

Faculty of Engineering

Summer Research Program 2023-2024

Project Title: Microfluidic measurement of the propulsive power of swimming cells

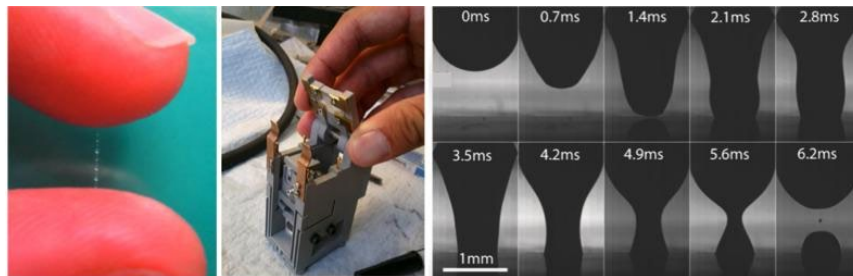
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Objective



It is common experience that thicker or more viscous drops take a longer time to break up when stretched between one's fingers. Inspired by this simple observation, we have developed a microfluidic device for inferring the viscosity of fluid drops of diameters of 1 mm, or even smaller. We are targeting this device for medical diagnosis in cases where sample volumes are small, and the viscosity of the sample provides a good indicator of medical conditions. One such case involves samples containing swimming cells, such as sperm.

Project Details

In experiments, we have observed that the viscosity of a suspension of swimming cells strongly depends on the propulsive power exerted by those cells. This has important applications. Male fertility is a serious issue not just in humans, but also in breeding programs for farm animals and critically endangered species. Infertility diagnosis is currently highly laborious, inaccurate and expensive.

In this SRP, you will aim to demonstrate **for the first time** that the average propulsive power of cells can be measured reliably by fitting predictions from computer simulations of the thread breakup of swimmer suspension to pre-existing experimental data on healthy and defective sperm samples.

Prerequisites

Strong interest in modeling & simulations. Good academic background in fluid mechanics.