

\*\*\*\* SEMINAR ANNOUNCEMENT \*\*\*\*

**SPEAKER:** Professor Kumar Vemaganti  
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Cincinnati, Ohio

**TOPIC:** Characterization and Modeling of Biomaterial and Tissue

**DATE:** Tuesday, November 14, 2006

**TIME:** 3:30 p.m.

**PLACE:** 138 DeBartolo Hall

Abstract

The characterization and modeling of biological materials have applications in many areas including robotic surgery, diagnostics, injury mechanics, and functional tissue engineering. In this talk, we discuss two areas of research in biomechanics at the University of Cincinnati: a) the development of nano-reinforced biomaterials for tissue engineering applications; and b) the characterization and modeling of liver tissue.

Functional Tissue Engineering (FTE) seeks to engineer artificial tissue by delivering mechanical stimuli to cell-seeded biomaterials in order to promote cell growth and collagen expression. The ideal materials for FTE must therefore be biocompatible and be able to withstand mechanical stimuli. Researchers from Mechanical Engineering and Biomedical Engineering at the University of Cincinnati are collaborating to examine the effects of carbon nanomaterials on the material response and biocompatibility of biomaterials (e.g., agarose). This work is described in the first part of the talk. We also discuss the development of computational models of the macroscopic response of the reinforced biomaterial using compressible hyperelastic formulations. Our preliminary results show that the addition of 2% wt/vol carbon nanofibers leads to increases of 87% and 165% in the biomaterial shear and bulk moduli, respectively, with no noticeable change in cell viability.

The second part of the talk will focus on the experimental and computational characterization of liver tissue. When diseased, the liver undergoes substantial changes in its microstructure, leading to increased tissue stiffness. The ability to accurately characterize this changing stiffness can therefore act as a valuable diagnostic tool. We report the results of experiments on bovine and porcine liver and discuss an approach to account for friction in uniaxial unconfined compression tests on tissue samples. Preliminary work on nonlinear computational models of liver cells and lobules will also be described.