Seminar im Rahmen des GRK 2078

Referee: **Prof. Dr.-Ing. Laura De Lorenzis**
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Date: Tuesday, November 27, 2018
Time: 14:00 h
Location: Bldg. 10.23, 3rd Floor, Room 308.1 (KM-Seminar Room)

Title: **Phase-field modeling and computation of fracture and fatigue**

Abstract

Fatigue is a key phenomenon in mechanics, and is largely responsible for many structural failures. Despite the significance of the problem, most existing fatigue theories are based on empirical laws that lack of generality and predictive capabilities. Hence, the development of mathematically sound and reliable fatigue models is still an open issue. On the other hand, the phase-field modeling approach to fracture, after the pioneering investigations of the early 2000 in the mathematics community, has recently attracted a tremendous interest also in the engineering community due to its theoretical soundness, computational flexibility and demonstrated predictive power, and is thus the ideal candidate for modeling of fatigue phenomena. Recently, we proposed a new variational fatigue phase-field model based on the idea that the fracture toughness is degraded as a suitable internal history variable is accumulated. Such degradation, on turn, is ruled by a suitable dissipation potential which explicitly depends on the strain history. The talk departs from the ideas of this model in one dimension and then illustrates its extension to higher dimensions including the unsymmetric response in tension and compression for the evolution of both phase-field and fatigue internal history variable. The use of alternative variables is explored highlighting advantages and drawbacks. To illustrate the capabilities of the model, classical benchmark problems, such as single edge tension/shear test and compact tension specimen under cyclic loading are investigated. Remarkably, the model is shown to be able to reproduce, with no ad hoc tailoring, many relationships known from the fatigue literature, such as Wöhler curves, Paris' law, and Miner's law. In contrast to Paris' law, the model is able to describe all three typical fatigue fracture regimes, namely the fatigue fracture initiation, the stable fatigue crack propagation and the final abrupt fracture stages, for geometries and loading cases of arbitrary complexity and in three dimensions.

Alle Interessenten sind herzlich eingeladen.

Prof. Dr.-Ing. Thomas Böhlke
(Sprecher des GRK 2078)