



## MECHANICAL ENGINEERING STUDENT SEMINAR

Thursday, August 29 2024 at 13:30, D. Dan and Betty Kahn Building, Room 217.

Online: <https://technion.zoom.us/j/2366074670>

### Additive and subtractive microfabrication by hydrodynamic flow confinements

Daniel Widerker

**Adviser: Prof. Moran Bercovici**

In recent years, 3D printing has become a game changing method for millimeter and centimeter scale prototyping. However, its adoption for microfabrication processes in MEMS and transducer applications remains limited. A primary challenge hindering the relevance of additive manufacturing in microfabrication is the difficulty to integrate structural, electrical, chemical, and biological functionalities within a single process at small scales. In my research, I explore new approaches for micro-scale fabrication using confined flows, with a focus on material diversity and process integration.

In this seminar, I will discuss my research on utilizing flow confinement to precisely control the spatial interaction between a processing liquid and a substrate. In the first part I will introduce a device called the "fluidic biomill", which enables both the structuring of microfluidic channels and their bio-functionalization, facilitating prototyping of biochips. I will demonstrate the implementation of hydrodynamic flow confinements to fluidically mill microchannels into a polystyrene substrate and immobilize biomolecules on their surfaces.

In the second part I will present my approach for multi-metal printing of microscale structures, combining hydrodynamic confinement with localized electrochemical deposition. By implementing upstream liquid switching to adjust the confined electrolyte's composition, we control the composition of the deposited metal. Using electrolytes suitable for the deposition of copper, tin, silver, and nickel, we demonstrate the ability to fabricate structures with over 60 material transitions in a single printing process.

Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Shmuel Gal.