Environmental Engineering
2021 Projects

Applicants: *Remember your top two project preferences, as you will be required to select them during your application.*

Use of local plant species to dewater oil sands tailings

Supervisor: Nicolas Beier nabeier@ualberta.ca
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Description: Surface mining to extract bitumen from oil sands generates large volumes of tailings. Tailings is a term used to describe a mixture of fine soil particles suspended in water. These fluid tailings exhibit little to no settlement over decades due to the soil particles' high affinity to water. This results in low strength/density fluid (think chocolate milk). Such fluid waste poses a challenge to contain securely and reclaim. Many technologies exist to decrease the water content and increase the strength of these tailings. One of them encompasses local plant species' use to absorb water and reinforce the soil matrix.

The proposed project is a part of the field data analyses scheme to evaluate how different plants help reduce the water trapped within the tailings and how their roots act as reinforcement; and part of an industry-wide effort to reduce the environmental footprint of operations and accelerate land reclamation. Reclamation activities create skilled, well-paying jobs and help return the lands to a biodiverse self-sustaining ecosystem. The student will work closely with a direct supervisor to help structure field datasets to detect patterns and understand underlying trends that can be identified. The goal is to create a predictive tool for engineers to quantify dewatering through different plants. The student will be exposed to integrated post-secondary experience in engineering judgement, computational and coding skills. The student will be cultivating abilities in both oral and written communication.

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Bioaccumulation pathways of wastewater-derived pharmaceuticals and personal care products in receiving aquatic environments

Supervisor: Maricor Arlos arlos@ualberta.ca

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Description: Municipal wastewater treatment plant (WWTP) is a major source of micropollutants such as pharmaceuticals and personal care products. Although they are present at extremely low concentrations, prescription and over-the-counter drugs can create unwanted effects in exposed aquatic organisms. For example, birth control pills in wastewater can feminize male fish downstream of WWTPs and antidepressants can impact fish behaviour. There have been massive advancements in detecting these compounds in our environment, but most studies have limited to evaluating water concentrations.

This project aims to (1) develop sample preparation methods for micropollutant analysis in environmental compartments (sediment, biofilms, and biota) and (2) assess the bioaccumulation potential of micropollutants using the artificial streams facility located in the Advancing Canadian Wastewater Assets in Calgary. The student will get hands on experience on designing and executing field sampling campaigns and will be trained on laboratory techniques for the analysis of pharmaceuticals in environmental samples. This project creates an opportunity to exchange ideas between western science and Indigenous knowledge in a safe learning environment, and allows Indigenous youth support the capacity of Indigenous groups/communities to address wastewater challenges

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Are organic contaminants released from microplastic pollution in freshwater?

Supervisor: Jeffrey Farner farner@ualberta.ca
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Description: Plastic pollution largely enters into rivers and streams through mismanaged waste and littering where it will break down into smaller fragments. These microplastics will travel in streams and rivers, potentially harming the ecosystem. Understanding the interactions of microplastics in the environment will improve our understanding of the risks associated with microplastic pollution which include contamination of drinking water and fish supplies, impacting individuals and communities that rely on them.

The student will use microplastics produced and weathered in the lab to perform leaching experiments to understand the release of organic compounds from the plastic matrix and model desorption. Working on this project will lead to direct laboratory experience setting up experiments and collecting and analyzing data while considering the wider context of microplastic pollution.

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Clean Energy Transitions in Remote Communities

Supervisor: Petr Musilek pmusilek@ualberta.ca

Faculty of Engineering, Electrical and Computer Engineering

http://entail.group/

Description: This project will provide the intern with the opportunity to learn about clean energy transition and how it can help remote Indigenous communities to move away from the use of diesel fuel electricity generation. This, in turn, will have a positive impact on the environment, economy and health of the communities. It will help the participating student to get familiar with the knowledge and skills required to design, implement, operate and maintain clean energy systems that use renewable energy resources.

Upon completion, the intern will comprehend the principles of energy conversion, distribution and storage and be familiar with basics of electricity generation from fossil fuels and renewable energy resources. They will also develop understanding of the economy of renewable energy systems and awareness of the conditions that must be met to operate such systems.