



MECHANICAL ENGINEERING SEMINAR

Wednesday, March 29 2023 at 15:00, D. Dan and Betty Kahn Building, Auditorium 1

Plant roots and robotic arms: how to get the best out of a soft fibre?

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Hosted by: Assoc. Prof. Yizhar Or

Many plants make use of slender and soft organs to find and reach distant resources (like light, nutrients, water). Typical tasks of these organs include resisting gravitational forces, penetration into a stiff medium, autonomous avoidance of obstacles, and exploration of unevenly distributed resources. Soft robotic arms are designed to achieve similar goals. Efficiency may depend in both cases on how curvature of the fibre is controlled. In the first part of my talk, I present a 3D, quasi-static elastic rod model of root growth with curvature control, which explains how roots cope with various contact-induced forces. The model reproduces experimentally observed morphological patterns of *Arabidopsis thaliana* roots. In the second part, I talk about the role of curvature control in the case of robotic arms carrying heavy weights, and find theoretical limits for the maximum overhang of a soft arm. Finally, I outline some challenges of the development of robotic arms that rely on contact to deliver a payload to distant locations.

Peter Varkonyi received the Ph.D. degree in architectural engineering from Budapest University of Technology and Economics, Hungary, in 2006. He is currently a Professor of structural engineering with Budapest University of Technology and Economics. His research interests include nonsmooth, nonlinear and hybrid dynamics, and its application in robotics, mechanical and structural engineering, as well as applied geometry and mechanics.

