



**Department of Mechanical Engineering Seminar
to be held on**

Thursday, January 19, 2023, 11:00

*in the Seminar Room (117) of the Mechanical Engineering Building (55)
at the Campus of the Ben-Gurion University of the Negev*

**Flow, Deformation and Reaction in Porous Media:
The Coupling of Flow and Elastic Expansion in Porous Media**

Dr. Yaniv Ederly

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(Hosted by: Ori Shoshani and Yoav Green)

Abstract:

A porous material is a solid skeleton with a network of connected voids with a wide distribution of sizes. This distribution dictates a rich variation for the fluid velocities between the voids that affect reaction between chemicals, deformation of the solid skeleton, and mixing between miscible phases. In this seminar, I will briefly explore the experimental and computational work we do on the porous medium's flow, mixing, reaction, and deformation. Yet, I will specifically focus on how fluid injection raises the pore pressure within the porous rocks while deforming them. This coupling is not fully validated for risk assessment as experimental studies of rocks are usually limited to postmortem inspection and cannot capture the complete deformation process in time and space. We investigate injection-induced elastic expansion of a unique rock-like medium mimicking the deformation of sandstone and show that pressurized flow through a porous medium will result in a non-uniform expansion following the local pore pressure changes. We fully model this coupling using the theory of poroelasticity. As our porous medium has the same deformation scale as real rock, our conclusions are applicable to injection-induced underground expansion. We further investigate the rock-like material's transition from elastic to plastic deformation through in-situ deformation and by the change in the porous media's irreversible permeability.

Bio:

Yaniv Ederly is an assistant professor in the Department of Civil and Environmental Engineering, Technion, Israel. Yaniv obtained his BSc in physics and oceanography from the Hebrew University, his MSc and Ph.D. from the Weizmann Institute, and did his postdoc in the soft matter physics lab at Harvard University. Currently, he is heading the porous media visualization (PMV) lab in the Technion, investigating the physics of flow, reaction, and deformation in soil and rock.

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