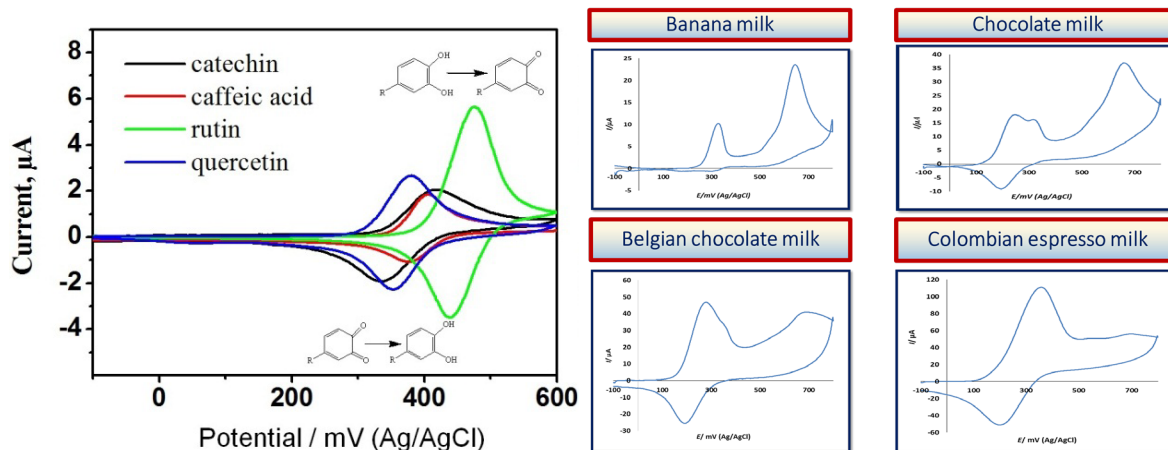


# Faculty of Science

## Summer Research Scholarships

### 2026/2027 Projects (Chemical Sciences)

<b>Project code</b>	SCI004
<b>Project title</b>	<b>Characterisation of beverage antioxidants using cyclic voltammetry</b>
<b>Discipline</b>	Chemical Sciences
<b>Supervisor(s)</b>	Prof Paul Kilmartin
<b>Contact details</b>	p.kilmartin@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>Analytical Chemistry laboratory work</li> <li>Electrochemistry principles from CHEM252 and preferably CHEM340</li> </ul>
<b>Project description</b>	
<p>The antioxidants present in beverages can be quantified and information provided about their reducing strength using the electrochemical technique of cyclic voltammetry. This technique has been developed at the University of Auckland to profile wines, fruit juices, teas and coffees, and milk. In this project, the voltammetry procedure will be applied to the antioxidants present in a series of alcoholic and other beverages, including beer and fortified drinks. An examination of the most appropriate solvent for the measurement of the phenolic and other antioxidants present will be made, along with the electrode conditions needed to make a reliable quantification. Comparisons will be made with standard Food Science antioxidant assays, and a wide range of beverages of different strengths will be surveyed.</p>	



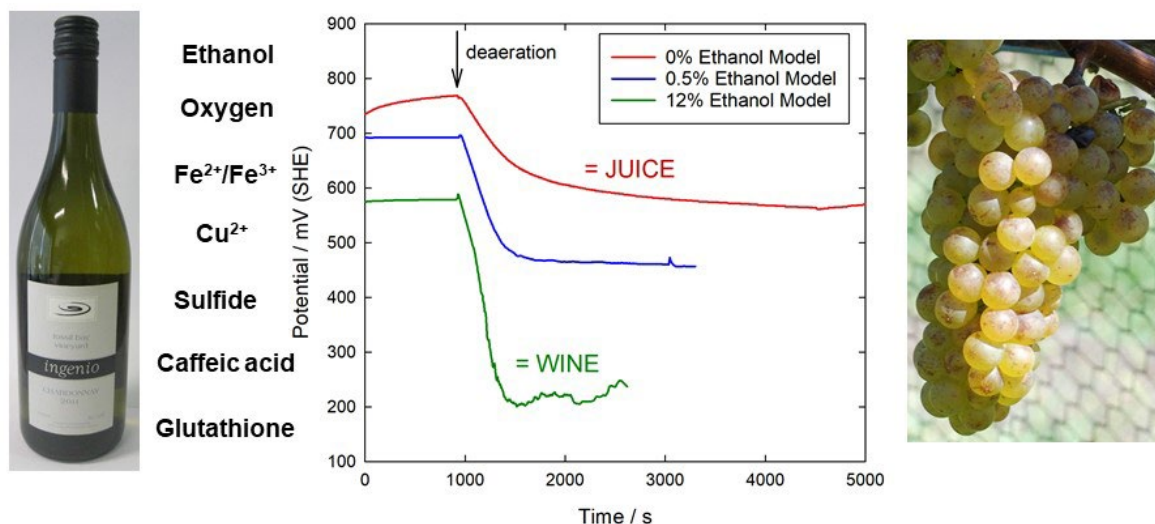
Cyclic voltammograms of polyphenol standards and of flavoured milks

# Faculty of Science

## Summer Research Scholarships

### 2026/2027 Projects (Chemical Sciences)

<b>Project code</b>	SCI005
<b>Project title</b>	<b>Behaviour of platinum electrodes at open circuit in and wines of different ethanol contents</b>
<b>Discipline</b>	Chemical Sciences
<b>Supervisor(s)</b>	Prof Paul Kilmartin
<b>Contact details</b>	p.kilmartin@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>Analytical Chemistry laboratory work</li> <li>Electrochemistry principles from CHEM252 and preferably CHEM340</li> </ul>
<b>Project description</b>	
<p>The so-called redox potential of wine at a bright platinum electrode (with no current flowing) has a long history in enology. However, our own experiments have indicated that the measure provides only a broad indication of dissolved oxygen content, but little further information on wine redox status.</p> <p>The experimental tests will include monitoring the redox potential and the dissolved oxygen content across a range of wines of differing alcohol content, particularly so-called “zero” alcohol wines, lighter wines and full-strength wines. Selective additions of ethanol to wines will be made and the redox potential response recorded. Prolonged exposure of wine to Pt at open circuit will be undertaken to check for acetaldehyde formation.</p>	



Previous trends seen in redox potential values of model wines solutions of varying ethanol content.

**Faculty of Science**  
**Summer Research Scholarships**

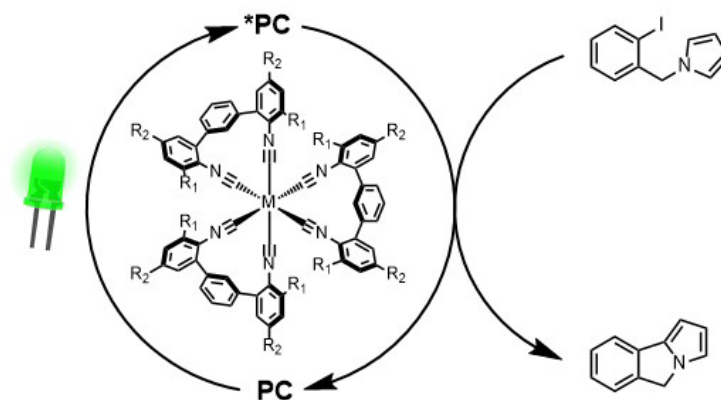
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI006
<b>Project title</b>	<b>Electrochemical Biosensor for Detection of Alzheimer's Disease</b>
<b>Discipline</b>	Faculty of Science, School of Chemical Sciences
<b>Supervisor(s)</b>	Prof. Jadranka Travas-Sejdic
<b>Contact details</b>	j.travas-sejdic@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• Interest in materials science</li><li>• Interest in interdisciplinary research</li><li>• good lab skills and reports writing skills</li></ul>
<b>Project description</b> <p>The project will focus on developing advanced conducting polymer microelectrode arrays for highly sensitive electrochemical biosensing applications. The work will involve fabricating conducting polymer 3D electrodes using a meniscus-guided printing technique developed in our lab and evaluating their performance for the detection of neurological disease biomarkers.</p> <p>The project will aim to optimise the 3D electrode architecture achieve highly sensitive sensing compared with conventional two-dimensional electrode designs. As a proof-of-concept, the optimised platform will be applied to the detection of Tau231, a biomarker associated with Alzheimer's disease. This research contributes to the development of next-generation bioelectronic sensing platforms for multiplexed detection of neurological biomarkers and early disease diagnostics.</p>	

**Faculty of Science**  
**Summer Research Scholarships**

**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI007
<b>Project title</b>	<b>Earth-Abundant Photocatalysts</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Christopher Larsen
<b>Contact details</b>	<a href="mailto:christopher.larsen@auckland.ac.nz">christopher.larsen@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• 200-level synthetic chemistry lab experience (CHEM 251/253)</li></ul>
<b>Project description</b> <p>The 21<sup>st</sup> century has already been named the century of the photon, due to the exploding importance of photochemistry for solar energy conversion, quantum technologies and sustainable chemical synthesis.</p> <p>Most photocatalysts are based on complexes of unabundant, expensive precious metals. In this project, we seek to develop earth-abundant photocatalysts as sustainable and cost-effective alternatives. We will design and prepare novel photoactive complexes, spectroscopically investigate their photophysical properties, and test their performance in photoredox and energy-transfer catalysis applications.</p> <p>Specific projects can be tailored to students interests in organic synthesis, coordination chemistry, photochemistry and spectroscopy.</p>	

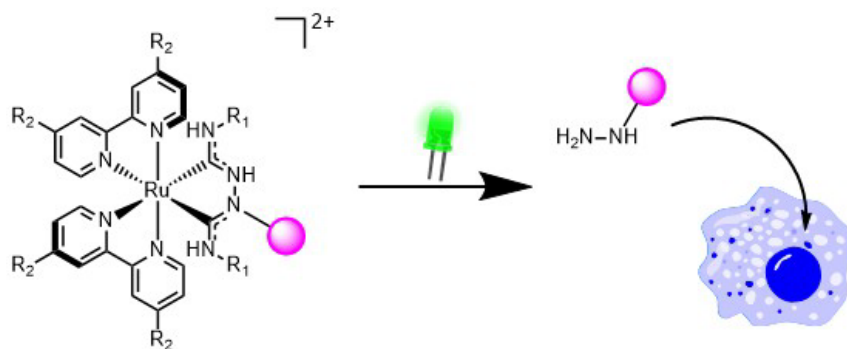


**Representative photocatalytic cycle with an earth-abundant photocatalyst**

**Faculty of Science**  
**Summer Research Scholarships**

**2026/2027 Projects (Chemical Sciences)**

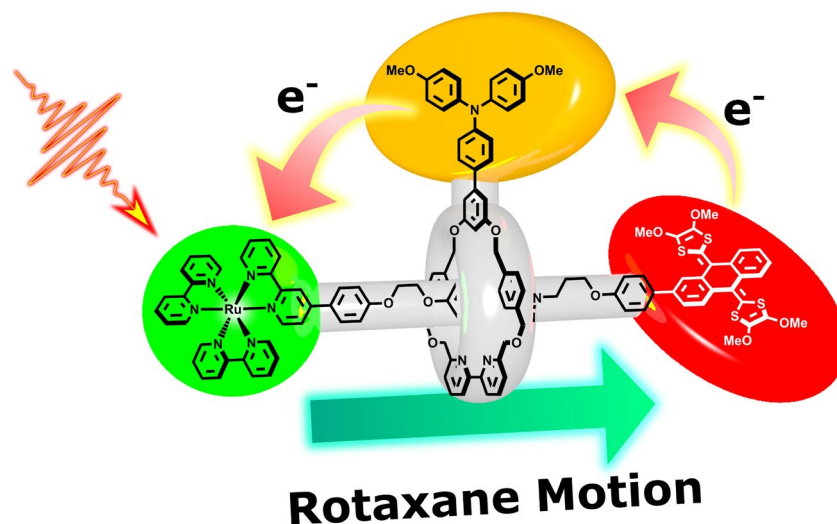
<b>Project code</b>	SCI008
<b>Project title</b>	<b>Photoresponsive Molecules for Targeted Drug Delivery</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Christopher Larsen
<b>Contact details</b>	<a href="mailto:christopher.larsen@auckland.ac.nz">christopher.larsen@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• 200-level synthetic chemistry lab experience (CHEM 251/253)</li><li>• <b>OR</b> 200-level physical chemistry lab experience (CHEM 251/252)</li></ul>
<b>Project description</b>	<p>Photoactivated chemotherapy is an emerging approach to circumvent side effects of traditional chemotherapy and the increasing problem of drug resistance.</p> <p>In this approach, we develop Ru-based photo-responsive molecules (photocages) that selectively deliver highly toxic anti-cancer drugs to tumours, which are then released with high spatiotemporal control through non-harmful visible light irradiation.</p> <p>Offered projects include:</p> <ul style="list-style-type: none"><li>• Developing and studying new photocage scaffolds with novel photorelease mechanisms</li><li>• Developing new methods of connecting drug molecules / stimulants to photocages</li><li>• Investigating photorelease mechanisms through temperature-dependent spectroscopies</li></ul>



**Targeted photorelease from a Chugaev-type dicarbene complex**

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

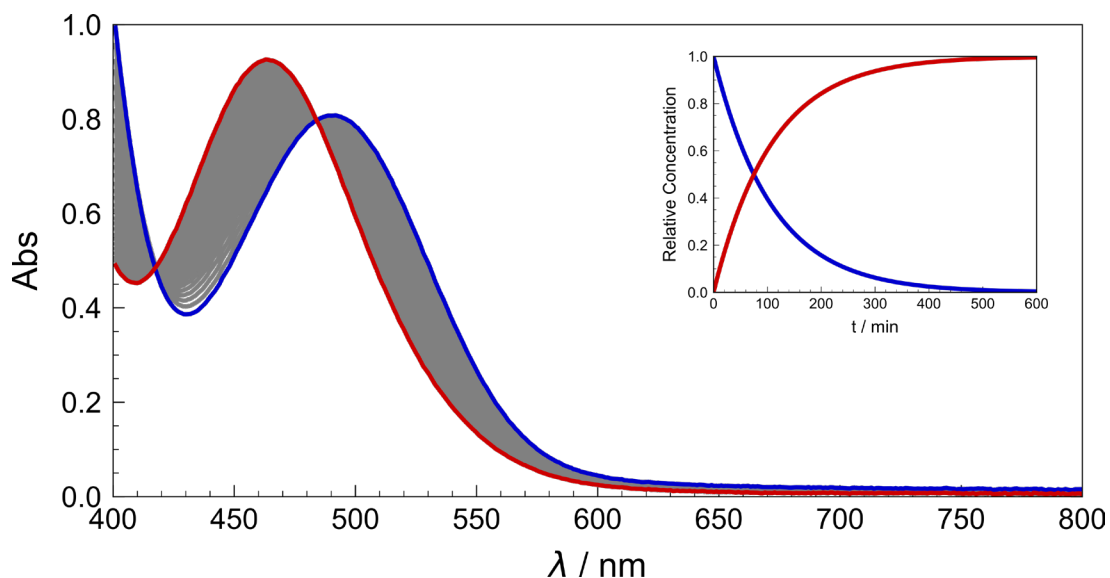
<b>Project code</b>	SCI009
<b>Project title</b>	<b>Supramolecular Approaches Towards Artificial Photosynthesis</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Christopher Larsen
<b>Contact details</b>	<a href="mailto:christopher.larsen@auckland.ac.nz">christopher.larsen@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• 200-level synthetic chemistry lab experience (CHEM 251/253)</li></ul>
<b>Project description</b> We are investigating new paradigms to transport charge at the molecular scale using the dynamic nature of supramolecular architectures known as molecular machines. In doing so, we seek to overcome current limitations in biomimetic artificial photosynthesis and successfully mimic key steps of natural photosynthesis.  Offered projects include: <ul style="list-style-type: none"><li>• Developing and studying rotaxanes that transport charge via molecular machine-type behaviour</li><li>• Developing synthetic approaches to higher order rotaxanes for long-range charge separation</li></ul>	



**Molecular machine-based charge-transport**

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI010
<b>Project title</b>	<b>Modernising Classic Experiments with Chemometric Analyses</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Christopher Larsen
<b>Contact details</b>	<a href="mailto:christopher.larsen@auckland.ac.nz">christopher.larsen@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>• 200-level physical chemistry lab experience (CHEM 251/252)</li> <li>• An interest in education/pedagogy</li> <li>• Experience in coding not required</li> </ul>
<b>Project description</b>	
<p>In this chemical education project, we are seeking to modernise classic undergraduate laboratory experiments with the state-of-the-art spectroscopic facilities in our undergraduate labs, and through the utilisation of now widespread digital tools to perform powerful chemometric analyses that will enhance student understanding of underlying theoretical concepts.</p> <p>These experiments are generally focussed around the use of UV-Vis spectroscopy to investigate reaction rate constants, thermodynamic binding constants and pKa values. Chemometric analyses will be implemented across several platforms including Python, R and Matlab.</p>	

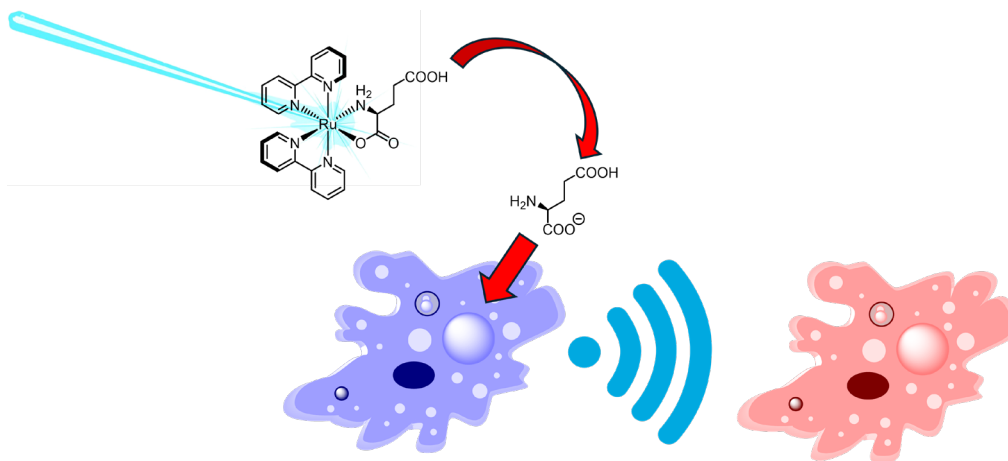


**UV-Vis kinetics experiment and species populations from global fitting**

**Faculty of Science**  
**Summer Research Scholarships**

**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI011
<b>Project title</b>	<b>Caging Functional Molecules to Understand Communication in Brain Cancer Cells</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Christopher Larsen Prof. Christian Hartinger Prof. Charles Unsworth
<b>Contact details</b>	<a href="mailto:christopher.larsen@auckland.ac.nz">christopher.larsen@auckland.ac.nz</a> <a href="mailto:c.hartinger@auckland.ac.nz">c.hartinger@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• 200-level synthetic chemistry lab experience (CHEM 251/253)</li></ul>
<b>Project description</b>	<p>We are seeking to study how brain cancer cells communicate in 3D. To achieve this, we will introduce 'caged' biostimulants (e.g. glutamate) that can be released under light irradiation with high spatiotemporal control to stimulate a single cell, and track how the cells communicate using 3D fluorescence microscopy techniques.</p> <p>This project will involve the synthesis and characterisation of coordination compounds with ligated glutamate and potentially other biostimulants, and study their light-induced release from photoactive Ru(II) complexes for cell communication studies.</p>



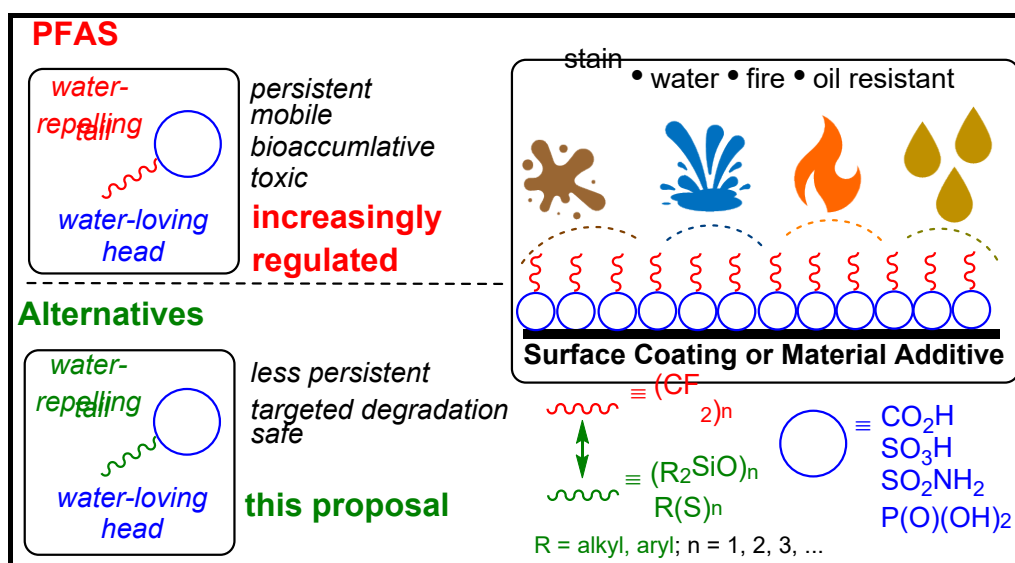
**Targeted photorelease of glutamate initiating communication between cancer cells**

# Faculty of Science

## Summer Research Scholarships

### 2026/2027 Projects (Chemical Sciences)

<b>Project code</b>	SCI012
<b>Project title</b>	<b>Safe-by-design alternatives to forever chemicals</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Associate Professor Erin Leitaó
<b>Contact details</b>	erin.leitao@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>• Undergraduate chemistry lab experience</li> <li>• Desire to synthesise and characterise materials</li> <li>• Interest in learning air-sensitive techniques</li> </ul>
<b>Project description</b>	
<p>Thousands of per- and poly-fluoroalkyl substances (PFAS) are widely used for their remarkable chemical-, water-, heat- and stain-resistant properties. However, these same properties make them extraordinarily persistent, allowing them to move through the environment, bioaccumulate and pose significant risks to human health. Growing global concerns have already led to regulatory bans and restrictions, highlight an urgent need for safer, high-performance alternatives.</p> <p>In this research project you will be at the forefront of developing the next generation of sustainable PFAS-like materials. You will help design, synthesise, and characterise the alternatives, evaluate their performance, and investigate how they break down in real-world conditions. Your work will contribute directly to tackling one of today's most pressing environmental challenges – helping to create safer products for a cleaner and healthier future.</p> <p>This project is funded by the Royal Society Te Apārangi Marsden Grant.</p>	



<b>Project code</b>	SCI013
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# Faculty of Science

## Summer Research Scholarships

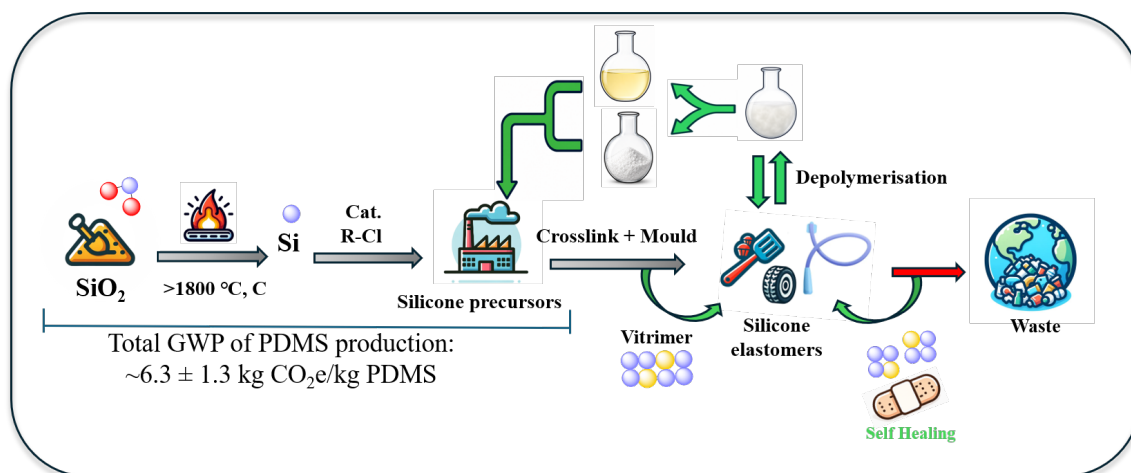
### 2026/2027 Projects (Chemical Sciences)

<b>Project title</b>	<b>Closing the loop on silicone</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Associate Professor Erin Leitao
<b>Contact details</b>	erin.leitao@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>• Undergraduate chemistry lab experience</li> <li>• Desire to synthesise, characterise and degrade materials</li> </ul>

#### Project description

Silicone materials are everywhere, from healthcare devices to everyday consumer products, thanks to their flexibility, durability, and remarkable performance across extreme conditions. Yet despite their widespread use, most silicones still follow a linear lifecycle, contributing to waste and carbon emissions. This research project tackles that challenge by exploring two strategies to make silicones more circular: chemical degradation and silicone redesign.

You will investigate silicone materials that can be repaired, reused, and regenerated. The project will include silicone synthesis, formulation, degradation and characterisation using a variety of analytical techniques. Your work will help to develop sustainable solutions that extend silicone material lifetimes, reduce waste, moving from a linear to a circular silicone economy.

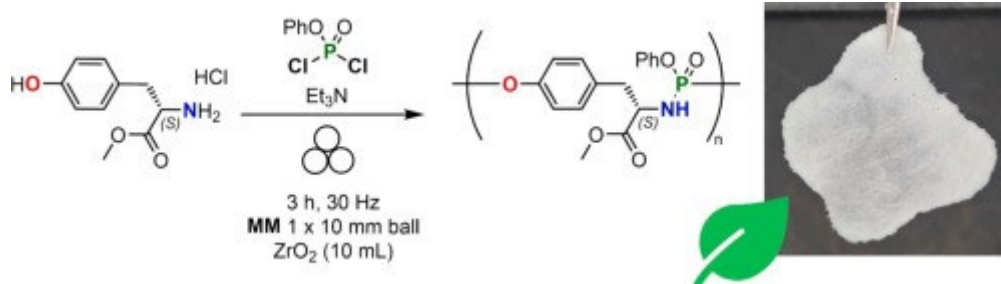


# Faculty of Science

## Summer Research Scholarships

### 2026/2027 Projects (Chemical Sciences)

<b>Project code</b>	SCI014
<b>Project title</b>	<b>Creating flame retardant phosphorus-containing polymers</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Associate Professor Erin Leitao
<b>Contact details</b>	erin.leitao@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• Undergraduate chemistry lab experience</li><li>• Desire to synthesise, characterise and degrade materials</li><li>• Interest in learning mechanochemistry</li></ul>
<b>Project description</b> <p>Polyphosphoramidates are a unique class of phosphorus–nitrogen-containing polymers known for their inherent flame-retardant behaviour and thermal stability, but their broader development and property evaluation remains largely untapped.</p> <p>In this project, you will expand on the scope of the materials developed in our lab by synthesising new polymers using mechanochemical (solvent-free) techniques. You will also investigate the polymer properties such as thermal resistance, char formation, flame retardancy and pH triggered degradation. This project offers hands-on experience in modern polymer synthesis and characterisation, while contributing to the development of safer, more sustainable, high-performance materials.</p>	



**Faculty of Science**  
**Summer Research Scholarships**

**2026/2027 Projects (Chemical Sciences)**

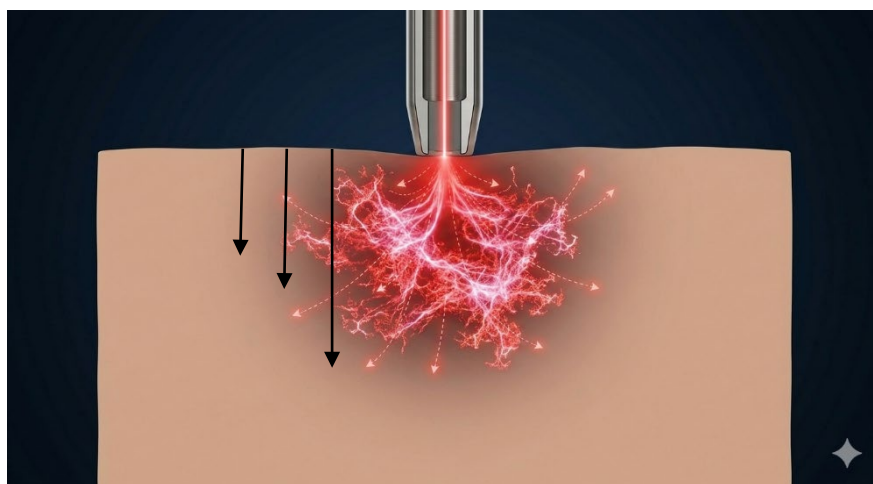
<b>Project code</b>	SCI015
<b>Project title</b>	<b>Measure the depth Near Infrared Radiation penetrates skin</b>
<b>Discipline</b>	Physical Chemistry, Optical Physics
<b>Supervisor(s)</b>	Michel Nieuwoudt Hannah Sheridan Supported by Hannah Matthews
<b>Contact details</b>	m.nieuwoudt@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• An interest in Raman spectroscopy and its use in health diagnostics</li><li>• Some knowledge of Python and/or Matlab coding</li><li>• Physics and/or Physical Chemistry as majors</li></ul>

**Project description**

New Zealanders experience the highest UV levels in the world during our summer months, which has resulted in the highest death rate from melanoma in the world – more than annual road deaths. GP's are the first point of call for most people seeking advice on suspicious skin lesions, but they are not skin specialists and either over-refer for biopsies or miss melanomas and other skin cancers.

We have developed a portable Raman system that can be used in the clinic to accurately identify skin lesions as cancerous or benign in the clinic. The measurement is non-invasive and rapid, with measurement taking 10 s. In addition, preliminary measurements have shown that we can distinguish chronologically aged skin from photo-aged (exposed to UV) skin.

While Monte Carlo simulations have been used to estimate the depth of penetration of the Raman laser excitation in biological tissue, the geometry and design of the fibre optic probe delivering the laser radiation will affect this. In this Summer project, you will perform measurements to empirically determine the depth that the laser excitation from a custom designed fibre optic probe geometry penetrates into skin, by measuring the Raman signal and compare your measurements with Monte Carlo simulations.



**Faculty of Science**  
**Summer Research Scholarships**

**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI016
<b>Project title</b>	<b>Measure how deep Near infrared radiation penetrates skin</b>
<b>Discipline</b>	Physical Chemistry, Optical Physics
<b>Supervisor(s)</b>	Michel Nieuwoudt Hannah Sheridan Supported by Hannah Matthews
<b>Contact details</b>	m.nieuwoudt@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• An interest in using Raman spectroscopy for in-clinic health diagnostics</li><li>• Some knowledge of Python and/or Matlab coding</li><li>• Physics and/or Physical Chemistry as majors</li></ul>
<b>Project description</b> <p>New Zealanders experience the highest UV levels in the world during our summer months, which has resulted in the highest death rate from melanoma in the world – more than annual road deaths. GP's are the first point of call for most people seeking advice on suspicious skin lesions, but they are not skin specialists and either over-refer for biopsies or miss melanomas and other skin cancers.</p> <p>We have developed a portable Raman system that can be used in the clinic to accurately identify skin lesions as cancerous or benign in the clinic. The measurement is non-invasive and rapid, with measurement taking 10 s. In addition, preliminary measurements have shown that we can distinguish chronologically aged skin from photo-aged (exposed to UV) skin.</p> <p>While Monte Carlo simulations have been used to estimate the depth of penetration of the Raman laser excitation in biological tissue, the geometry and design of the fibre optic probe delivering the laser radiation will affect this. In this Summer project, you will perform measurements to empirically determine the depth that the laser excitation from a custom designed fibre optic probe geometry penetrates into skin, by measuring the Raman signal and compare your measurements with Monte Carlo simulations.</p>	

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI017
<b>Project title</b>	<b>Dynamic Microfluidics using High-Speed Photography</b>
<b>Discipline</b>	Chemistry
<b>Supervisor(s)</b>	Prof Geoff Willmott Dr Mohammed Abdelbassit
<b>Contact details</b>	<a href="mailto:g.willmott@auckland.ac.nz">g.willmott@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• <i>Good written and verbal communications skills</i></li><li>• <i>Interest and good track record in related academic topics</i></li></ul>
<b>Project description</b> <p>The Dynamic Microfluidics Laboratory (<a href="https://fluidics.physics.auckland.ac.nz/">https://fluidics.physics.auckland.ac.nz/</a>) uses high-speed photography to study the motion of fluids at small length scales. Various projects are available to study phenomena including (for example):</p> <ul style="list-style-type: none"><li>• Impacts of drops on to surfaces, especially fluids of industrial interest which are often non-Newtonian (e.g. milk, ferrofluids).</li><li>• The fate of droplets floating in air, relevant (for example) to the spread of viruses.</li><li>• The detailed dynamics of capillary uptake.</li></ul> <p>The student should be an aspiring chemist with an interest in analytic, physical/materials, food, or forensics topics. They will gain skills and experience relating to materials characterization, high-speed photography and/or image analysis.</p>	

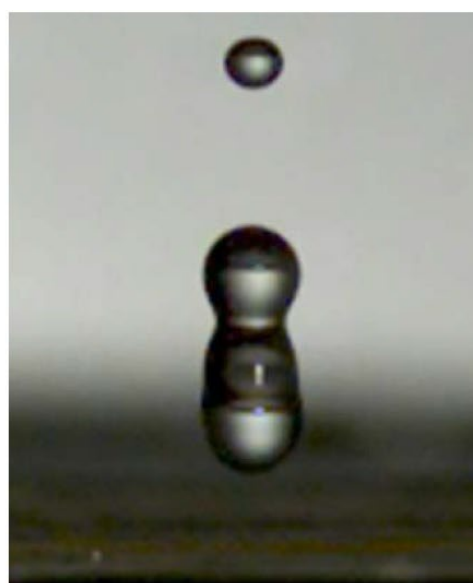
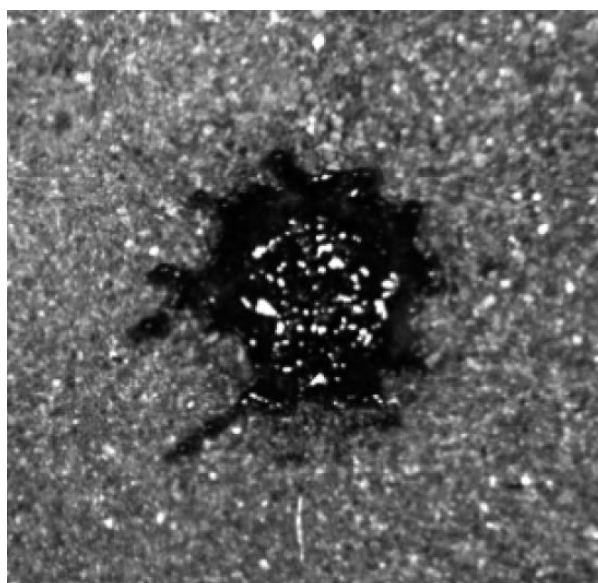


Figure: examples of water drop impact outcomes on (left) a granular surface, top-down view; and (right) a superhydrophobic surface, side view.

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI018
<b>Project title</b>	<b>Janus Spheres</b>
<b>Discipline</b>	Chemistry
<b>Supervisor(s)</b>	Prof Geoff Willmott Stephen Chung, Thomas Murphy
<b>Contact details</b>	<a href="mailto:g.willmott@auckland.ac.nz">g.willmott@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• <i>Good written and verbal communications skills</i></li><li>• <i>Interest and good track record in related academic topics</i></li></ul>
<b>Project description</b> <p>This project will experimentally study Janus spheres, which are microspheres which have two (or more) different surface coatings applied to them. We are interested in how the asymmetry of these spheres affects the formation of self-assembling particle clusters. Janus particle clusters could be used to develop reconfigurable components for sustainable technologies, and they also serve as a good model for biological self-assembly.</p> <p>To study clustering, particles in solution are observed as they come together on a microfluidic chip.</p> <p>The student should be an aspiring physical/materials chemist, who will gain skills and experience relating to materials characterization, microfluidics, fabrication, and/or image analysis methods.</p> <p>Lab website: <a href="https://fluidics.physics.auckland.ac.nz/">https://fluidics.physics.auckland.ac.nz/</a></p>	

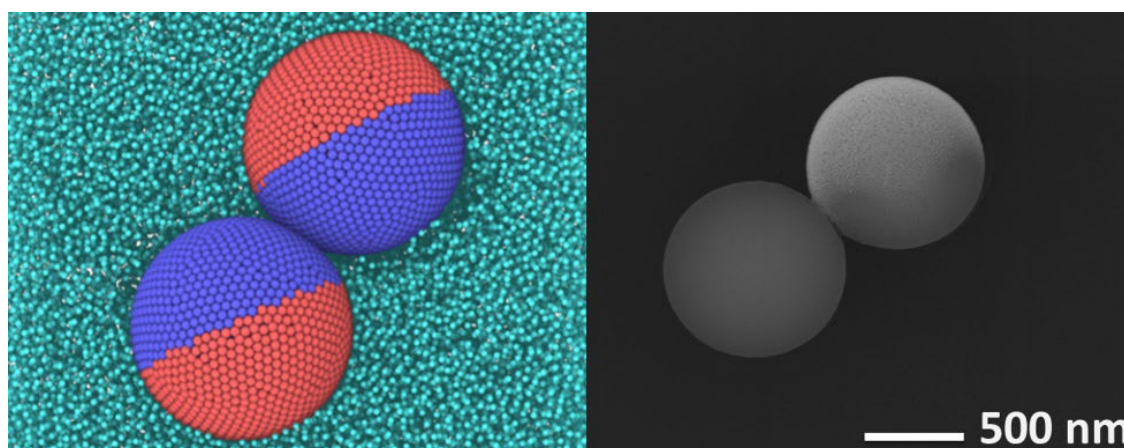


Figure: Dimers of Janus particles represented in (left) a computational simulation; and (right) SEM imaging of gold-capped polystyrene colloids.

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI019
<b>Project title</b>	<b>How Squishy is a Soft Particle?</b>
<b>Discipline</b>	Chemistry
<b>Supervisor(s)</b>	Prof Geoff Willmott Chi Minh (Mike) Truong, Akid Ornob
<b>Contact details</b>	<a href="mailto:g.willmott@auckland.ac.nz">g.willmott@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• <i>Good written and verbal communications skills</i></li><li>• <i>Interest and good track record in related academic topics</i></li></ul>
<b>Project description</b> <p>We have developed a method (known as ‘aspiration’) which can measure the mechanical properties of soft microparticles using the humble pipette. The important role of such mechanical properties in (bio-)medical research is emerging. Projects are available to apply aspiration to interesting particles. For example, we are keen to explore the mechanics of liposomes, a family of synthetic micro- and nanoparticles analogous to cells, and with potential drug delivery applications.</p> <p>The student should be an aspiring physical/materials scientist, who will gain skills and experience relating to materials fabrication and characterization.</p> <p>Projects may be funded from an ongoing Smart Ideas grant. Lab website: <a href="https://fluidics.physics.auckland.ac.nz/">https://fluidics.physics.auckland.ac.nz/</a></p>	

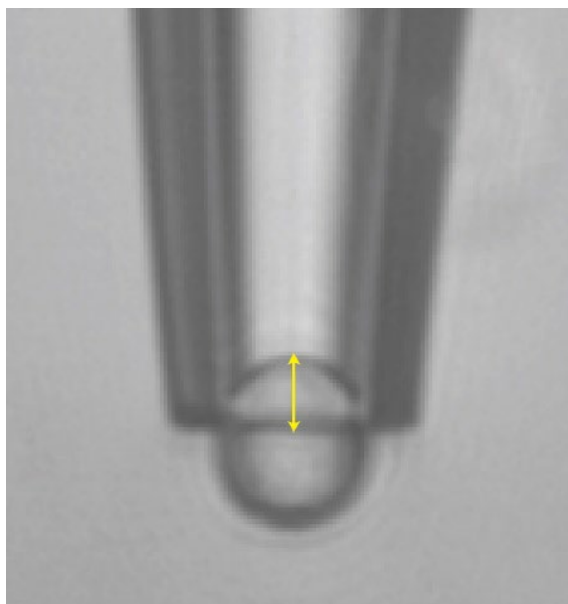


Figure: Uptake of a ~10  $\mu\text{m}$  diameter soft colloid into the opening of a pipette, with the degree of deformation measured (yellow arrow).

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI020
<b>Project title</b>	<b>Switchable solvents for enhanced biocatalysis</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Cameron Weber Tristan de Rond
<b>Contact details</b>	<a href="mailto:cameron.weber@auckland.ac.nz">cameron.weber@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• Stage II (or higher) background in chemistry</li><li>• Interest in green chemistry, catalysis, biological chemistry or alternative solvents</li><li>•</li></ul>
<b>Project description</b> <p>Switchable solvents are liquids that abruptly change properties in response to an external trigger. We have recently developed a new class of cost-effective switchable solvents that change miscibility with water under mild heating (&lt; 50 °C in many cases). These solvents are expected to be compatible with enzymatic processes based on their chemical similarity to known additives, although this has not yet been investigated.</p> <p>This summer research project will explore the viability of these solvents for biocatalysis for well-known enzymatic processes, with the aim to use these solvents as both an additive to enhance reactivity and medium for the separation of products. This will allow the enzyme to be recovered and reused and the minimisation of solvent waste.</p>	

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI021
<b>Project title</b>	<b>Phase behaviour of thermoswitchable solvents</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Cameron Weber Benjamin Smit-Colbran
<b>Contact details</b>	<a href="mailto:cameron.weber@auckland.ac.nz">cameron.weber@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• Stage II (or higher) background in chemistry</li><li>• Interest in green chemistry, physical chemistry or alternative solvents</li></ul>
<b>Project description</b> <p>Thermoswitchable solvents change their miscibility with water above or below a critical temperature. We have recently discovered a cost-effective class of switchable solvents which change their miscibility with water on heating and at relatively mild temperatures (&lt; 50 °C). While the behaviour of these solvents with water is known, the interaction of these solvents with non-polar liquids is not currently understood.</p> <p>This summer research project will explore the temperature-dependent ability of these switchable solvents to mix with non-polar liquids in the presence and absence of water. Based on the outcomes of these investigations, model extraction studies will be performed to evaluate the application of this approach to enable selective separation processes.</p>	

**Faculty of Science**  
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**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI022
<b>Project title</b>	<b>Metal separation using switchable solvents</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Cameron Weber Benjamin Smit-Colbran
<b>Contact details</b>	<a href="mailto:cameron.weber@auckland.ac.nz">cameron.weber@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• Stage II (or higher) background in chemistry</li><li>• Interest in green chemistry, analytical chemistry or alternative solvents</li></ul>
<b>Project description</b> <p>Preliminary results from our group have identified that our recently developed thermally switchable solvents enable the separation of a range of metal ions from water under both neutral and acidic conditions. This approach could help with metal recovery and reuse from e-waste and mining operations.</p> <p>The aim of this summer research project will be to explore the selectivity of this approach for different metal ions of interest for e-waste recycling, and optimise the conditions for this extraction process for selected metals.</p>	

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**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI023
<b>Project title</b>	<b>Genome mining to decode nature's potential</b>
<b>Discipline</b>	Chemical Sciences
<b>Supervisor(s)</b>	Tristan de Rond
<b>Contact details</b>	Tristan.de.rond@gmail.com
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• Some knowledge of molecular biology</li><li>• Some familiarity with the unix command line</li></ul>
<b>Project description</b> <p>Billions of years of evolution have produced immense natural genetic diversity, much of which is only now becoming accessible through modern sequencing technologies. Genome mining seeks to explore this sequencing data to discover new biocatalysts, pharmaceuticals and biochemical insight.</p> <p>In this project, the student will culture bacteria, extract DNA, and use genome sequencing alongside metabolite analysis to investigate bacterial biosynthetic potential. Metabolites produced by the host organism will be analysed using analytical chemistry techniques such as LC-MS or GC-MS, while genome sequencing data will be explored using computational bioinformatic genome-mining approaches to identify biosynthetic genes and enzyme families. By combining chemical and genomic information, we will begin linking genes to the molecules whose production they encode.</p> <p>The student will gain experience in microbiology, bacterial culturing, genome sequencing, comparative bioinformatics, biosynthetic logic, metabolite analysis, literature analysis and scientific presentation. Depending on progress, selected genes and metabolites may be prioritised for future experimental characterisation.</p>	

**Faculty of Science**  
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**2026/2027 Projects (Chemical Sciences)**

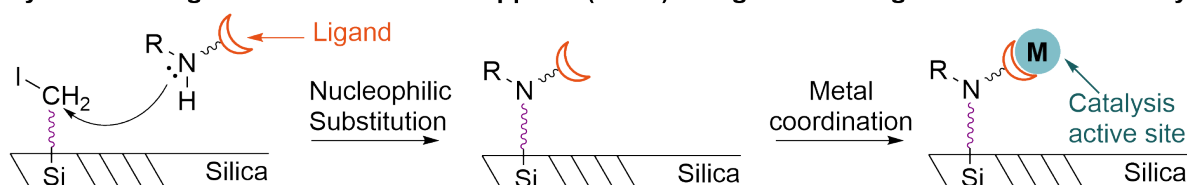
<b>Project code</b>	SCI024
<b>Project title</b>	<b>Uncovering Nature's Hidden Chemistry</b>
<b>Discipline</b>	Chemical Sciences
<b>Supervisor(s)</b>	Tristan de Rond
<b>Contact details</b>	Tristan.de.rond@auckland.ac.nz
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• Some knowledge of organic chemistry</li><li>• Some chemistry laboratory skills</li><li>• Some knowledge of molecular biology</li></ul>
<b>Project description</b> <p>Nature contains a vast reservoir of uncharacterised enzymes that may produce molecules with new structures and useful biological activities. Genome mining can identify biosynthetic genes coding for enzyme for which the function is unknown, but that means the chemical products of these enzymes must be detected, purified and structurally characterised to reveal the enzymes' functions.</p> <p>In this project, the student will investigate metabolic products produced by selected unannotated biosynthetic genes. Genes will be expressed heterologously, and the presence of new metabolites will be determined using modern analytical chemistry methods such as LC-MS or GC-MS. Promising products will be purified, their structures investigated, and, where appropriate, tested for medicinal or biological potential. The project will focus on connecting unknown genes to the molecules they produce, helping to shed light on nature's "metabolic dark matter".</p> <p>Students will learn valuable laboratory skills in microbiology, molecular cloning, small-molecule extraction, chromatography, mass spectrometry and structure elucidation. They will also develop their ability to read the literature, interpret analytical data and present chemical discovery results clearly.</p>	

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**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI025
<b>Project title</b>	<b>Solid Catalysts with Molecular Control</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Rosalyn Falconer
<b>Contact details</b>	<a href="mailto:Rosalyn.falconer@auckland.ac.nz">Rosalyn.falconer@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"><li>• An interest in Inorganic Chemistry and Catalysis</li><li>• Experience in laboratories (e.g. teaching labs)</li></ul>
<b>Project description</b> <p>Catalysts make chemical reactions faster and more efficient. They are used extensively in industry, but many of the catalysts developed in university research are unsuitable for industrial scale plants. This is because they are soluble (homogeneous) and so are difficult to separate from the products. In the Falconer group, we take fast and selective catalysts and affix them to solid supports so they are no longer soluble. Using this method, we make sustainable catalysts that are suitable for industrial scale.</p> <p>In this project, you will synthesise solid supports (silica) with chemical functional groups and transform them to ligands such as amines. You will then coordinate metal complexes to make catalysts. You will learn how to perform research in solution and on solids and investigate how changing the state affects reactivity of ligand and transition metal coordination complexes. Finally, you will test these new coordination complexes in catalysis to make new, sustainable catalysts that will be applicable to industrial scale processes.</p>	

**Synthesis of ligands affixed to solid supports (silica) using Surface Organometallic Chemistry**



# Faculty of Science

## Summer Research Scholarships

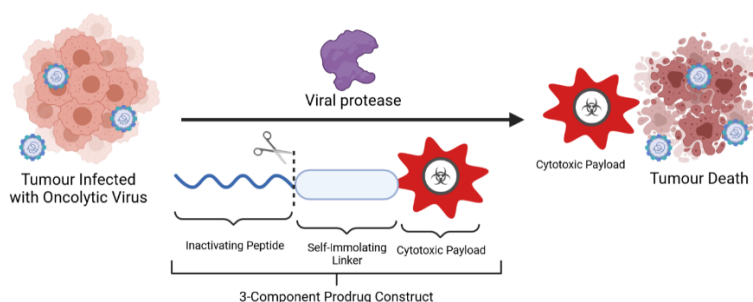
### 2026/2027 Projects (Chemical Sciences)

<b>Project code</b>	SCI026
<b>Project title</b>	<b>Developing Titanium Complexes into Catalysts</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Rosalyn Falconer
<b>Contact details</b>	<a href="mailto:Rosalyn.falconer@auckland.ac.nz">Rosalyn.falconer@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>• An interest in Inorganic Chemistry and Catalysis</li> <li>• Experience in laboratories (e.g. teaching labs)</li> </ul>
<p><b>Project description</b></p> <p>Catalysts for chemical reactions most commonly consist of coordination complexes of rare and expensive metals such as Pt, Pd or Rh. In contrast, titanium is very abundant in the Earth's crust but is underused as its chemistry is difficult to control. Typically, titanium is paired with ligands that contain hard donor atoms such as N and O. In this project, you will instead explore the coordination chemistry of titanium with soft donors such as phosphorus. You will synthesise bidentate ligands that contain phosphorus donor atoms and investigate how the steric and electronic properties of these ligands affect coordination to titanium.</p> <p>You will develop synthetic skills and learn how to perform chemistry under an inert atmosphere. You will use equipment such as a Glovebox and become skilled at characterising compounds using <math>^1\text{H}</math> and <math>^{31}\text{P}</math> NMR spectroscopy.</p>	

<b>Project code</b>	SCI027
<b>Project title</b>	<b>Fingerprint of New Zealand Flax</b>
<b>Discipline</b>	Chemistry/Physics
<b>Supervisor(s)</b>	Dr. Freddy Lyzwa Prof. David Barker
<b>Contact details</b>	<a href="mailto:f.lyzwa@auckland.ac.nz">f.lyzwa@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>• An interest in analytical chemistry, optical characterization of materials, and/or organic chemistry</li> <li>• Some experience in Python/Matlab and algorithm design, and chemometrics</li> </ul>
<p><b>Project description</b></p> <p>New Zealand Flax (Harakeke) as a natural and high-quality fibre has cultural significance and growing interest for sustainable materials applications, both on earth and in the aerospace sector. The student will combine experimental spectroscopy methods with machine-learning approaches to identify the Flax fibre's intrinsic "fingerprint" and how it varies fibre treatment. They will gain hands-on experience in collecting and analysing Raman and Fourier-transform infrared (FTIR) spectra, and learn how vibrational spectroscopy can reveal hidden phases. The outcomes will contribute to a better understanding of harakeke as a functional biomaterial.</p>	

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

<b>Project code</b>	SCI087
<b>Project title</b>	<b>Virus Activated Cancer Prodrugs</b>
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Alan Cameron
<b>Contact details</b>	Email: <a href="mailto:Alan.cameron@auckland.ac.nz">Alan.cameron@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>A background in organic or medicinal chemistry undergraduate courses</li> </ul>
<b>Project description</b>	
<p>Oncolytic viruses are an emerging class of therapeutics for cancer treatment. These viruses selectively infect and lyse cancerous cells. However, these therapies still suffer from certain limitations, perhaps the greatest of clearance of the virus prior to complete tumour destruction due to the patient's immune system. To elicit maximal efficacy, these viruses can be used in combination with chemotherapeutics or radiotherapy. The presence of viral infection provides new opportunities to develop selectively targeted chemotherapeutics.</p> <p>This project seeks to develop a novel Virus-Directed Enzyme Prodrug Therapy (VDEPT). Cytotoxic payloads will be developed and conjugated to an inactivating peptide sequence that is selectively cleaved by the protease of a promising oncolytic virus to release the active cytotoxin selectively in the tumour microenvironment. Thus, the project seeks to develop a novel prodrug and combination therapy. A key aspect of the research will be optimising the self-immolating cleavable linker system for a favourable rate of payload release.</p> <p>The project is an active collaboration with the University of Otago. The successful candidate will develop skills in modern organic chemical synthesis, Solid Phase Peptide Synthesis (SPPS), reverse phase-HPLC and may also have the opportunity to conduct biological assays/enzyme assays.</p>	



*A three-component prodrug to provide a novel VDEPT strategy.*

**Faculty of Science**  
**Summer Research Scholarships**  
**2026/2027 Projects (Chemical Sciences)**

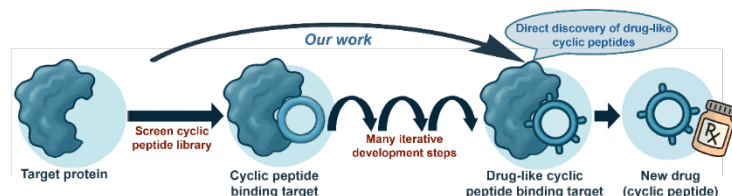
<b>Project code</b>	SCI088
<b>Project title</b>	Macrocyclic Peptide Libraries for Drug Discovery with 'Undruggable' Targets
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Alan Cameron
<b>Contact details</b>	Email: <a href="mailto:Alan.cameron@auckland.ac.nz">Alan.cameron@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>A background in organic or medicinal chemistry undergraduate courses</li> </ul>

Many important drug-targets have long been considered 'undruggable'. Cyclic peptides (circular chains of amino acids) are poised to offer a new era of drug discovery, reaching 'undruggable' targets at the interface of protein-protein interactions (PPIs). However, these cyclic peptides require extensive modification to be suitable drugs for use in humans. Currently, only limited methods exist to directly identify 'drug-like' cyclic peptides from the massive libraries (often  $>10^9$  individual molecules) required to find strong target binders. The key challenge is to identify the 'needle in a haystack' from these massive libraries that binds the target and may be a magic bullet for currently untreatable diseases.

This project seeks to develop a novel chemical platform to directly identify 'drug-like' target binders from cyclic peptide libraries which require only minimal further modification—leapfrogging several steps in the existing development pipeline (**Fig. 1**).

The project will entail chemical synthesis of cyclic peptide libraries, utilising specially engineered linker systems that allow for cleavage (linearisation) of the cyclic peptides, after they bind a target of interest, into simple linear peptides that can be identified from large libraries by mass spectrometry fragmentation (MS-MS) approaches.

As a candidate in this project, your work will be focused on chemical synthesis, analysis and studying appropriate cleavage conditions to linearise peptide libraries hit compound identification.



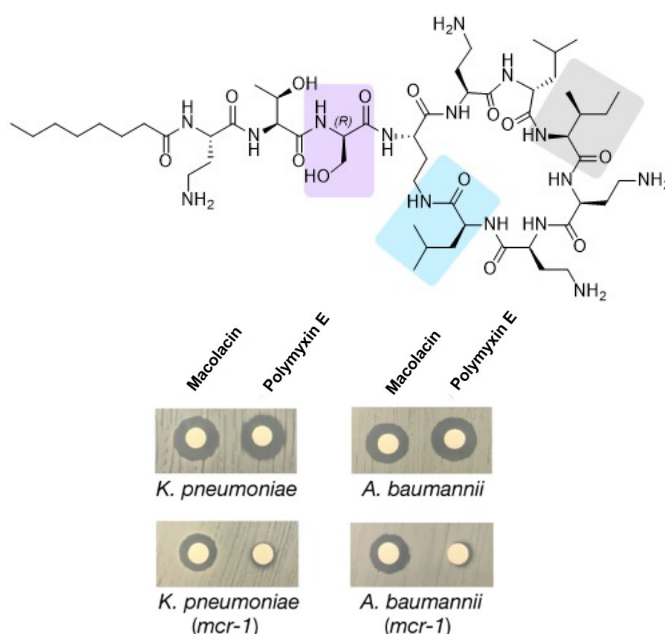
**Fig. 1:** Discovering cyclic peptides drugs by screening libraries requires many iterative steps of modification to discover 'drug-like' cyclic peptides. With novel chemistry, we can fast-track this by directly discovering 'drug-like' Hit Compounds.

# Faculty of Science

## Summer Research Scholarships

### 2026/2027 Projects (Chemical Sciences)

<b>Project code</b>	SCI089
<b>Project title</b>	SAR Study to Combat Antimicrobial Resistance
<b>Discipline</b>	School of Chemical Sciences
<b>Supervisor(s)</b>	Dr Alan Cameron
<b>Contact details</b>	<a href="mailto:Alan.cameron@auckland.ac.nz">Alan.cameron@auckland.ac.nz</a>
<b>Skills Needed</b>	<ul style="list-style-type: none"> <li>A background in organic or medicinal chemistry undergraduate courses</li> </ul>
<b>Project description</b>	
<p>Antibiotic resistance is recognised by the WHO as one of the greatest threats to humanity and infectious diseases rank as the second most common cause of death worldwide.</p> <p>Polymyxin antibiotics are the current last-line of defence, but are severely nephrotoxic. Most worryingly, since 2015, a mobile resistance gene (<i>mcr-1</i>) has been spreading globally and making our last hope in the clinic ineffective. In 2022, macolacin was discovered. Macolacin is a new polymyxin scaffold that retains potent activity towards <i>mcr-1</i> mediated polymyxin resistant Gram-negative bacteria.</p> <p>This project seeks to conduct a structure-activity-relationship (SAR) study of macolacin and prepare new analogues with diminished toxicity that could replace polymyxins as last-line of defence antibiotics in the clinic. Successful candidates will use organic synthesis techniques and modern methods of solid phase peptide synthesis. Candidates will also have the opportunity to undertake and learn biological assays if they desire.</p>	



(Upper) Chemical structure of Macolacin with modification sites highlighted; (lower) activity of macolacin towards polymyxin resistant isolates.