

Mechanics Seminar series 2024 – 25

Make it and break it: Contact and Cracks at soft interfaces

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Venue: Amphi Becquerel (Polytechnique)

Abstract

Some of the most pressing challenges in engineering science arise when materials are adjacent to one another - from the bottom of an impacting droplet to the separating faces of a crack. Here I will introduce two vignettes on these important topics: first, a calibrated, nano-scale, direct measurement of the intervening air film at the critical juncture of contact formation during droplet impact, and second, the toughening that can result from geometric complexity at the tip of a propagating crack. The focus of the talk will be on the crack propagation problem. These seemingly disparate systems are deeply connected on a variety of levels, from their sensitivity to defects to the propagating singularity that defines the mathematical problem of contact line and crack propagation. The talk will conclude with a discussion of perspectives and some puzzles that remain open despite recent progress.

About the speaker

Kolinski studied engineering mechanics and mathematics at the University of Illinois at Urbana-Champaign and graduated with bachelor's degrees in both subjects in 2008, before earning a master's degree in applied mathematics (Sc.M.) and a PhD in applied physics from Harvard University, in 2010 and 2013, respectively. His PhD thesis on "The role of air in droplet impact on a smooth, solid surface" was supervised by Lakshminarayanan Mahadevan and Shmuel Rubinstein. Supported by a Fulbright-Israel post-doctoral fellowship, he moved in 2014 to Israel to work with Eran Sharon and Jay Fineberg at the Racah Institute of Physics at the Hebrew University of Jerusalem. There he studied the interfacial instabilities in fluid and solid systems such as water bells and the fracture of hydrogels. Since May 2017, Kolinski has been a Tenure Track Assistant Professor at EPFL and the head of the Laboratory of Engineering Mechanics of Soft Interfaces (EMSI) at EPFL's School of Engineering.

