron Marshall, Chemical & Process Engineering, UC
Assoc Prof Ken Morison, Chemical & Process Engineering, UC
Dr Antonia Miller, Protein Science and Engineering Team, Callaghan Innovation
Assoc Prof Jim Morton, Lincoln University
Dr Andrew Muscroft-Taylor, Protein Science and Engineering Team, Callaghan Innovation
Dr Wayne Patrick, Department of Biochemistry, University of Otago
Dr Phillip Rendle, Ferrier Research Institute, Victoria University
Prof Ian Shaw, Chemistry Department, UC
Dr Mark Staiger, Mechanical Engineering Department, UC
Dr Peter Tyler, Ferrier Research Institute, Victoria University
Dr Gabriel Visnovsky, Chemical & Process Engineering, UC
Dr Tim Woodfield, Department of Orthopaedic Surgery and Musculoskeletal Medicine, University of Otago

BIC ADJUNCTS

ADJUNCT PROFESSOR
Prof Stephen Brennan, University of Otago
Prof Juliet Gerard, University of Auckland
Prof Geoff Jameson, Massey University
Prof Richard Neutze, University of Gothenburg, Sweden
Prof Carol Robinson, Oxford University, England

ADJUNCT ASSOCIATE PROFESSOR
Dr Jolon Dyer, AgResearch Ltd
Dr Nigel Larsen, Plant & Food Research Ltd
Assoc Prof Jim Morton, Lincoln University
Dr James Murphy, Walter and Eliza Hall Institute of Medical Research, Australia
Dr Simone Dimartino, University of Edinburgh, Scotland

ADJUNCT SENIOR FELLOW
Dr Brent Gilpin, Environmental Science & Research
Dr Antonia Miller, Callaghan Innovation
Dr Andrew Muscroft-Taylor, Callaghan Innovation
Dr Phillip Rendle, Ferrier Research Institute, Victoria University
Dr Hironori Suzuki, Japan

ADJUNCT FELLOW
Dr Leonardo Negron, Callaghan Innovation
Dr Luigi Sasso, Delft University of Technology, The Netherlands
Dr Rachel Williamson, Australian Synchrotron

POSTDOCTORAL FELLOWS AND RESEARCH STAFF
Dr Karen Adair, Associated with Anthony Poole’s group
Dr Nicola Blackmore, Associated with Emily Parker’s group
Dr Ryan Catchpole, Associated with Anthony Poole’s
Dr Justine Cottam, Associated with Juliet Gerrard’s group
Dr Penel Cross, Associated with Emily Parker’s group
Dr Tim Huber, Associated with Conan Fee’s group
Dr Wanting Jiao, Associated with Emily Parker’s group
Dr Dmitri Joseph, Associated with Emily Parker’s group
Dr Muge Kasanmascheff, Associated with Renwick Dobson’s group
Dr Angela Newton, Associated with Juliet Gerrard’s group

Dr Sarah Kessans, Associated with Renwick Dobson’s group
Dr Moritz Lasse, Associated with Ren Dobson’s group
Dr Stinus Lindgreen, Associated with Anthony Poole’s
Dr Angela Newton, Associated with Juliet Gerrard’s group
Dr Luigi Sasso, Associated with Juliet Gerrard’s group
Dr Ali Reza Nazmi, Associated with Juliet Gerrard’s group
Dr Hironori Suzuki, Associated with Renwick Dobson’s group
Dr Céline Valéry, Associated with Juliet Gerrard’s group
Dr Madhu Vasudevamurthy, Associated with Juliet Gerrard’s group
Mathieu Vilmay, Associated with Conan Fee’s group
Dr Amy Osborne, Associated with Anthony Poole’s group
Dr Leyla Bustamante, Associated with Emily Parker’s group
Gert-Jan Moggré – Associated with Emily Parker’s group

POSTGRADUATE STUDENTS
Shakil Afr – PhD, with Emily Parker
Fatemeh Ashari Ghomi – PhD, with Paul Gardner
Helen Ashmead – PhD, with Juliet Gerrard, in partnership with Callaghan Innovation
Yu Bai – PhD, with Emily Parker
Nicola Blackmore – PhD, with Emily Parker, in partnership with the Maurice Wilkins Centre
Neha Chandrasekaran – PhD, with Conan Fee & Simone Dimartino
Shradha Chandrasekaran – PhD, with Conan Fee & Simone Dimartino
Tammie Cookson – PhD, with Emily Parker, in partnership with the Maurice Wilkins Centre
Jennifer Crowther – PhD, with Renwick Dobson, in partnership with AgResearch
Fabian Dolamore – PhD, with Conan Fee & Simone Dimartino, in partnership with MBIE
Katherine Donovan – PhD, with Renwick Dobson
Emma Dorsey – MSc, with Renwick Dobson
Hisham Eldai – PhD, with Paul Gardner
Yifei Fan – BSc (Hons), with Emily Parker
Dylan Gifford, MSc, with Grant Pearce
Letitia Gilmour – MSc, with Renwick Dobson, in association with Canterbury Scientific Ltd
Fiona Given – PhD, with Emily Parker
Anne Gordon – PhD, with Conan Fee & Simone Dimartino, in partnership with MBIE
Azadeh Hashemi – PhD, with Volker Nock & Maan Alkaisi
Logan Heyes – PhD, with Emily Parker
Michael Hunter – PhD, with Emily Parker
Amanda Inglis – MSc, with Emily Parker, in partnership with ESR
Dimitri Joseph – PhD, with Emily Parker, in partnership with the Maurice Wilkins Centre
Janadari Kariyawasan – PhD, with Richard Hartshorn
Manmeet Kaur – PhD, with Juliet Gerrard, in partnership with MBIE
Patrick Kearney – MSc, with Volker Nock, Luigi Sasso & Conan Fee
Jeremy Keown – PhD, with Grant Pearce
Sam Kim, with Juliet Gerrard, in partnership with Callaghan Innovation
Alicia Lai Sook Wei – PhD, with Anthony Poole
Eric Lang – PhD, with Emily Parker, in partnership with the BlueFern
Alex Law – MSc, with Renwick Dobson
Wenting Liu – PhD, with Anthony Poole
Emma Livingstone – MSc, with Emily Parker
Deepthi Mahapatra – PhD, with Renwick Dobson, Jolon Dyer & Juliet Gerrard, in partnership with AgResearch
Ashar Malik – PhD, with Jane Allison (Massey) & Anthony Poole
Anton Mather – MSc, with Simone Dimartino
Gerd Mittelstädt – PhD, with Emily Parker
Sujas Nawada – PhD, with Conan Fee & Simone Dimartino, in partnership with CAPE
Angela Newton – PhD, with Juliet Gerrard, in partnership with Fonterra
Vi-Vie Ng – PhD, with Volker Nock & Mathieu Sellier
Rachel North – PhD, with Renwick Dobson
Victoria O’Leary – MSc, with Richard Hartshorn, in partnership with AgResearch
Michael Oliver – BSc (Hons), with Renwick Dobson
Thomas Orban – PhD, with Renwick Dobson, in partnership with MBIE and Canterbury Scientific Ltd
Louise Orcheston-Findlay – PhD, with Volker Nock
Mohamad Othman – MSc, with Emily Parker
Rishi Pandey – PhD, with Grant Pearce, Jolon Dyer, Celine Valéry & Juliet Gerrard, in partnership with AgResearch,
Amy Phillips – PhD, with Juliet Gerrard, in partnership with MacDiarmid
Prasanna Ponnumallayan – PhD, with Conan Fee
Nivaskumar Ramaswamy – PhD, with Grant Pearce
Arvind Ravichandran – PhD, with Renwick Dobson
Roy Rezanavaz – PhD, with Conan Fee & Simone Dimartino
Eric Richards - Grant Pearce, in partnership with Callaghan Innovation and Anagenix
Anannah Rickerby – MSc, with Anthony Poole
Jordyn Smith – MSc, with Emily Parker

Michael Oliver – BSc (Hons), with Renwick Dobson
Nicole Wheeler – MSc, with Paul Gardner
Sarah Wilson-Coutts – PhD, with Emily Parker, in partnership with Callaghan Innovation
Amy Yewdall – PhD, with Juliet Gerrard, in partnership with US ARO
Our Networks

CONNECTING
59
INSTITUTIONS

International

National

Australia
Canada
China
Denmark
United Kingdom
France
Germany
Israel
Japan
Netherlands
Sweden
United States of America

AgResearch
Callaghan Innovation
Canterbury Scientific Limited
ESI
Ferrier Research Institute
Fonterra Research Centre
Lincoln University
Massey University
Mesynthes
Plant and Food
Powerhouse Ventures Ltd
University of Auckland
University of Otago
University of Waikato
Victoria University

Connecting
59 institutions
AGResearch
Jolon Dyer, Lincoln
Stefan Clerens, Lincoln
Ali Hodgkinson, Ruakura

Biotelliga
Stephen Ford

Callaghan Innovation
Antonia Miller, Christchurch
Andrew Muscroft-Taylor, Christchurch
Leonardo Negron, Lower Hutt

Canterbury Scientific Limited
Maurice Owen

Institute of Environmental Science & Research (ESR)
Brent Gilpin

Ferrier Research Institute
Gary Evans
Richard Furneaux
Peter Tyler
Phillip Rendle

Fonterra Research Centre
Paul Andrewes
Skelte Anema

Lincoln University
Jim Morton

Massey University
Jane Allison, Auckland
Geoff Jameson, Palmerston North
Bill Williams, Palmerston North
Heather Hendrickson, Auckland
Patrick Biggs, Palmerston North

Mesynthes
Barney May

Plant and Food
Nigel Larsen
Nick Tucker

Powerhouse Ventures Ltd
Stuart Lansley
Jennifer Anderson

University of Auckland
Margaret Brimble
Austen Ganley, Auckland
Juliet Gerrard
David Goldstone
Shaun Lott
Alok Mitra
Chris Squire
Jadranka Travas-Sejdic
David Williams
Laura Domigan

University of Otago
Stephen Brennan, Christchurch
Greg Cook
Monica Gerth
Mark Hampton, Christchurch
Tony Kettle, Christchurch
Kurt Krause
Jim McQuillan
Wayne Patrick
Tim Woodfield, Christchurch
Peter Fineran

University of Waikato
Vic Arcus

Victoria University
David Ackerley
Petrik Galvosas
Kate McGrath

Australia
Ashley Buckle, Monash University, Melbourne
John Carver, ANU, Canberra
John Fuerst, University of Queensland, Brisbane
Sally Gras, Bio21
Michael Griffin, University of Melbourne, Melbourne
Danny Hatters, Bio21, Melbourne
Craig Hutton, Bio21, Melbourne
Jenny Martin, University of Queensland, Brisbane
Bridget Mabbutt, Macquarie University, Sydney
Joel Mackay, University of Sydney, Sydney
Bostjan Kobe, University of Sydney, Sydney
James Murphy, Walter and Eliza Hall Institute, Melbourne
Matt Perugini, La Trobe University, Melbourne
Rachael Williamson, Australian Synchrotron, Melbourne
Celine Valery, RMIT, Melbourne
Claudia Vickers, University of Queensland, Brisbane

Canada
Karen Cheung, University of British Columbia, Vancouver
Derek Wilson, York University

China
Wenhui Wang, Tsinghua University, Beijing

Denmark
Eske Willerslev, Copenhagen University, Copenhagen
FRANCE
Simonetta Gribaldo, Institut Pasteur, Paris
Claude Verdier, University Joseph Fourier, Grenoble

GERMANY
Muge Kasancheff, Max Planck Institute for Biophysical Chemistry
Haydyn Mertens, EMBL, Hamburg
Gerald Urban, University of Freiburg, Freiburg
Mark Hoeppner, University of Kiel

ISRAEL
Meir Haber, Biota

JAPAN
Eiji Morita, Osaka University, Osaka
Jun Ogawa, Kyoto University, Kyoto
Hironori Suzuki, Japan
Robert Sinclair, Okinawa Institute of Science & Technology, Okinawa

NETHERLANDS
Luigi Sasso, Delft University of Technology

SWEDEN
Rosmarie Friemann, University of Gothenburg
Richard Neutze, University of Gothenburg
Britt-Marie Sjöberg, Stockholm University, Stockholm

UNITED KINGDOM
Sean Devenish, University of Cambridge, Cambridge
Carol Robinson, University of Oxford, Oxford
Graham Richards, University of Oxford, Oxford
Colin Kleanthous, University of Oxford, Oxford
Adrian Mulholland, University of Bristol
Nick Thomson, Wellcome Trust Sanger Institute, Cambridge
Jerry Turnbull, University of Liverpool, Liverpool

UNITED STATES OF AMERICA
David Boehr, Pennsylvania state university
Tim Cooper, University of Houston, Houston
Andre Hudson, Rochester Institute, New York
Eileen Jaffe, Fox Chase Cancer Center, Philadelphia
David Kaplan, Tufts University, Boston
Thomas Laue, University of New Hampshire, Durham
George Lorimer, University of Maryland, Washington
Charlene Mello, University of Massachusetts, Boston
Vern Schramm, Albert Einstein College of Medicine, New York


Access via UC Research Repository.


β-lactoglobulin nanofibrils and pectins

Morphology of complexes formed between
MAK, McGillivray DJ, Gerrard JA (2016)
Hettiarachchi CA, Melton LD, Williams
and its H274Y mutant to the antiviral drug
Somasundaram, B., Fee, C.J., Fredericks,
DOPA on stainless steel. Journal of Peptide
adhesive peptide sequences containing
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adhesive peptide sequences containing
and its H274Y mutant to the antiviral drug
Somasundaram, B., Fee, C.J., Fredericks,


**ORAL PRESENTATIONS**


Poole, A.M. (2016) RNA evolution is dominated by rapid turnover, not molecular fossils. Keynote speaker, Society for Molecular Biology & Evolution 2016, Gold Coast, Australia: July 2016


Poole, A.M. (2016) From RNA to DNA. Invited speaker, LUCA, its contemporaries and their viruses, Fondation des Treilles, Provence, France: May 2016


Poole, A.M. (2016) The RNA world and the origin of DNA. Invited seminar, University of Tokyo, Tokyo, Japan: March 2016


Poole, A.M. (2015) DNA, RNA, protein, time: using long term evolution experiments to study early evolution. Invited seminar, Massey University, Palmerston North, NZ: October 2015


**OTHER**


Matthew Nicholson and Emily Parker, Fungal factories for manufacture of high value industrial bioproducts, MBIE, $953,186 (2014-2016).


Emily Parker, Vurucidal action of naturally occurring enzymes found in waste stabilisation ponds, ESR, $17,000 (2014–2015).


Karen Adair, Community dynamics of freshwater algal blooms, $15,000 (2015–2016)


Renwick Dobson, How do bacteria scavenge sialic acids from their host cell? Marsden $770,000 (2016–2019)

Conan Fee, Riddet Institute, $54,480 (2016–2018)

Paul Gardner, CoRE Bio-Protection: Provide bioinformatics expertise to allow genomic comparisons and co-supervision of two students, $26,686 (2016)

Paul Gardner, CoRE Bio-Protection: To identify determinants of virulence and adaptation in the kiwifruit pathogen Pseudomonas syringae pv. actinidiae (Project 3), $64,596 (2016)

Volker Nock, Using the Lab-on-a-Chip to understand the protrusive force exerted by pathogenic hyphae, Brian Mason Scientific and Technical Trust, $11,763 (2015-2017)

Volker Nock, Hyphae-on-a-Chip - A microfluidic platform for the study of protrusive forces in hyphal invasion, Marsden Fast-Start, $300,000 (2016-2019)

Emily Parker, CoRE Maurice Wilkins, $765,940 (2015-2017)

Emily Parker, Virucidal action of naturally occurring enzymes found in waste stabilisation ponds, ESR, $61,000 (2014-2017)

Grant Pearce, Effect of protein and lipid co-oxidation on food quality, Co-funding for doctoral student, BIC/AgResearch, $42,543 (2016-2019)

Anthony Poole, Phylonygeny-informed comparative transcriptomics of bacteria and archaea, $15,000 (2015-2016)

Emily Parker, Dr. Maurice Wilkins students, $26,686 (2016)

Emily Parker, Vurucidal action of naturally occurring enzymes found in waste stabilisation ponds, ESR, $17,000 (2014–2015).


Karen Adair, Community dynamics of freshwater algal blooms, $15,000 (2015–2016)

Renwick Dobson, Riddet Institute, $68,520 (2016-2018)
Grants Disbursed

BIC supports the development and growth of biomolecular interaction research by funding projects that support our aim to promote excellent, high impact, interdisciplinary and collaborative research. In 2014 we awarded more than $150k.

Principal Investigator travel funding:
- Grant Pearce, AUC Conference, $2,500;
- Antony Fairbanks, Pacifichem 2015, $3,750;
- Renwick Dobson, AUC Conference and travel to the US, $5,000; Volker Nock, Micro TAS Conference, $4,000; Anthony Poole, Pacifichem, $3,500; Emily Parker, Pacifichem, $3,500.

Unfunded postgraduate student support was awarded to Azadeh Taleb Hashemi, $7,275.00; Jenna Gilkes, $7,640.00; Pariya Noeparvar, $8,600.00; Rasika Kariyawasam, $4,250.00; Yu Bai, $7,640.00; Jordyn Smith, $7,050.00.

Flagship funding of $75,000 was disbursed.

2015

Principal Investigator seed funding to establish new research projects, $27,000.

Renwick Dobson and Volker Nock, leveraged postgraduate scholarship funding co-funded by Callaghan Innovation, Laminar Flow Devices for Measuring the Diffusional Coefficients of Macromolecules and Macromolecular Interactions: Toward Devices for Medical Testing, $21,000 plus fees per annum for three years, (half funded by BIC).

Akshita Wason (Antony Fairbanks), strategic Postdoctoral Fellowship funding, Synthesis of Phosphorylated Glycoproteins, $8,000.

Katherine Donovan (Renwick Dobson), strategic Postdoctoral Fellowship funding, Viral capsid-like bacterial enzyme factories: Structure, function, evolution and mode of assembly and packaging, $16,000.

Amy Osborne (Ant Poole), strategic Postdoctoral Fellowship funding, Phylogeny-informed comparative transcriptomics of Bacteria and Archaea as a tool to study avoidance of non-coding RNA – mRNA crosstalk interactions, $17,500.

Dorien Coray (Paul Gardner), strategic Postdoctoral Fellowship funding, RNA vs protein: investigating evolutionary robustness, $17,500.

Prasanna Ponnumallayan (Conan Fee), strategic Postdoctoral Fellowship funding, Gelation Properties of Self-Assembling Peptides, $10,700.

Principal Investigator travel funding:
- Grant Pearce, AUC Conference, $2,500;
- Antony Fairbanks, Pacifichem 2015, $3,750;
- Renwick Dobson, AUC Conference and travel to the US, $5,000; Volker Nock, Micro TAS Conference, $4,000; Anthony Poole, Pacifichem, $3,500; Emily Parker, Pacifichem, $3,500.

Unfunded postgraduate student support was awarded to Azadeh Taleb Hashemi, $7,275.00; Jenna Gilkes, $7,640.00; Pariya Noeparvar, $8,600.00; Rasika Kariyawasam, $4,250.00; Yu Bai, $7,640.00; Jordyn Smith, $7,050.00.

Flagship funding of $75,000 was disbursed.

2016

Grant Pearce, leveraged postgraduate scholarship funding co-funded by AgResearch, Effect of protein and lipid co-oxidation on food quality, $21,000 plus fees per annum for three years, (half funded by BIC).

Anthony Poole, full postgraduate scholarship funding, Using synthetic evolution to streamline translation, $21,000 plus fees per annum for three years, (half funded by BIC).

Paul Gardner, full postgraduate scholarship funding, Evolving RNA-protein interactions, $21,000 plus fees per annum for three years.

Gabriel Visnosky, seed funding, Production of baculovirus biopesticides using insect cell culture: improving yields to allow commercialisation, $10,500.

Mark Staiger, seed funding, Prevention of fungal invasion via pruning wounds in grape vines, $5,000.

Volker Nock and Monica Gerth, seed funding, SlipChips for Bacterial Chemotaxis, $5,000.

Renwick Dobson, seed funding, Function of SpoF: a bi-functional enzyme that controls bacterial adaptation, $5,000.

Anthony Poole, strategic Postdoctoral Fellowship funding, Evolving RNA editing in the lab, $17,000.

Renwick Dobson, strategic Postdoctoral Fellowship funding, Biointeractions between milk proteins: a new role for β-lactoglobulin and interactions of lactoferrin, $17,000.

Paul Gardner, strategic Postdoctoral Fellowship funding, Robustness of RNA and protein function in the face of genetic change, $17,000.

Emily Parker, strategic Postdoctoral Fellowship funding, Tracing the evolutionary relationship of allosteric regulation mechanisms in metabolic enzymes, $17,000.

Principal Investigator travel funding,
- Volker Nock, MNE 2016 Micro- and Nano-engineering conference, $5,400;
- Emily Parker, Protein Society Symposium, GRC – Enzymes coenzymes and metabolic pathways conference, visits to US collaborators, $4,700;
- Renwick Dobson, QMB 2016, SMBE 2016 and visit to the Australian Synchrotron, $5,000; Grant Pearce, visit to the Australian Synchrotron, $1,000; Antony Fairbanks, 27th International Carbohydrate Symposium (ICS), $3,200.

Principal Investigator seed and targeted funding to establish new research projects, $75,000.

Prasanna Ponnumallayan (Conan Fee), strategic Postdoctoral Fellowship funding, Gelation Properties of Self-Assembling Peptides, $10,700.

Unfunded postgraduate student support was awarded to Jenna Gilkes, $2,500.00; Pravesh Tyagi, $5,000.00; Mohammad Firoozinia, $2,500.00; Mehrnoosh Tangestani, $5,000.00; Hamish Cleland, $3,000.00; Cameron MacDonald, $3,000.00; James Davies, $3,000.00; William Finnis, $3,000.00.

UC Summer Scholarships, co-funding of 14 projects of BIC Principal and Associate Investigators, $35,000.

Flagship funding of $75,000 was disbursed.

TO ENCOURAGE AND GROW RESEARCH THAT SUPPORTS OUR VISION

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