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Growth, instability, and failure: bringing order into the chaos of natural phenomena

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ABSTRACT:

Natural phenomena such as growth, instability, and failure can be highly dependent upon activation of stochastic mechanisms at the microscale, such as the existence of microscopic imperfections, the action of molecular motors, and the diffusion of constituents. Yet, at the macroscale, astonishing order is often observed. In this talk, I will discuss our recent attempts to bring a deterministic understanding to explain such processes by focusing on some examples. We will consider the growth of cavities in soft materials and their transition into cracks, and the growth of bodies by reactions of association or dissociation on their boundaries.

BIOGRAPHY:

Tal Cohen is the Robert N. Noyce Career Development Assistant Professor at MIT. She joined the Department of Civil and Environmental Engineering in 2016 and received a joint appointment in the Department of Mechanical Engineering in 2017. She received both her MSc and PhD degrees at the Faculty of Aerospace Engineering at the Technion in Israel. Following her graduate studies, Tal was a postdoctoral fellow for two years (2014-2015) at the Department of Mechanical Engineering at MIT and continued for an additional postdoctoral period at the School of Engineering and Applied Sciences at Harvard University. She received the ONR young investigator award and the NSF CAREER award in 2020, and the ARO young investigator award in 2019. Earlier awards include the MIT-Technion postdoctoral fellowship and the Zonta International Amelia Earhart Fellowship. Her research is broadly aimed at understanding the nonlinear mechanical behavior and constitutive sensitivity of solids. This includes behavior under extreme loading conditions, involving propagation of shock waves and dynamic cavitation, material instabilities, and chemo-mechanically coupled phenomena, such as, material growth.