

# Kolloquium

## Biomedizinische Technik und verwandte Gebiete

*Wintersemester 2014/15*

**Donnerstag, 05.02.2015, 17:00 - 18:30 Uhr**

**Prof. Bernd Markert**

*Institut für Allgemeine Mechanik, RWTH Aachen*

(Moderation: Univ.-Prof. Dr.-Ing. Klaus Radermacher,  
Lehrstuhl für Medizintechnik (mediTEC) im Helmholtz-Institut für Biomedizinische  
Technik der RWTH Aachen)

### **„Multi-X Continuum Approaches in the Biosciences“**

#### **Abstract:**

Continuum Mechanics is commonly associated with a macroscopic view on materials and structures with the objective to theoretically and numerically model their behaviour and predict their response under mechanical loading. It is beyond question that, for many decades now, thanks to modern computational techniques, continuum theories have been successfully exploited for numerous applications in science and technology. However, the underlying models, independent of their degree of sophistication, are commonly based on standard continuum approaches which, by their very nature, are restricted to the description of so-called simple materials as local grade-one and single-phase continua, including only dissipative ODE evolutions of some local internal variables. Although this general modus operandi is still of great importance, it increasingly appears that material properties stemming from microstructural phenomena have to be considered. This is particularly true for hierarchical biocomposites and biomimetic nanomaterials, i. e., materials with distinct microtopologies associated with characteristic length scales that affect the macroscopic response; something for which standard continuum theories fail to account. It is obvious that the situation is particularly delicate for biological materials as they commonly consist of multiple constituents, components or phases, which gives rise to internal flow, diffusion and phase-transformation processes driven by additional state quantities and dependent upon microstructural properties. Following this idea, it is evident that standard continuum mechanics has to be augmented to capture lower-scale structural and compositional phenomena, and to make this information accessible to macroscopic numerical simulations. In this context, the present contribution aims at giving an elucidating insight into the possibilities offered by advanced continuum approaches as well as the macroscopic description of coupled multi-field and multi-physics or general multi-x problems in the aspiring field of bioscience. Thereby, special attention will be drawn to the modelling and simulation of interfacial problems by use of non-local diffusion approaches (phase-field models), the multi-field description of growing and remodelling biological tissue as well as some computational multi-physics aspects in the multi-scale modelling of spider silk.

**Veranstalter:** Direktorium des Helmholtz-Instituts für  
Biomedizinische Technik der RWTH Aachen  
**Ort:** Helmholtz-Institut für Biomedizinische Technik  
der RWTH Aachen (Seminarraum 2.70)  
Pauwelsstraße 20, 52074 Aachen  
**Koordination:** Univ.- Prof. Dr.-Ing. Klaus Radermacher  
Lehrstuhl für Medizintechnik, RWTH Aachen  
**Kontakt:** meditec@hia.rwth-aachen.de; Tel.: +49-(0)241-80 23870

