Masters Students for Technology Development in Aquatic Microbial Ecology

Aquatic microbes inhabit an ever-changing environment, where they frequently battle predators, viruses, and each other during their quest for nutrients. A key aspect of this microscale life is the ability to sense and navigate their surroundings, and many aquatic microbes tackle this challenge through swimming informed by chemical sensing. Traditionally, researchers have struggled to observe microbial behavior in the environment, due to a number of technical hurdles. Recently the Stocker Lab has developed several tools that allow measurements of these microbial processes in unprecedented detail at the microscale; however, our current deployment methods limit the range of habitats we can access with these new technologies. The objective of this research project is to develop and construct a deployment technology for new microdevices designed to study microscale microbial processes in aquatic environments. Such an advance will make possible the overall goal of understanding how aquatic microorganisms access resources and thereby shape the natural and man-made systems in which they live.

The Masters project will require design and hands-on work with a number of fabrication tools, including (but not limited to) 3D printing, laser cutting, and CNC milling in order to construct new deployment platforms, based on the specific deployment environment. In addition, the student has the possibility to carry out proof of concept experiments, for example to isolate bacteria that are dominant in the selected ecosystem. These isolates could later be used in an extensive bioprospecting campaign in an effort to discover new microbial functions that may be applicable to engineered systems (i.e. drinking water quality, wastewater treatment, bioremediation), with the potential to scale-up and impact human health and well-being. Device deployment could occur in one of several systems, including lakes, rivers, soil, wastewater treatment plants, and drinking water systems.

The candidate should be familiar with prototyping techniques and have some computer-aided design experience. Although previous exposure to environmental microbiology is not a requirement, enthusiasm to develop in this area of knowledge is desirable.

During their project, the student will have the opportunity to carry out some (or all) of the following work:

- Design and fabrication of a deployment platform for a chosen ecosystem;
- Plan experiments to isolate key microbes involved in selected environmental processes;
- Carry out an isolation campaign, whereby microorganisms are isolated from the environment and screened through a combination of molecular methods and microscopy.

If interested, please send your CV with a cover letter to lambert@ifu.baug.ethz.ch.

For more information about the Stocker Lab and some of the work currently underway, please visit stockerlab.ethz.ch.