

# Jan Stegemann

Professor

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BIOMEDICAL ENGINEERING

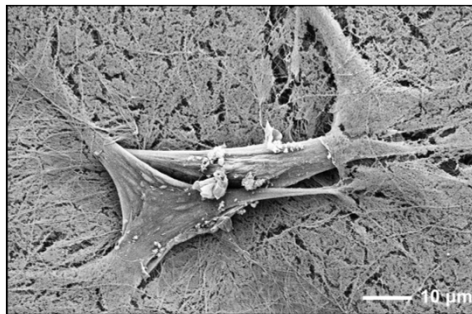
MACROMOLECULAR  
SCIENCE & ENGINEERING



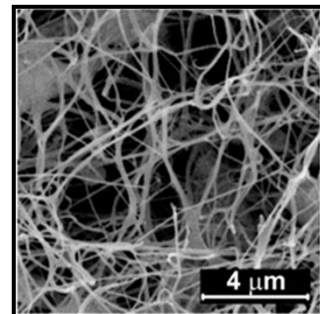
## Biomaterials, Cell-Based Therapies, and Mechanobiology

→ **Understanding and applying cell-matrix interactions:** Our laboratory focuses on how cells interact with the 3D protein matrix around them, and how these interactions can be used to develop better biomaterials and engineered tissues. Main application areas in cardiovascular and orthopaedic tissues.

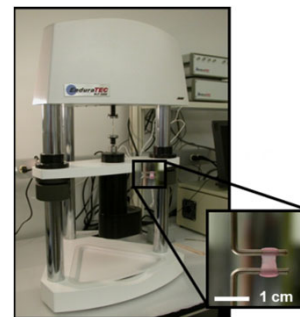
### ▪ Fabrication and characterization of composite biomaterials



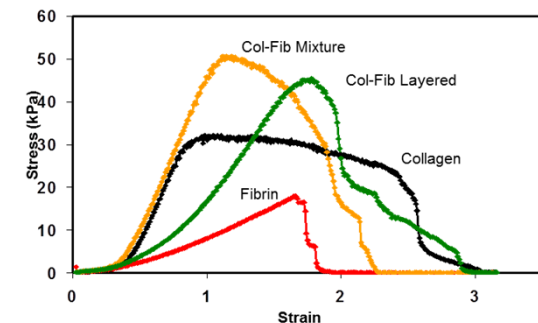
Collagen-Fibrin



Collagen-Chitosan



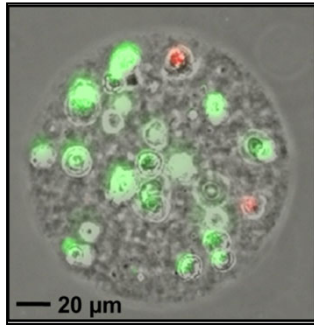
Biochemical and mechanical testing



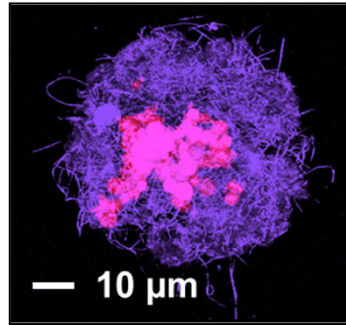
→ We have developed and characterized a range of pure and composite biomaterials based on naturally derived proteins and polysaccharides. These materials are designed to have desirable biochemical, physical, and mechanical properties, which can be used to guide cell function. We also study structure-function relationships in such composite materials.

**Jan Stegemann, Professor, Macromolecular Sci & Eng, Biomedical Engineering**

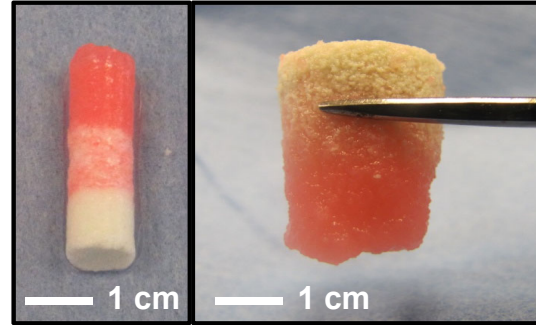
▪ Development and testing of **cell-based therapies**



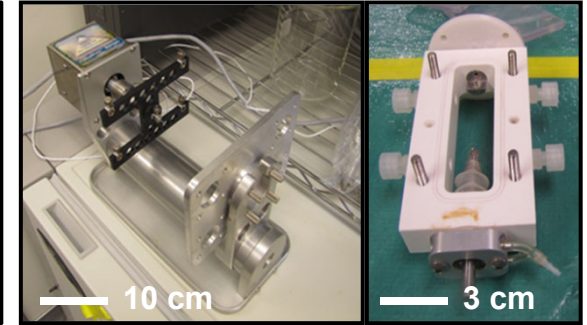
Microbeads for stem cell delivery



Drug and growth factor delivery



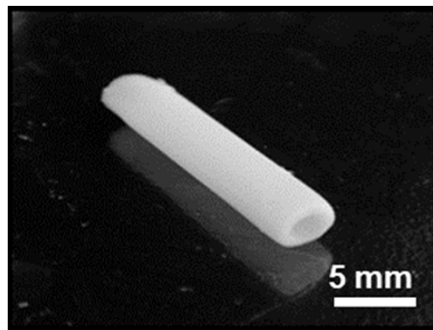
Multiphase tissues and complex interfaces



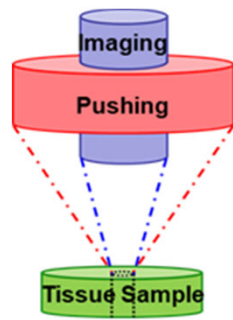
Bioreactors for controlled tissue stimulation

→ In these projects we are developing ways to control the phenotype of progenitor cells using defined microenvironmental cues. The goal is to prime cells to regenerate desired tissues upon transplantation to challenging sites of wound repair.

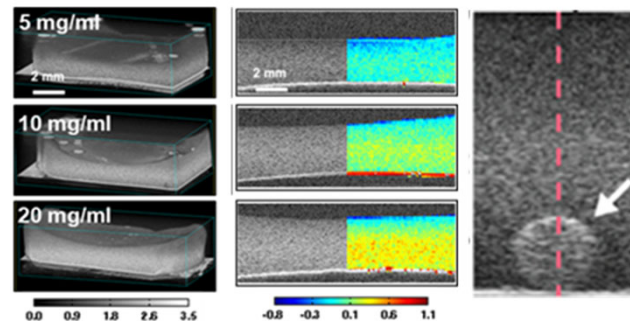
▪ Characterization and stimulation of **engineered tissues**



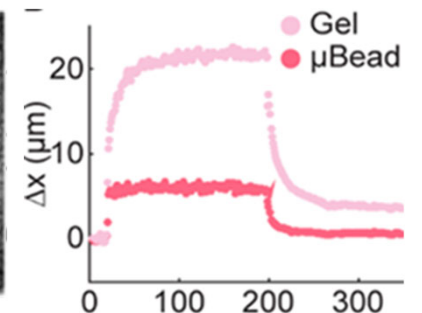
Blood vessel construct



Ultrasound viscoelastography



Microscale characterization and stimulation



Mechanical behavior

→ In collaboration with the Deng Lab (BME), we have developed ultrasound-based techniques that can be used to quantitatively characterize soft engineered and natural tissues at the microscale. Ultrasound is also used to stimulate progenitor cell differentiation in these tissues.