סמינר - SEMINAR

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 13.01.2020 (ט"ז בטבת תש"פ), בניין דן קאהן, אודיטוריום 1, 30 :14.

מרצה:

Dr. Bin Li, Ph.D.

Department of Mechanical and Aerospace Engineering,
Cornell University, Ithaca, NY

על הנושא:

Variational approach to brittle fracture: tearing thin sheets and anisotropic surface energy

The seminar will be given in English

להלן תקציר ההרצאה:

Brittle fracture mechanics has focused on bulk materials with isotropic surface energy. In this situation, different physical principles for crack path selection are very similar or even equivalent. The situation is radically different when considering crack propagation in materials with anisotropic surface energy. When this anisotropy is strong, the phenomenology of crack propagation becomes very rich, with forbidden crack propagation directions or complex sawtooth crack patterns. Thus, this situation interrogates fundamental issues in fracture mechanics, including the principles behind the selection of crack direction. Similarly, tearing of brittle thin elastic sheets, ubiquitous in nature, technology and daily life, challenges our understanding of fracture. Since tearing typically involves large geometric nonlinearity, it is not clear whether the stress intensity factors are meaningful or if and how they determine crack propagation. Geometry, together with the interplay between stretching and bending deformation, leads to complex behaviors, restricting analytical approximate solutions to very simplified settings and specific parameter regimes.

In both situations, a rich and nontrivial experimental record has been successfully understood in terms of simple energetic models. However, general modeling approaches to either fracture in the presence of strong surface energy anisotropy or to tearing, capable of exploring new physics, have been lacking. The success of energetic simple models suggests that variational theories of brittle fracture may provide a unifying and general framework capable of dealing with the more general situations considered here. To address both problems, we have developed variational phase-field models. Our numerical simulations demonstrated that the regularized variational approach to brittle fracture constitutes a general framework that naturally generalizes to non-trivial situations.

Biographical Sketch: Bin Li is a Postdoctoral Researcher at Sibley school of Mechanical and Aerospace Engineering, Cornell University. From Apr. 2016 to Mar. 2018, he held a postdoctoral appointment at Institut Jean Le Rond d'Alembert (∂'Alembert), Université Pierre et Marie Curie. He received his PhD in Computational Mechanics at LaCàN--Mathematical and Computational Modeling, under the supervision of Prof. Marino Arroyo, from the Universitat Politècnica de Catalunya--BarcelonaTech in 2016, and M.Sc. in solid mechanics from the Shanghai University. He works in the fields of theoretical and computational solid mechanics. His research focuses on mathematical modeling and advanced computational methods to improve the fundamental understanding of the mechanics and physics of fracture in solids. He is interested in the fundamental study of damage and fracture of anisotropic materials, heterogeneous materials, and tearing thin sheet, as well as mechanics of soft materials.

מארח : פרופ' מיכאל שפירא

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