



## MECHANICAL ENGINEERING SEMINAR

Monday, Dec. 05 2022 at 14:30, D. Dan and Betty Kahn Building, Auditorium 1

### **Nanofluidics: surfaces, interfaces, and boundary conditions – a devil's masterpiece**

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**Hosted by: Prof. Moran Bercovici**

"God made the bulk; the surface was invented by the devil." Wolfgang Pauli's quote epitomizes the field of nanofluidics. In such small systems, the relatively large surface-area to volume ratio leads to surface phenomena dominating the overall response of such systems. The multiple scales (length and time) inherent to these systems, as well as the expected breakdown of the continuum mechanics framework, continue to frustrate the advancement of our fundamental understanding of this field.

This talk focuses on the particularly challenging and interdisciplinary sub-field of ion transport through highly charged nanopores. The electrical response of these systems is determined by an interplay of bulk phenomena (diffusion, electromigration, and advection), with surface mechanisms (surface charges and their regulation and hydrodynamic slip lengths) and the effects of various interfaces manifested by a wide range of boundary conditions.

I will delineate the contribution of each phenomenon separately as well as the response of their collective interplay. I will demonstrate that only after accounting for the full array of surface phenomena can theoretical analysis rationalize experimental measurements of the electrical conductance of nanopores. Finally, I will briefly review the future directions my lab is taking.

Yoav Green joined the Department of Mechanical Engineering at Ben-Gurion University in 2019 as a Senior Lecturer. Yoav heads the Fluid Mechanics Laboratory, where his current research focus is nanofluidics and electrokinetics. In particular, Yoav's research group utilizes a combination of theoretical modeling, numerical simulations, and experiments to investigate the electrical response of nanochannel systems.

