



# JOHNS HOPKINS

## BIOMEDICAL ENGINEERING



**Friday June 13, 1:00PM, Clark 110, Videoconferenced to Traylor 709**

### ***Self-Assembly of Hierarchically Ordered Peptide-Based Structures for Regenerative Medicine Applications***



**Ramille Capito, PhD**  
Research Assistant Professor  
Materials Science and Engineering  
Northwestern University

**Abstract:** Biomaterials designed at the molecular and supramolecular levels to interact with cells, biomolecules, and pharmaceuticals will have a profound impact on technologies targeted towards the regeneration of damaged tissues resulting from trauma, disease or genetic defects. Since less invasive therapies are desirable to minimize patient recovery time, materials that can be injected in liquid form and self-assemble into bioactive scaffolds once inside the body will play a key role in future regenerative medicine technologies. One regenerative medicine target that would greatly benefit from a less invasive treatment procedure is articular cartilage. Treatment of damaged articular cartilage due to injury or degenerative disease remains a major medical challenge due to its limited capacity for self-regeneration. One focus of this talk will describe a class of peptide-amphiphile (PA) molecules that can be designed to self-assemble into an interconnected network of nanofibers resembling the nanostructure of collagen fibrils naturally found in the extracellular matrix. This PA system with or without a bioactive peptide sequence was evaluated for its potential to stimulate the regeneration of articular cartilage both *in vitro* and *in vivo*. The second topic will describe novel materials that self-assemble at a liquid-liquid interface between aqueous solutions of small, charged PA molecules and oppositely charged high molar mass biopolymers. The resulting structures grow to macroscopic dimensions with a high degree of hierarchical order across the scales. This interfacial interaction allows the formation of self-sealing sacs, membranes with tailorable size and shape, as well as continuous strings. The resulting materials are relatively robust, permeable to proteins, and can support cell viability and function. Their unique structural and physical characteristics offer significant potential in cell therapies, drug diagnostics, and regenerative medicine applications.

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