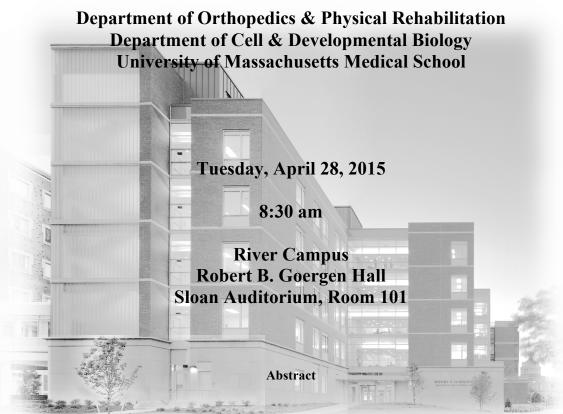# University of Rochester
Department of Biomedical Engineering
Seminar Series

"Degradable Shape Memory Polymers and Polymer-mineral Composites for Orthopedic Applications"

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Tuesday, April 28, 2015

8:30 am

River Campus
Robert B. Goergen Hall
Sloan Auditorium, Room 101

Abstract

Regenerative medicine aspires to reduce reliance on or overcome limitations associated with donor tissue-mediated repair. A major roadblock in translating synthetic scaffold-guided tissue regeneration approaches into clinical practice is the lack of materials combining desirable surgical handling characteristics and tailored biodegradability with tissue-specific physical and biochemical properties to enable their safe /minimally-invasive delivery, stable fixation, integration with and ultimate replacement by the tissue of interest. Thermal responsive biodegradable shape memory polymers (SMPs), when properly engineered, have the potential to address these challenges. In the first part of this seminar, I will present the design of a nanostructured thermal-responsive degradable SMP implants for weight-bearing orthopedic applications [*Proc. Natl. Acad. Sci.* 2010, *107 (17)*, 7652-7657; *Biomaterials* 2011, *32*, 985-991]. How the nanostructured network design translates into high shape memory performance of the thermoset around physiological temperatures will be discussed. In the second part of the seminar, an amphiphilic biodegradable polymer-hydroxyapatite composite with reprogrammable shape memory behavior around physiological temperature and hydration-induced self-fixation property will be presented [*Acta Biomaterialia* 2013, *9(9)*, 8354–8364; *Tissue Engineering, Part C: Methods*, 2014; *Macromol. Chem. Phys.* 2014; *ACS Applied Materials & Interfaces* 2015].How this thermoplastic degradable SMP composite, with enhanced polymer-mineral interfacial adhesion and readily electrospun or rapid-prototyped into 2-D or 3-D composites, accomplishes a combination of attractive surgical handling characteristics and osteogenic property *in vitro* and *in vivo* will be discussed.