ACADEMIC PROJECT SUBMISSION DETAILS:

<table>
<thead>
<tr>
<th>Project #:</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor/s:</td>
<td>Martyn Beaven and Rich Masters</td>
</tr>
<tr>
<td>Project Title:</td>
<td>Blue Light and objective measures of brain function</td>
</tr>
<tr>
<td>Field:</td>
<td>Human Performance Science</td>
</tr>
<tr>
<td>Division/School:</td>
<td>HECS - Division of Health, Science, Computing &amp; Engineering</td>
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EXPECTED OUTCOMES:

1. Objective data set on the effectiveness of light interventions on brain activity - knowledge generation
2. Brief report (extended abstract) on experimental findings and poster depicting the experimental protocol and outcomes
3. Pathway to Masters or project for student with potential to investigate light effects on cognition and physical performance in high stress environments
4. Presentation at a local conference (e.g. SESNZ)

STUDENT TASKS:

1. Familiarise themselves with the electro-encephalography device (under supervision)
2. Pilot experimental procedures and familiarise with assessment tools
3. Actively engage in the recruitment of 10-12 volunteers
4. Plan and implement experimental trials
5. Write a brief report on the collected data including designing a poster depicting the experimental protocol and outcomes

REQUIRED SKILLS:

1. Experience / interest in physiology & psychology testing
2. Basic knowledge of experimental psychology (HPSCI302 preferred)
3. Strong written and oral communication skills

PROJECT ABSTRACT:

We all feel better when the weather is nice. Sunlight has a unique ability to alter our mood and other aspects of our physiology. The blue light in sunlight sensed by our brain and activates pathways connect to the suprachiasmatic nucleus (SCN). The SCN controls our daily biorhythms and the secretion of melatonin (the sleep hormone) which is why we get sleepy when the sun goes down.

The most common acute outcome measures reported from exposure to blue light are an improvement in sustained attention and improvements in reaction time. Data from our university laboratory in Mount Maunganui also suggest that blue light can improved motor time (time to lift their leg following a visual stimuli) in older adults.
PROJECT ABSTRACT:

Improvements in ‘fluid intelligence’ (or information processing) corresponding to increase in IQ by 5 points, have also been reported following blue light exposure. These outcomes have also been reported during the day, in the absence of any appreciable melatonin changes.

This project will extend on work looking at the non-image forming effects of blue light on brain function. Brain connectivity and changes in brainwave activity will be measured using electro-encephalography (EEG) during exposure to blue light provided either by specially built glasses (visual stimulation) or by light-emitting ear buds (aural stimulation). The effectiveness and persistence of any effects of visual or aural stimulation will be measured.

As decreases in alpha brain waves are associated with attention, our thought is that we may see some effects of blue light on reducing EEG alpha activity. Measuring EEG may allow an objective measure of the efficacy of a given intervention (in a given population) and allow us to relate to the subsequent cognitive or physical performance effects. The ability to affect attention and focus may also contribute to our knowledge around neuro-feedback and being “in-the-zone”.

The project will involve testing a group of volunteers using EEG while they are exposed to different light sources.
## Academic Project Submission Details:

<table>
<thead>
<tr>
<th>Supervisor/s:</th>
<th>Kim Hebert-Losier</th>
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<tbody>
<tr>
<td>Project Title:</td>
<td>An investigation of the calf-raise test: Effect of cadence and incline on clinical outcomes</td>
</tr>
<tr>
<td>Field:</td>
<td>Physiotherapy/Biomechanics</td>
</tr>
<tr>
<td>Division/School:</td>
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## Expected Outcomes:

1. Pilot data on the effect of incline and cadence on calf-raise test outcomes
2. Creation of a final research poster
3. Brief report (extended abstract) on findings
4. Pathway to master or PhD project for student

## Student Tasks:

1. Recruit participants for testing (with help of supervisor)
2. Collect and extract calf-raise test data using mobile app (under supervision)
3. Complete a final research poster
4. Write a brief report (extended abstract) on findings

## Required Skills:

1. Experience / interest in clinical screening and movement analysis
2. Basic human anatomy and human movement knowledge
3. Strong written and oral communication skills
4. Coaching, clinical, or sporting experience (preferred, but not required)

## Project Abstract:

Clinicians, trainers, and researchers in sports medicine use the calf-raise test to test the strength and endurance of the calf-muscles. The test requires a person to go “up and down” on their toes as many times as possible, standing on one leg.

There are several different variations of the calf-raise test protocol. Two of the main calf-raise test parameters that are varied in clinical settings are incline and cadence (raises per minute), with no knowledge as of yet regarding the effects of these variations in calf-raise test protocol on outcomes.

This summer project will also provide an opportunity for a student to lead a pilot study investigating the effect of calf-raise test parameters on outcomes, which has implications for clinical practice.
**PROJECT ABSTRACT:**

This summer scholarship provides a student an opportunity to participate in the longer-term research plans of the Te Huataki Waiora School of Health, and use a recently developed app by the primary investigator to collect data.

The scholarship will allow the School to strengthen a database that is currently in use for research and grant-application purposes, and offers the student a pathway to postgraduate study.
ACADEMIC PROJECT SUBMISSION DETAILS:

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<tr>
<th>Supervisor/s:</th>
<th>Joanna Hicks</th>
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<tbody>
<tr>
<td>Project Title:</td>
<td>On and off: Regulation of sulphur metabolism in the human pathogen Neisseria gonorrhoeae</td>
</tr>
<tr>
<td>Field:</td>
<td>Biochemistry and Molecular Microbiology</td>
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<tr>
<td>Division/School:</td>
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EXPECTED OUTCOMES:

1. Characterisation of DNA binding by CysB
2. Crystallisation of CysB
3. Preliminary attachment and invasion assays completed
4. Research Poster

STUDENT TASKS:

1. Protein expression and purification using a bacterial host
2. Crystallisation of CysB
3. Characterisation of CysB DNA binding using DNA binding assays
4. Attachment experiments with N. gonorrhoeae cysB deletion and human cells
5. Invasion assays with N. gonorrhoeae cysB deletion and human cells
6. Create Research Poster

REQUIRED SKILLS:

1. Biochemistry experience (second year and above)
2. Accurate pipetting
3. Critical thinking
4. Microbiology/cell culture

PROJECT ABSTRACT:

The ability of a bacterial pathogen to switch genes on and off is critical to establishing infection of human cells and overcoming host immune responses. The sexually transmitted bacterium Neisseria gonorrhoeae displays unique differences in the regulation (switching on and off) of sulphur metabolism and cysteine synthesis genes. We are investigating CysB, the master regulator of these genes. To understand the role of CysB in infection this project will characterise how CysB binds DNA using structural (crystallisation and x-ray crystallography) and molecular biology approaches. Complementary to this we will delete CysB from the chromosome of N. gonorrhoeae, and test how this affects the ability of the bacterium to attach to and invade human cells. Collectively this will enable us to determine how CysB can regulate certain genes for sulphur and cysteine metabolism and in turn how this affects the ability of the bacterium to infect human cells.
ACADEMIC PROJECT SUBMISSION DETAILS:

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<tr>
<th>Supervisor/s:</th>
<th>William Kelton and Adele Williamson</th>
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<tr>
<td>Project Title:</td>
<td>Multiplexed PCR for next-generation sequencing of antibody genes</td>
</tr>
<tr>
<td>Field:</td>
<td>Biotechnology/Immunology</td>
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<tr>
<td>Division/School:</td>
<td>HECS - Division of Health, Science, Computing &amp; Engineering</td>
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<td>School of Health</td>
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EXPECTED OUTCOMES:

1. The development of a PCR protocol that can amplify synthetic antibody genes
2. The student will develop hands on experience with molecular biology techniques
3. We are aiming to publish this new method once multiplexing capability is established. This will likely require subsequent work outside the scope of this project to obtain information from real genomic samples but offers a continued path for suitable students

STUDENT TASKS:

1. Design PCR oligonucleotide sequences for antibody gene amplification
2. Grow and extract plasmids from E.coli containing target antibody gene sequences
3. Optimize PCR conditions for scheme in Figure 1 to obtain robust amplification of antibody sequences in plasmids. This involves control of temperature, polymerase type, and reagent concentrations
4. Demonstrate multiplexing of two gene targets simultaneously
5. Poster creation

REQUIRED SKILLS:

1. Experience with PCR
2. Experience growing a bacterial culture

PROJECT ABSTRACT:

Antibodies form the backbone of our serum defence against infections and disease. In order to combat new or evolving threats, the immune system has devised ways to generate lots of diversity in pathogen binding regions called variable domains. It is rapidly emerging that while most diversity is constrained to these variable domains, mutations also arise in other domains thought to be largely invariable. Constant domains, in particular, are essential for the recruitment of immune cells and the direction of potent antibody-mediated responses that clear infection. A broad goal of our laboratory is to investigate the extent and consequence of this emerging diversity.
PROJECT ABSTRACT:

This project aims to develop a PCR based method capable of a high degree of multiplexing to allow for the discovery of new antibody constant domain genes. These regions have historically been difficult to sequence in the genome due to a high degree of similarity that leads to problems assembling short fragments. Regular PCR and Sanger sequencing methods do work but are impractical for large numbers of genes from large numbers of patient samples. We have devised a new PCR-based approach for amplifying these genes that requires optimization and subsequent evaluation of multiplexing capability, initially using synthetic gene sequences.

Our proposed method will allow the targeting of multiple antibody constant domain gene sequences in the genome simultaneously. In future, we aim to to broadly sample antibody diversity using this PCR approach, coupled with next-generation sequencing, to investigate the diversity in large numbers of gene sequences. We also expect development of this method to have application to other related areas such as multiplexed detection of pathogens in samples. This project will be jointly supervised by Dr. William Kelton (Health) and by Dr. Adele Williamson (Science) who is an expert in DNA associated enzymes.
### ACADEMIC PROJECT SUBMISSION DETAILS:

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<th><strong>Supervisor/s:</strong></th>
<th>Kirsten Petrie and Vic Arcus</th>
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<tbody>
<tr>
<td><strong>Project Title:</strong></td>
<td>How can we make undergraduate science 'lectures' more interactive?</td>
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<tr>
<td><strong>Field:</strong></td>
<td>Biological Science, Health Science</td>
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<tr>
<td><strong>Division/School:</strong></td>
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<td>School of Health</td>
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### EXPECTED OUTCOMES:

1. An endnote library of papers pertinent to active learning and student-centred approaches to teaching biological science (and STEM more broadly) to large classes
2. Oral presentation to academic professional learning community
3. Infographic as a resource for lecturers planning delivery of introductory biological science (STEM)
4. Draft of literature review section for academic journal paper submission (anticipated publication: Research in Science Education)

### STUDENT TASKS:

1. Completion of systemic literature review focused on effective pedagogical approaches for creating active learning and or student-centred experiences for introductory science in large-classes
2. Creation of a transportable Endnote library of publications included in literature review
3. Draft of literature review for academic publication focused on large class pedagogical to make teaching introductory science more interactive
4. 30 min presentation of findings from literature review to Biological Sciences Professional Learning Community and other science lecturers
5. Infographic presenting most effective approaches, key pointers for academic-practitioners (STEM lecturers) to enact these when teaching large classes in introductory science

### REQUIRED SKILLS:

1. Computer competency in word
2. Experience in using search engines for academic literature
3. Experience using endnote desirable
4. Strong academic writing skills
PROJECT ABSTRACT:

Universities have traditionally used mass lectures as a means of organising the learning for large numbers of students (100+). While lectures provide efficient ways for teachers to communicate with large numbers of learners this approach positions students as the audience and not as participants in the learning process. COVID forced the adoption of online modes of deliver, and yet in as some biological science lecturers have reported, lectures particularly for first years, continued in a traditional manner dominated by a teachers’ talking and students listening approach. In reflecting on this during and since “lockdown” lecturers in biological science have begun to seek alternative approaches to the mass lecture, that enhances student learning while not impacting the workload for staff. There is equally a desire to generate a community of learners who are active in the learning process, and graduates with the skills to think and engage like scientists. To do this we need to know more about alternative strategies that have previously been employed effectively with large classes in science undergraduate programmes, and other areas of the physical sciences.

This Summer Scholarship project focuses on collecting and reporting on previous academic research, curriculum initiatives, and educational resources/strategies that can assist the biological science professional learning community (PLC) at Waikato University to progress toward “lecturing” in ways that place the student at the centre of the learning experience. The scholar will be responsible for undertaking a systematic review of literature and examining educational resources that demonstrate what approaches are effective for engaging students at the centre of learning in large class formats. This review will be written up both as a draft for an academic publication. There will also be an opportunity to present the information as an infographic (graphic visual representations of information, data, or knowledge intended to present information quickly and clearly) to support lecturers recognition of strategies they could adopt in their own teaching. Finally, the scholar will present their findings (with support from the supervisors) to the biological science PLC, and join conversations about the delivery of (human) biological science papers at Waikato.

As a summer scholar they will be a member of the biological sciences PLC, and play a key role in supporting us to develop our knowledge of teaching large class in biological science. As a member of the PLC, and with support from the project supervisors, they will have the opportunity to: extend your own knowledge of different approaches to teaching scientific content, develop your ability to source and present (both in writing and visually) academic material, and contribute to challenging traditions associated with teaching approaches for science in undergraduate programmes.

The project would be suitable for someone studying in biological sciences, and who has an interested in educating others should consider applying.
ACADEMIC PROJECT SUBMISSION DETAILS:

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<tr>
<th>Supervisor/s:</th>
<th>Robert Townsend</th>
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<tbody>
<tr>
<td>Project Title:</td>
<td>Understanding Talent Identification and Development in Disability Sport</td>
</tr>
<tr>
<td>Field:</td>
<td>Social Sciences; Sport Coaching; Qualitative Research;</td>
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<tr>
<td>Division/School:</td>
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EXPECTED OUTCOMES:

1. Further reinforcing University of Waikato's commitment to disability research.
2. Enhancing the profile of University of Waikato through stakeholder engagement and dissemination of findings throughout the research process.
3. High quality journal article targeting Quartile 1 journals in sport (e.g. Sport, Education and Society, Qualitative Research in Sport, Exercise and Health)
4. Preliminary data to support a larger grant application in disability, sport and inclusion.
5. Research poster to disseminate findings.

STUDENT TASKS:

1. Literature Review
2. Sampling, data collection and analyses
3. Creation of a research poster to disseminate findings.

REQUIRED SKILLS:

1. Ability to think and work independently.
2. Evidence of critical thinking skills.
3. Interest and passion for enhancing and supporting opportunities for disabled people in sport.

PROJECT ABSTRACT:

In 2013, over 1.1 million New Zealanders (24% of the population) identified as disabled. Disability sport is a unique context in which to understand disability and is firmly embedded in government policy as a vehicle for establishing New Zealand as a "non-disabling society". Such is the power of sport that in October 2019 the Minister for Sport and Recreation promised a $7m investment into the disability sport sector to strengthen the long-term opportunities for New Zealanders with disabilities’, recognising the need to promote the participation of disabled people in sporting activities at all levels as a matter of disability rights. However, we know very little about disability sport, in particular disabled peoples’ access and entry points into disability sport performance pathways. Furthermore, while coaching has been identified as a crucial practice to support the participation and performance of disabled people in sport, little is known about how coaches reconcile notions of talent and performance with culturally-embedded, and often negative, beliefs about disability.