



DEPARTMENT OF MECHANICAL ENGINEERING

SEMINAR

*to be held on Thursday, January 17, 2019, 11:00
in the Seminar Room (#117) of the Mechanical Engineering Building (#55)
at the Campus of the Ben-Gurion University of the Negev*

The Fluid Dynamics of Nanochannels and Biological Systems

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Abstract:

Nanochannels and nanopores are ubiquitous to nature and technology. They can be found in macroscopically large permselective membranes such as those used for desalination in electro dialysis systems, or small system such as cell membranes. The sub-micron scale in such systems allows them not only to desalinate water, harvest energy, and serve as highly sensitive bio-molecular detectors, but it also allows these nanochannels to behave as diode-like current rectifiers.

In nanofluidic systems, a nanochannel is typically connected to much larger microchannels/reservoirs. Until recently, in the nanofluidics community it was assumed that the effects of the microchannels is negligible. In this talk, I will present contradicting evidence to this assumption. I will then present a new modified paradigm which emphasizes the importance of the microchannels themselves as well as the microchannel-nanochannel interfaces. These new insights are extremely useful for designing new nanofluidic based systems.

To conclude, I will present my recent research in biomechanics that focuses on relating the kinematics of an epithelial monolayer of cells to its kinetics. As the epithelial monolayer migrates collectively, each constituent cell exerts intercellular stresses on neighboring cells and exerts traction forces on its substrate. The relationship between the velocities, stresses and tractions is fundamental to collective cell migration but it remains unknown. It will be shown that the observed dynamics does not conform to the simple and commonly assumed laws of a linear Hookean solid or Newtonian fluid. Rather, the mechanics are much more complicated, likely because of the active nature of the cells. These findings are crucial for developing a deeper understanding of collective cellular behavior.

Lastly, I will discuss future research directions.

Bio: Yoav Green is currently a post-doctoral researcher in the Harvard T.H. Chan School of Public Health where he is working in the field of biomechanics. Before that Yoav received his PhD in mechanical engineering from the Technion - Israel Institute of Technology where his research fields were nanofluidics and electrokinetics. Yoav also holds an M.Sc. in physics (astrophysics and astronomy) from the Weizmann Institute of Science, and B.Sc. in Aerospace Engineering from the Technion.