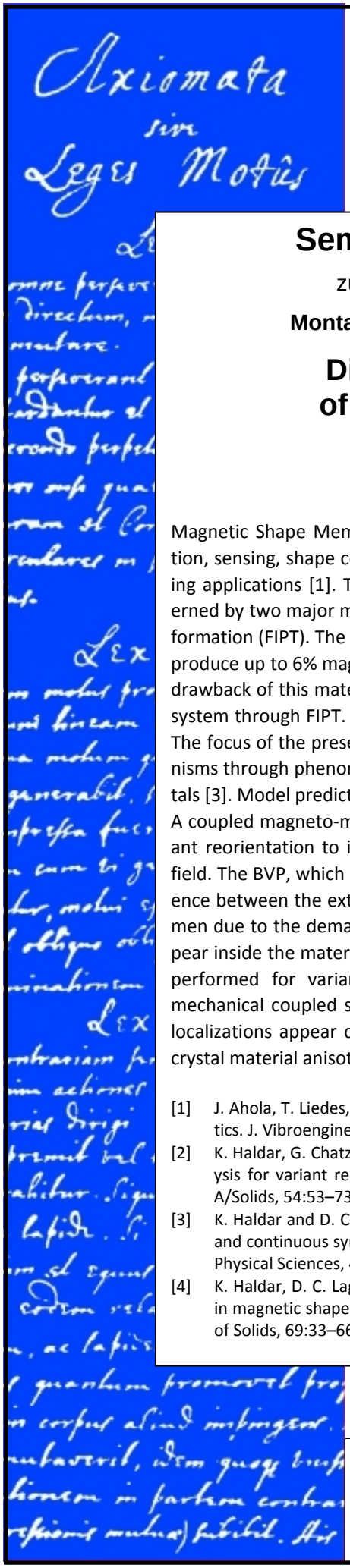

Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Montag, 30.11.2015, 13:00 Uhr, seminar room PGS

Discrete Symmetry and Modeling of Magnetic Shape Memory Alloys

Krishnendu Haldar, Ph.D.
Institute of Mechanics, TU Dortmund

Magnetic Shape Memory Alloys (MSMAs) are promising multi-functional materials for actuation, sensing, shape control, vibration suppression, magnetic refrigeration, and energy harvesting applications [1]. The hysteretic magneto-mechanical responses of such materials are governed by two major mechanisms which are variant reorientation and field induced phase transformation (FIPT). The most widely used material for variant reorientation is Ni2MnGa which can produce up to 6% magnetic field induced strain (MFIS) under 5 MPa actuation stress. The major drawback of this material is a low blocking stress, which is overcome in the NiMnCoIn material system through FIPT. This magnetic alloy can exhibit 5% MFIS under 125 MPa actuation stress. The focus of the presentation is on the magneto-thermo-mechanical responses of such mechanisms through phenomenological modeling [4]. Discrete symmetry is considered for single crystals [3]. Model predictions of magneto-thermo-mechanical loading conditions are presented.
A coupled magneto-mechanical boundary value problem (BVP) is solved that accounts for variant reorientation to investigate the influence of the demagnetization effect on the magnetic field. The BVP, which mimics a real experiment, provides a methodology to correlate the difference between the externally measured magnetic data and internal magnetic field of the specimen due to the demagnetization effect. The numerical results show that localization zones appear inside the material between a certain ranges of applied magnetic field. Stability analysis is performed for variant reorientation to analyze these numerical observations. Magneto-mechanical coupled stability analysis reveals that the MSMA system becomes unstable when localizations appear due to non-linear magnetization response. It is also observed that single crystal material anisotropy has strong influence on instability [2].

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Prof. Dr.-Ing. P. Steinmann
Prof. Dr.-Ing. K. Willner
Lehrstuhl für Technische Mechanik
Egerlandstraße 5, 91058 Erlangen

Prof. Dr.-Ing. S. Leyendecker
Lehrstuhl für Technische Dynamik
Haberstraße 1, 91058 Erlangen