DBMR Research Conference

Seminar room EG050
Murtenstrasse 24, 3008 Bern

Date: **Monday, December 8, 2025, 5pm – 6pm**

Title: **From Physics to Medicine: Translating Ultrasound Microrobotics from Preclinical Models toward Clinical Applications**

Speaker: **Prof. Daniel Ahmed, Director of Acoustic Robotic Systems Lab (ARSL), Department of Mechanical and Process Engineering, Acoustic Robotics for Life Science and Healthcare, ETH Zurich**

Bio: Daniel Ahmed is an Assistant Professor of Acoustic Robotics for Life Sciences and Healthcare in the Department of Mechanical and Process Engineering at ETH Zurich. Currently, he is the director of Acoustic Robotic Systems Lab (ARSL) and is engaged in pioneering ultrasound microrobotics and microtechnologies for applications in life science applications and translational medicine.
Daniel holds Bachelor's, Master's, and Doctoral degrees in Engineering Science and Mechanics from Pennsylvania State University (U.S.). His research has been published in *Nature (in press)*, *Nature Electronics*, *Nature Machine Intelligence*, *Nature Communication*, *Science Robotics*, *Science Advances*, and *PNAS*.
Daniel has successfully secured numerous grants both nationally and internationally in his role as an independent Principal Investigator. His notable achievements include receiving the ERC Starting Grant, ERC Proof of Concept, the EIC Pathfinder, Bridge Discovery, multiple grants from the Swiss National Science Foundation (SNSF), the ETH Internal Grant, and the ETH Zürich Career Seed Grant.
He was recognized as one of the Falling Walls Science Breakthrough of the Year 2021 winners in Engineering and Technology. Actively translating research into innovation, Daniel holds multiple patents and is the founder of SonoRobotics, a spinoff developing acoustic robotic technologies. Most recently, he received the Dandelion Entrepreneurship Award at ETH Zürich.

Abstract: Microrobots offer transformative opportunities for life sciences and medicine, yet their integration into *in vivo and preclinical models* remains in its early stages. At microscopic scales, the physics of motion is entirely distinct from our macroscopic world — a bacterium swimming in fluid obeys very different rules than a human in water. Drawing inspiration from biology, my team develops microrobotic systems that operate safely and effectively within living environments using ultrasound as both an energy source and a means of control.
Ultrasound provides unique advantages: it is noninvasive, biocompatible, and capable of deep tissue penetration. We have established a diverse family of ultrasound-powered microrobots and microtechnologies, including neutrophil-inspired navigators capable of upstream motion, starfish-larva–inspired ciliary swimmers for active manipulation, and bacteria-like double-helical devices for targeted thrombus disruption. More recently, we introduced autonomous and programmable control of microrobots through reinforcement learning.
We were the first to translate ultrasound microrobotic systems into living organisms — first by manipulating microparticles within the vasculature of zebrafish embryos, and subsequently by navigating and manipulating microrobots in the brain vasculature of live mice. More recently, we developed a new class of US-driven artificial muscles and soft robots and demonstrated their use in manipulating excised bladder, stomach, and intestinal tissues, as well as serving as bio-integrated patches for mechanical actuation and drug delivery in the heart and bladder.
This lecture will highlight our recent advances in ultrasound microrobotics, their integration with *preclinical biological systems,* and emerging applications paving the way toward *clinical translation* and bio-integrated medical devices.

Host: Prof. Nadia Mercader, Head of Department at the Institute of Anatomy, Professor of Anatomy, Developmental Biology and Regeneration, Faculty of Medicine, University of Bern

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