CREATE-U & AUSRA Projects for 2024

Please click on the links, or scroll down to read about each project:

Ambassador Undergraduate Student Research Awards

The AUSRA program provides paid undergraduate student research experiences to North American Indigenous and Black students from UBC or select partner institutions. Complementing the NSERC USRA (for Canadian students), WLIUSRA (for UBC international students), and CREATE-U (for UBC Mechanical students) programs, the AUSRA brings together technical mentorship, social supports, and meaningful research experiences in one paid summer experience.

Students will be paid a minimum of:

- $2000/month (April 29 – August 30 or May 15 – August 15)
- An additional $500/month if you are entering your final year of studies or have dependents
- Students from partner institutions will receive a travel reimbursement of up to $2000 (standard UBC travel rules apply).

Partner institution students have the opportunity to live on campus (at their own expense; this is currently Pacific Spirit Hostel (first year dorms) but is in negotiation).

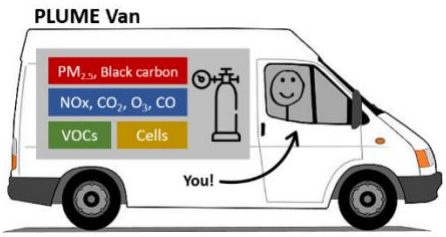
Combining Research Experience and Technical Electives for Undergraduates

CREATE-U is an immersive, cohort-based experience featuring research education opportunities in Mechanical Engineering. Open to Mechanical Engineering undergraduates, CREATE-U is a unique opportunity to complete 6 credits of course work + a research project in the summer. Students are paid a minimum of $6000 for the summer work term and can count it towards co-op. The applicants are chosen based off a diverse selection criteria – it's not just about grades. There are up to 5 spaces available in the summer cohort!

Project Title: A Real-World Approach to Human Lung Cell Toxicology of Atmospheric Air Pollutants
Laboratory Name: iREACH Lab (Naomi Zimmerman Lab)
Faculty Supervisor: Dr. Naomi Zimmerman
Graduate Student Mentor(s): Yuetong Zhang (PhD student) and Cynthia Pham (MASc student)
General Area(s) of Research: Clean energy and environment (aerosol science and instrumentation, engine technologies), Cell toxicology

The Project:

Air pollution is a major global health issue. This project will use the iREACH lab's mobile laboratory (also known as the PLUME Van) to investigate **toxicological impacts** of atmospheric pollutants, such as those from **marine ship emissions** different types of **engines** and **wildfire emissions**. The PLUME Van, designed by students in the iREACH lab, uses an isokinetic sampling line to efficiently transport **ultrafine particles** to a collection of **air monitoring instruments** and an **in-line cell exposure system**. The air monitoring instruments include gas analyzers (CO_2, NOx, O_3, CO), particle sizers and counters, and volatile organic compound analyzers, in the form of a gas chromatography system. These instruments, along with the cell exposure system, will be used under real-world conditions in **field campaigns** throughout your CreateU project term. Through investigation of the toxicological response under atmospheric conditions, relevant conclusions can be made to shift policies and regulations on marine engines and wildfires in Vancouver, BC.



What You Will Do:

For this project, you will have the opportunity to participate directly in lab and field work including but not limited to the following:

- Learn about cell-culture work and assist with preparation of human lung cell in a state-of-the-art cell laboratory at the Vancouver General Hospital.
- Work closely with Graduate Student Mentor's to assess in real-time the atmospheric air quality during exposure experiments in the field. This will include learning how to use and set up the air quality instrumentation, along with other PLUME Van components such as anemometers, weather data collection and GPS data.
- Experience first-hand field campaigns involving either marine campaigns or wildfire episodes.
- Conduct literature searches to inspire new projects and ideas.

Supervision Received:

You will start by working closely with the Graduate Student Mentors and be fully trained on instrumentation and cell culture methods. You have the opportunity to then move towards more independent work as learning progresses. There will be weekly group meetings to attend to interact more and learn from the other lab members and faculty supervisor.

Skills for Success:

- Competent at reading/searching for academic articles
- Attention to details (you will be working with the graduate student to set-up lots of instruments within a mobile space that requires full attention to ensure appropriate set-up)
- Timeliness (since many field campaigns will be conducted on a tight schedule that takes lots of planning and includes many time-sensitive components)

Developing wearable sensors to probe human brain health

Laboratory Name: Sensing in Biomechanical Processes Lab (SimPL)
Faculty Supervisor: Lyndia Wu
Graduate Student Mentor: TBD

General Area of Research:

Biomedical Engineering, Wearable Sensors

The Project:

Traditionally, scientists have conducted experiments and measurements in the laboratory to understand how the brain works, which has contributed to building our understanding of neuroscience. In recent years, wearable technology development has enabled mobile measurements in real-world contexts, opening a new possibility of understanding human brain function and health in everyday life. In our lab, we are developing and validating a wearable technology toolkit that allows us to probe multiple areas of brain function, such as the measurement of electrical activity in the brain or assessment of balance function controlled by the brain. We validate and deploy these technologies in clinical applications ranging from concussion testing to sleep monitoring.

What You Will Do:

This is a flexible project where, based on the experience level and interests of the student, one or more of the following activities could be discussed:

- *Developing hardware, firmware, and software systems of wearable sensors.*
- *Designing and conducting experiments to validate wearable sensors in the laboratory setting.*
- *Deploying wearable sensor in real-world environments and collecting human participant data.*
- *Analyzing wearable sensors and developing software to detect abnormalities indicating potential functional deficit or disease.*

Supervision Received:

The student will be assigned a graduate student mentor with opportunity for frequent interaction. There will also be regular (weekly or biweekly) project meetings with the faculty supervisor Dr. Wu. Weekly lab meetings will allow for communication among a larger group of lab members.

Skills for Success:

- *Willingness to learn and passion in the research topic.*
- *Comfortable working in a team environment and good communication skills.*
- *Knowledge in neuroscience or sensors may be helpful for the project but not required.*
- *Basic programming knowledge and experience would be helpful.*

Evaluating Geering Up Outreach Efforts – What Factors Impact Participation

Laboratory Name: STEM Outreach/Engineering Education Research Group
Faculty Supervisors: Agnes d'Entremont (MECH), Robyn Newell (SBME), Katherine Lyon (SOCI), Karen Cheung (SBME/ECE), Jenna Usprech (SBME)
Graduate Student Mentor: Jessica Wolf (MECH)

We would like two CREATE-U + AUSRA pairs (four students total) for this project.

General Area of Research:

Engineering education and outreach

The Project:

The project will expand on pilot efforts started in 2023 to evaluate the effectiveness of the Geering Up outreach camps run by the Applied Science faculty at UBC. The main goal of many STEM Outreach programs is to eventually influence youth in pursuing STEM. Particularly, we are interested in whether these camps effectively reach and are impactful for underrepresented groups in STEM/engineering (e.g., girls and gender-diverse folks, Black and Indigenous youth, etc.). Our pilot study (summer 2023) surveyed child and adolescent participants in the Geering Up camps before and after participating in a week of camp. Several factors, such as parental influence, role models, and STEM identity, were explored via validated Likert-scale measures. Preliminary results suggest that large proportions of participants possess existing role models and/or parents in engineering and/or have initially strong STEM identities, raising pertinent questions about whether the camp effectively reaches individuals who would benefit most from its initiatives. Based on our pilot work, we recognize many interwoven factors that may influence participation in and impact of STEM outreach camps among these groups that remain underrepresented in engineering. Further exploration of why certain trends were observed is challenging without qualitative data (e.g., interview data). This project will focus on expanding on the quantitative pilot efforts by addressing these shortcomings. The students (CREATE-U and AUSRA) will survey a broader range of Geering Up campers from K-12 (in the summer of 2024) to expand our dataset and additionally employ a mixed-methods approach to gather qualitative data via interviews and/or focus groups based on preliminary survey results.

This project is important because it will inform future outreach efforts to encourage more equitable and diverse representation in STEM degree programs and professions.

What You Will Do:

The CREATE-U/AURSA students will:

(1) Augment and deploy surveys to extend data collection to more camp participants this summer, especially those for younger children, and to further explore factors such as the impact of role models.

This will include finding and reading research literature, editing survey documents/websites, working on ethics board approvals, obtaining consent for participants, going into camps to deploy surveys, collecting data, cleaning data, analyzing data (including statistics), and presenting results to the group.

(2) Conduct qualitative methods with the camp participants through either interviews or focus groups to explore their reasons for their interest in STEM, the impact of their role models, and how they perceive their STEM identity at different points.

This will include finding and reading research literature, designing the research study, completing ethics board approvals, recruiting and consenting participants, running data collection (interviewing or leading focus groups), transcribing and coding data, analyzing data, and presenting results to the group.

(3) Assist with other related projects or data analyses, as needed, involving similar topics and activities as those listed above.

Supervision Received:

The students will be supervised primarily by Drs. Agnes d'Entremont and Robyn Newell, with additional supervision from co-investigators (including Drs. Katherine Lyon, Karen Cheung, and Jenna Usprech). The students will also work closely with a PhD student, Jessica Wolf. The research group also consists of additional faculty members and undergraduate students. This group meets weekly to discuss several ongoing research projects under this Engineering Outreach and Education umbrella. The students will get to check in weekly with the supervisors and group to update on their progress and get feedback and support. Additionally, students will have the opportunity to interact with faculty from a range of disciplines. We also run a weekly or biweekly journal club to discuss literature in the area as a group, with students taking turns selecting papers and leading discussions. There may be opportunities for students to contribute to research conference and/or journal submissions.

Skills for Success:

List the minimum skill sets. Research shows gender differences in the percentage of qualifications people feel they must meet in order to apply for a position, so avoid listing things that are not required. When feasible, use generalized skills, eg. "Intermediate object-oriented programming," rather than "C++ programming expertise" if either will work. Do not include things you expect that they will learn on the job, nor any GPA or similar requirements. The intention is to make these positions as accessible as possible while still ensuring students have the ability to be successful in the position.

- Ability to work both independently and collaboratively
- Excellent communication and interpersonal skills
- Responsible, professional, reliable
- Interest in social science and equity issues

Merging Droplets: Flow visualization & quantification

Stoeber Lab
Faculty Supervisor: Dr. Boris Stoeber
Graduate Student Mentor: MJ Weir-Weiss

General Area of Research:

Fluid Dynamics with application to bioengineering

The Project:

This project is a collaboration with colleagues at Ritsumeikan University in Japan. The aim of this research project is the development of a fluid manipulation technology based on small droplets for applications to biochemical assays. Here, a hanging droplet opposes a sitting droplet, and vertical contact between the droplets leads to merging and fluid transfer between both droplets as shown in Fig. 1; subsequently, the droplets are again separated. This is useful for the transfer of nutrients or other compounds from one droplet to a second one containing cultured cells. Using microdroplets has several benefits: it decreases the total amount of sample and simultaneously enhance the reaction rates, thus lowering the experimental cost.

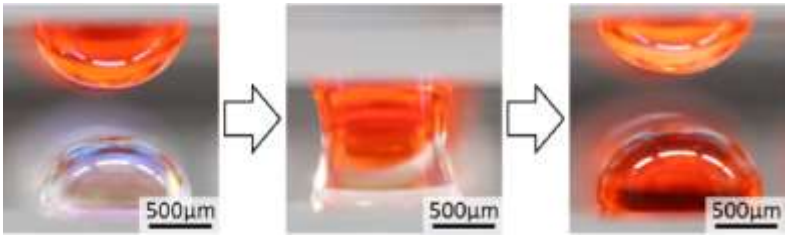


Figure 1: *Red fluid transferred from the upper droplet to the lower one upon merging remains after droplet separation* [1].

The long-term objective of this work is the development of a new platform technology for cell culture for a variety of applications including bioanalysis and drug screening. While developing this technology, we will create a better understanding of the fundamental aspects of fluid flow and transport in merging and separating droplets, a topic that is relevant to the broader research community.

What You Will Do:

The student working on this project with learn how to deposit droplets onto glass plates prepared by the collaborators in Japan. The student will learn how to prepare sample fluids including small tracer particles. The student will customize and operate an experimental platform to merge and separate droplets while imaging through the upper or lower glass plate to visualize the particles suspended in one of the droplets. A sequence of such images will then be processed with an existing software for particle image velocimetry (PIV) to calculate flow fields as a function of time to characterize fluid transfer and mixing inside the droplets [2]–[4]*. The student will run a sequence of experiments to understand the impact of fluid properties on the flow behaviour. Occasional Zoom calls with the team in Japan together with Dr. Stoeber will support the student's project.*

Supervision Received:

The student working on this project will be supported by MJ Weir-Weiss, one of Dr. Stoeber's team members. Other graduate students are also available for advice and help with equipment and procedures. Weekly meetings with Dr. Stoeber will provide opportunity to discuss results and solve problems with the experiment and data analysis. In addition, weekly group meetings will expose the student to other ongoing work in the group.

Skills for Success:

- *Interest in experimental work*
- *Interest in learning to use experimental tools and methods*
- *Interest in analyzing experimental data to answer a scientific problem or inform an engineering process*
- *Intermediate programming for data analysis (Matlab, etc.) might be helpful*

References

[1] S. Konishi, C. Ohya, and T. Yamada, "Selective control of the contact and transport between droplet pairs by electrowetting-on-dielectric for droplet-array sandwiching technology," *Sci. Rep.*, vol. 11, no. 1, Dec. 2021, doi: 10.1038/S41598-021-91219-X.

[2] B. Mustin and B. Stoeber, "On the effect of velocity gradients on the depth of correlation in µPIV," *Meas. Sci. Technol.*, vol. 27, no. 3, 2016, doi: 10.1088/0957-0233/27/3/035302.

[3] M. Jalaal, N. J. Balmforth, and B. Stoeber, "Slip of spreading viscoplastic droplets," *Langmuir*, vol. 31, no. 44, 2015, doi: 10.1021/acs.langmuir.5b02353.

[4] A. Babaie and B. Stoeber, "Viscous flow separation caused by the marangoni effect in competition with capillary flow," *Phys. Fluids*, vol. 27, no. 7, 2015, doi: 10.1063/1.4927035.

Thermo-elastic Materials for Variable Stiffness Soft Pneumatic Actuators

Laboratory Nam: Microelectromechanical systems laboratory
Faculty Supervisor: Dr. Mu Chiao
Graduate Student Mentor: Hiroshan Gunawardane

General Area of Research:

Soft-robotics, Themo-elastic materials

The Project:

The Microelectromechanical Systems Laboratory within the Department of Mechanical Engineering is dedicated to pioneering the advancement of soft, flexible materials tailored for future medical applications in soft robotics. This endeavor is realized through productive collaboration with inter-departmental colleagues, including Dr. John Madden's Group from the Department of Electrical and Computer Engineering and Dr. Feng Jiang from the Department of Wood Science. Additionally, international partnerships with Dr. Gursel Alici's group at the University of Wollongong, Australia, and Dr. Isuru Godage from the University of Texas A&M, USA, further enhance our focus on the development and assessment of innovative soft materials. In the upcoming summer, our ambitions extend beyond the confines of conventional materials typically employed in robot fabrication. We intend to explore new frontiers by delving into the realm of thermo-elastic materials for soft robotics. These materials possess the unique capability to modulate their primary property, stiffness, in response to external stimuli. Consequently, actuators crafted from these materials hold the promise of catapulting soft pneumatic actuator technology into an advanced class, far surpassing existing counterparts. The prospective candidate will play a pivotal role within our team, contributing to the development, modeling, and characterization of these groundbreaking materials and the robots they will empower.

The YouTube playlist provided below showcases several of our ongoing advancements in soft robotics:

https://www.youtube.com/watch?v=0akdS27jrTk&list=PLZax7I98VoXsHtUes3d6d9zVysfVpFVNJ

What You Will Do:

The successful candidate will be responsible for providing essential support to our team in multiple facets, encompassing the fabrication of material samples, their subsequent characterization, data collection, and the analytical comparison of these data against established models. In addition to these responsibilities, the student will actively participate in the development of novel soft pneumatic actuators and soft robots utilizing these materials. This role will also involve assisting in the formulation of practical applications for these innovations and the comprehensive characterization of their performance. Furthermore, the student will be involved in various critical tasks, including CAD designing, 3D printing, simulations, material testing, and the experimental characterization of actuators and robots, all within the domain of soft robotics.

Supervision Received:

The daily mentoring will be overseen by Hiroshan Gunawardane at the MEMS laboratory, with the student engaging in weekly/bi-weekly meetings with Dr. Mu Chiao to report on progress. In the event of unavailability, zoom meetings will be scheduled to facilitate progress updates and address any project-related concerns. Furthermore, WhatsApp will serve as a communication platform for real-time connectivity throughout the day and for interaction with other team members. Additionally, Basecamp will be employed for communication with international collaborators. The training program will encompass the following key components:

Supervision & Training

I. *The comprehensive program includes the following elements:*
II. *A detailed introduction to the MEMS laboratory and its primary research focal points.*
III. *Mandatory laboratory safety training and orientation sessions, encompassing chemical safety and laser safety protocols.*
IV. *In-person/ online training sessions conducted by the supervisor, graduate student, and both local and international research associates.*
V. *An extensive overview of robotics, including soft robotics, and the associated techniques for their fabrication.*
VI. *Practical, hands-on training in the creation of materials with variable stiffness properties.*
VII. *Practical, hands-on training in the modeling, simulation, and characterization of materials with variable stiffness properties, focusing on their performance within soft pneumatic actuators.*

Connections & Professional Development

I. *The student will receive invitations to partake in pertinent online workshops, training sessions, invited lectures, and professional gatherings.*
II. *The student will be motivated to collaboratively function within a team, fostering peer-to-peer learning.*
III. *The student will be prompted to actively participate in brainstorming sessions aimed at resolving engineering challenges associated with the project.*
IV. *Guidance will be provided to encourage the student to cultivate creative problem-solving skills, allowing for innovative solutions to engineering challenges within the project.*
V. *The student will have the opportunity to interact and establish connections with experts from beyond the university, thereby expanding their professional network within the research field.*

Skills for Success:

To attain success in this project, possessing any combination of the following skills is highly advantageous:

I. *Enrollment in the second year or higher of a program related to mechanical, mechatronics, engineering physics, or materials engineering.*
II. *Demonstrable experience in programming languages such as Python, C++, and MATLAB.*
III. *Proven expertise in 3D printing technologies.*
IV. *Proficiency in computer-aided drafting software, exemplified by competence in tools like SolidWorks.*

V. *Prior experience in material synthesis is considered an additional asset.*
VI. *A strong inclination toward acquiring new skills and an unwavering commitment to going the extra mile to achieve project goals and milestones.*

Viscosupplement Development for the Treatment of Osteoarthritis

Laboratory Name: Industrial and Biological Multiphysics Lab
Faculty Supervisor: Dana Grecov
Graduate Student Mentor: Akshai Bose

General Area of Research:

Rheology, Tribology, Fluid Mechanics, Nanomaterials, Bio-products, Osteoarthritis

The Project:

Osteoarthritis is a degenerative joint disease affecting the synovial joints. The characteristics of this disease include but are not limited to the breaking down of cartilage and bone exposure, formation of bone cysts, thinning of synovial fluid, and narrowing of joint space. Symptoms of this disease are joint pain, joint stiffness, limited movement of joints, and grinding of joints during walking, which make this disease a very traumatic experience for the patients. The treatment methods are anti-inflammatory drugs, viscosupplement injections to replace the degraded synovial fluid and ultimately complete joint replacement surgery.

Viscosupplements made from hyaluronic acid (a constituent of synovial fluid) are found to be one of the effective treatment methods at the initial stages of osteoarthritis. The viscosupplements are injected into the patient's joint with osteoarthritis, to thicken the degraded synovial fluid (thinning of synovial fluid is due to degradation) and effectively participate in lubricating the joint. Because of some oxidation reactions taking place in the diseased joint, the injected viscosupplement won't retain its properties for a long duration. Therefore, frequent reinjections are needed.

The project aims to develop a hyaluronic acid-based viscosupplement added by nanoparticles, that addresses the short half-life of current commercial viscosupplements. The developed viscosupplement is expected to have excellent lubrication properties with improved antioxidant capability, thereby reducing the frequency of required reinjections.

The current study focuses on the in-vitro assessment of mechanical and chemical properties of the suspensions of nanoparticles in hyaluronic acid, that have the potency to be a viscosupplement. Some of the important properties that are evaluated to check the efficacy of the suspensions for this study include steady shear viscosity, coefficient of friction, wear characteristics, and oxidative stability. As a part of the study, the formulated suspensions will also be blended with the osteoarthritis synovial fluid taken from patients during knee replacement surgery and evaluate the rheological characteristics of the synovial fluid-suspension blend to assess the changes.

What You Will Do:

- *Work collaboratively to run tests on equipment like Rheometer and tribometer.*
- *Work independently to apply the conceptual fluid mechanics knowledge to interpret the results.*
- *Actively participate in the literature review and development of the design of experiments for the study.*
- *Prepare weekly reports and present the results to the group.*
- *Become knowledgeable of various mechanical equipment, analytical software, and tools.*
- *Participate in site safety training and other necessary safety training to work with the samples.*

Supervision Received:

The day-to-day supervision will be done by Akshai Bose, who is a PhD student working on the same research topic. He will be available in person at the lab. There will be weekly meetings with the faculty supervisor where the student must present their weekly update, and there will be a group meeting at the end of the research term where the student will present their work to the whole research team.

Skills for Success:

- *In-depth knowledge of fluid mechanics*
- *Knowledge of non-Newtonian fluid mechanics will be an advantage*
- *Ability to learn quickly and to take on new challenges*
- *Collaborative team player with excellent interpersonal skills*
- *Excellent organizational skills and attention to detail*
- *Good written and verbal communication skills*
- *Shows critical and creative thinking and problem-solving*

Marine Cloud Brightening

Aerosol and Energy Lab
Faculty Supervisor: Steven Rogak
Graduate Student Mentor: Maryam Shahrasebi

General Area of Research:

Climate Repair (Geoengineering), Spray Technology

The Project:

Geoengineering has been proposed to mitigate the impacts of climate change while decarbonization efforts are in progress. Geoengineering can be implemented using a Solar Radiation Management technique called Marine Cloud Brightening (MCB). The underlying principle of MCB is to enhance the reflectivity and longevity of the marine clouds by injecting seawater droplets into them. This will eventually cool the planet.

Another form of solar radiation management is Stratospheric Aerosol Injection, which carries the risk of creating lasting damage to the atmosphere. The effects of MCB, however, would only last for about a week. Thus, continuous spraying would be needed, which emphasizes the importance of energy efficiency of the spray process. This is the key concern of our work. We are reaching out to collaborators at Cambridge University, Australia, and the US to exchange thoughts and make progress together.

What You Will Do:

Together we will be designing and prototyping a piece of equipment as an extension to the already-existing atomizers in the lab. This can be a heat exchanger to preheat our working fluid. To this end, we will be brainstorming about our design which may require a limited and guided literature review. Please be assured that your duties in the lab will be depend on both your interests and skills.

Supervision Received:

You will be supported by a graduate student mentor who will be available for day-to-day supervision.There will be weekly meetings with the faculty supervisor and the graduate student for further discussions and planning the next steps. Please be assured that you are also supported by other lab members if needed. You will be welcomed to attend the occasional "Aerosol and Energy lab meeting", that is a great opportunity to gain an insight into the other projects currently running in the lab and also socialize!

Skills for Success:

- *Basics of Heat transfer*
- *Interest in developing hands on shop skills*
- *Critical thinking applied to reading technical papers (or at least an interest in these skills)*

What are you doing Dave?

Laboratory Name: Unknown
Faculty Supervisor: Adam Clare and Dominic Liao-McPherson
Graduate Student Mentor: None (TBC)

General Area of Research:

Other. 3D printing. 'Metadesign'. Data. Design.

The Project:

Humans have been the best designers on earth for quite some time. With an ability to gather information and synthesize this we are able to devise solutions to the problems we face as a species. However, when the problems become complex the cognitive capacity of the human designer is exceeded and the computer must take over.

The supervisors have devised a new architecture to allow physical evaluation of large number of engineering systems to return data which will allow a new approach to design. This also becomes more challenging in the digital manufacturing era where iterations can be rapidly achieved.

Example – everyday millions of drone missions are undertaken. These gather Tbs of data which is not currently being used to advance the performance of the engineering system, mode of manufacture or overall performance. This project will overcome this and in doing so contribute towards a step change in how technologies evolve in service.

What You Will Do:

Create students will be central to the formative stage of this research and will be the leaders of a new research area for the department. Students will be expected to work closely with the Faculty team on a range of challenges from conceptualization of a new system through to devising and implementing code which builds upon a pre-agreed structure. Ideally the team will also build a demonstrator scenario to illustrate the approach we will take.

Supervision Received:

The students will meet with one of the Faculty supervisors on a weekly basis or more. The students will be expected to work in a team and offer peer support in developing and executing a common vision.

Skills for Success:

- *Interest and some experience in 3D printing*
- *Interest in coding*
- *Interest in data visualization and AI/ML (no prior experience required)*
- *Interest in Blender/visualization of designs at large 'n'*
- *Desire to shape a new concept and be part of a small team*

Contact Adam Clare/Dominic Liao-Mcpherson for more information and to share how you might like to develop the ideas we have so far!

Urban Freight Emissions

Laboratory Name: Thermochemical Energy Conversion Lab
Faculty Supervisor: Pat Kirchen
Graduate Student Mentor: Jeremy Rochussen

General Area of Research:

Clean Energy

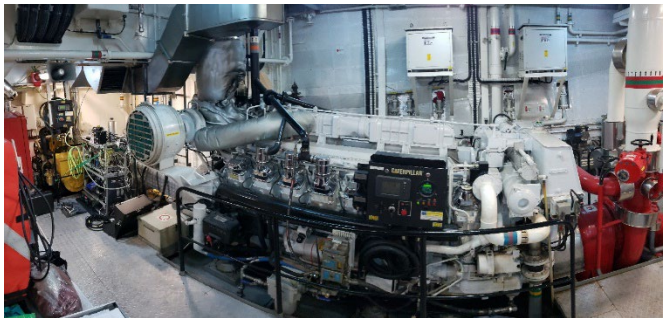


Figure 1: Tugboat Engine Operating with Renewable Diesel

The Project:

Freight and heavy-duty transportation systems are a challenging sector to decarbonize, and low carbon intensity fuels are an attractive solution. Effective and timely implementation of these fuels requires that they are assessed in realworld conditions – a challenging endeavor. This project will support our Urban Freight Emissions Program by developing and refining techniques to measure in-use emissions and gas flow rates. Ultimately, the data provided by this program will support rights- and stakeholders identify effective decarbonization strategies for transportation systems.

What You Will Do:

You will design, fabricate, and test exhaust and fuel flow measurement systems that can be deployed on freight vehicles. Your project will begin with an introduction to current techniques, and the challenges and limitations associated with them. Following this, you and the research team will select one or two candidate approaches and design and fabricate a prototype that you will test for feasibility and performance at UBC's Clean Energy Research Center. If appropriate, your prototype may be deployed for a field measurement (time dependent), with you supporting the measurement activities.

Supervision Received:

You will be fully integrated into our lab, and work daily with the rest of the research team, including research engineers, PhD and MASc students, and faculty. Beyond our lab, your work will integrate with the interdisciplinary Urban Freight Emissions program. You will meet at least weekly with the faculty supervisor.

Skills for Success:

An interest in reducing the environmental impact of practical energy conversion systems is needed. Previous experience or the willingness to develop experience with hand-tools and/or fabrication work will be helpful in developing the prototype. You should be comfortable communicating with technical and non-technical project participants. An interest in thermo- and/or fluid dynamics is desirable, but not essential.