Einladung zum Gastvortrag im Aachener Mechanik & Statik Kolloquium

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Mies-van-der-Rohe-Straße 1 | 52074 Aachen

RWTH AACHEN UNIVERSITY

Prof. Dr. Sanjay Govindjee

Structural Engineering, Mechanics, and Materials
Department of Civil and Environmental Engineering
University of California, Berkeley

„Homogenization in inelastic material systems"

Given an inelastic material model, a structural geometry, and a set of boundary conditions, one can in principle always solve the governing equations to determine the system's mechanical response. However, for large inelastic systems this procedure can quickly become computationally overwhelming, especially in three-dimensions and when the material is locally complex, has microstructure. In such settings multi-scale modeling offers a route to a more efficient model by holding out the promise of a framework with fewer degrees of freedom, which at the same time faithfully represents up to a certain scale the behavior of the system.

In this talk, we present a methodology that produces such models for inelastic systems upon the basis of a variational scheme. The essence of the scheme is the construction of a variational statement for the strain energy as well as the dissipation potential for a coarse scale model in terms of the strain energy and dissipation functions of the fine scale model. From the coarse scale energy and dissipation we can then generate coarse scale material models that are computationally far more efficient than either directly solving the fine scale model or by resorting to FE^2 type modeling. An essential feature for such schemes is the proper definition of the coarse scale inelastic variables. By way of concrete examples, we illustrate the needed steps to generate successful models via application to finite deformation nonlinear viscoelasticity within the microsphere model and by application to problems in classical plasticity.

Prof. Dr.-Ing. M. Itskov, Lehr- und Forschungsgebiet für Kontinuumsmechanik, RWTH Aachen
Prof. Dr.-Ing. S. Klinkel, Lehrstuhl für Baustatik und Baudynamik, RWTH Aachen
Prof. Dr.-Ing. B. Markert, Institut für Allgemeine Mechanik, RWTH Aachen
Prof. Dr.-Ing. S. Reese, Institut für Angewandte Mechanik, RWTH Aachen
Prof. K. Veroy-Grepl Ph.D., AICES, RWTH Aachen