



LMS Seminar

7 March 2024 at 2:00 pm - Room Jean Mandel

Crack nucleation in variational phase-field models of brittle fracture: the case of almost incompressible materials

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ABSTRACT

Phase-field approaches model sharp cracks as the localisation of a smooth damage field. Their success is due to their ability to predict the nucleation and propagation of complex crack patterns without ad-hoc hypotheses. My talk will focus on the problem of crack nucleation. I will show that standard gradient damage models can correctly predict the material strength and toughness in the case of almost uniaxial loadings, retrieving the fundamental scale effects observed for brittle materials. Hence, I will discuss the difficulties arising in the case of multi-axial loadings, where the strength is a hyper-surface in the stress space. I will discuss in details the curious case of almost incompressible materials. I will introduce an original model accounting for the experimental observations within an energetic approach, by coupling damage with a macroscopic nonlinear elastic model of the cavitation phenomenon.

BIOGRAPHY

Corrado Maurini is a Professor of Solid Mechanics in the d'Alembert Institute (<http://www.dalembert.upmc.fr/ijlrda/>) at Sorbonne Université in Paris, France. He earned a Ph.D. degree in Mechanics from University of Rome La Sapienza and Paris 6 – Pierre and Marie Curie University in 2005, after Master degrees from La Sapienza and Virginia Tech. His research interests are in theoretical and computational nonlinear solid mechanics and instabilities, and in particular on fracture and damage, phase-field models of fracture, nonlinear elasticity, plates and shells, morphing structures and active materials.