

Essen, 30.06.08

**Einladung zum**

## **Seminar Mechanik und Numerische Mathematik**

**Vortragender:**

**Herr Jun.-Prof. Dr.-Ing. Markus Böhl**  
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**Thema:**

**„Computational modelling of muscular thin films for cardiac repair“**

Motivated by recent success in growing biohybrid material from engineered tissues on synthetic polymer films, a computational simulation tool for muscular thin films in cardiac repair is derived. In this model, the polydimethylsiloxane base layer is simulated in terms of microscopically motivated tetrahedral elements. Their behaviour is characterised through a volumetric contribution and a chain contribution that explicitly accounts for the polymeric microstructure of networks of long chain molecules. Neonatal rat ventricular cardiomyocytes cultured on these polymeric films are modelled with actively contracting truss elements located on top of the sheet. The force stretch response of these trusses is motivated by the cardiomyocyte force generated during active contraction as suggested by the filament sliding theory. In contrast to existing phenomenological models, all material parameters of this novel model have a clear biophysical interpretation.

The predictive features of the model will be demonstrated through the simulation of muscular thin films. First, the set of parameters will be fitted for one particular experiment documented in the literature. This parameter set is then used to validate the model for various different experiments. Last, we give an outlook of how the proposed simulation tool could be used to virtually predict the response of multi-layered muscular thin films. These three-dimensional constructs show a tremendous regenerative potential in repair of damaged cardiac tissue. The ability to understand, tune and optimise their structural response is thus of great interest in cardiovascular tissue engineering

**Ort:** Universität Duisburg-Essen, Campus Essen, Raum T03 R02 D81

**Zeit:** Mittwoch, den 09.07.2008 von 17.00 Uhr bis 18.00 Uhr

gez. Prof. Dr. A. Klawonn    gez. Jun.-Prof. Dr.-Ing. T. Ricken    gez. Prof. Dr.-Ing. J. Schröder