



MECHANICAL ENGINEERING SEMINAR

Thursday, July 16, 2026 at 13:30, Lady Davis Building, Auditorium 250

Online: [ZOOM LINK](#)

“Purcell’s Scallop Theorem” with Non-viscous Friction

Assoc. Prof. Shai Revzen

Electrical Engineering and Computer Science, Ecology and Evolutionary Biology (courtesy)
University of Michigan, USA

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Hosted by Prof. Yizhar Or

Many mechanical engineers learn about the "Purcell’s Scallop Theorem": that a single Degree-of-Freedom moving back and forth cannot generate net motion in a viscous medium. This talk will define and analyze Purcell's classical result, and tie it to the motility map used in geometric mechanics. Using this tooling, we will define and analyze: swimming in biologically relevant non-newtonian fluids (1) Ostwald–de Waele fluids; (2) Carreau-Yasuda fluids; crawling, sliding, or slipping on a surface with (3) dynamic Coulomb friction; (4) asymmetric friction represented by Finsler metrics. For each of these cases we provide some mathematical analysis and some new insights. In each case, the motility map and its geometry lead to approximations of the body velocity integral, and from there to the net motion of the body through space. This talk is suitable for graduate students in mechanical engineering, applied mathematics, and physics. Early parts of this work were funded by the Dan D. and Betty Kahn Foundation Autonomous systems Mega-Project, ARO MURI W911NF-17-1-0306, and NSF CMMI 1825918.

Note: the seminar will be given in English

Speaker Bio: Shai Revzen is an Associate Professor of Electrical Engineering and Computer Science in the University of Michigan's College of Engineering, and holds a courtesy faculty appointment in the Department of Ecology and Evolutionary Biology. He received his PhD in Integrative Biology from the University of California at Berkeley, and his JD from Wayne State University. He did postdoctoral work in the GRASP Laboratory of the University of Pennsylvania, and his undergraduate and masters degrees at the Hebrew University in Jerusalem. Prior to his academic work, Shai spent a decade in the tech industry, rising to Chief Architect R&D of the convergent systems division of Harmonic Lightwaves (HLIT). He is currently co-founder and Chief Science Officer of two start-up companies, Acculine Medical, and Zenbul Labs; he also provides technical consulting services, and legal consulting service as a Michigan lawyer.

Seminars Coordinator: Assoc. Prof. Sefi Givli .