

CARNEGIE MELLON UNIVERSITY

BME 2023 FALL SEMINAR SERIES

Engineering Medicine at Multiscale via Granular Hydrogels



PRESENTED BY

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SCHEDULE

Porter Hall (PH) 100

**Thursday,
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(9:30-10:30AM)**

Successful translation of medical technologies from the benchtop to the bedside requires orchestrated efforts between engineers and clinicians. Clinicians often request platforms that rigorously and safely interface with biological systems at the molecular, cellular, and tissue levels. At the Bio-Soft Materials Laboratory (B-SMaL), we aim at addressing some of the quintessential challenges in translational biomaterials by developing colloidal systems based on the micro- and nanoengineering of abundant biopolymers. In this talk, I will first explain how the inherent structural limitations of bulk hydrogels, the most common platform for tissue engineering scaffolds, may be addressed by converting them to stimuli-responsive discrete building blocks that undergo on-demand assembly and form granular hydrogel scaffolds (GHS). Hinging on the unique structure-property relationships of protein-based GHS, I will then show how cell assembly and tissue formation are guided rapidly and hierarchically, which are otherwise non-trivial to achieve using the bulk hydrogel counterparts. Finally, I will discuss the fundamental challenges ahead of additive manufacturing of GHS, followed by the nanoengineering strategies that we have developed to enable the extrusion three-dimensional (3D) bioprinting of GHS with preserved porosity as a steppingstone in translating the GHS. Together, these platforms show the power of marrying granular hydrogels with medicine to leverage eminent, translational technologies for improving the quality of life.

