# Cell-Responsive Biomaterials

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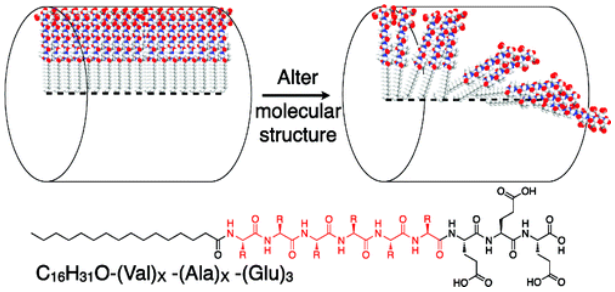
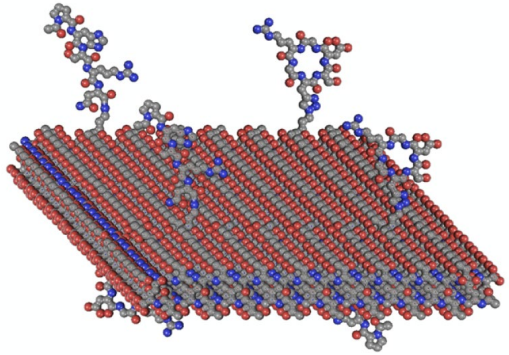
# E. Thomas Pashuck

- Graduate School: Northwestern University, Materials Science and Engineering (Advisor: Samuel Stupp)
- Postdoctoral Training – Imperial College London (Advisor: Molly Stevens)



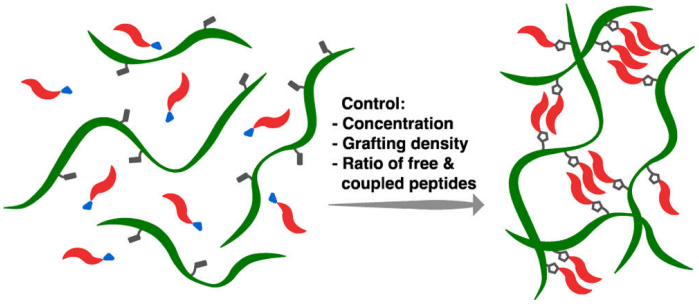

Pashuck, E.T., JACS 2010

*Control hydrogel mechanical properties*



Pashuck, E.T., ACS Nano 2016

*Peptide nano-spacings for selective protein binding*




Pashuck, E.T.*, Clarke D.E.* JACS 2017

*Hybrid peptide-polymer hydrogels*

# Recapitulating complex tissue microenvironments

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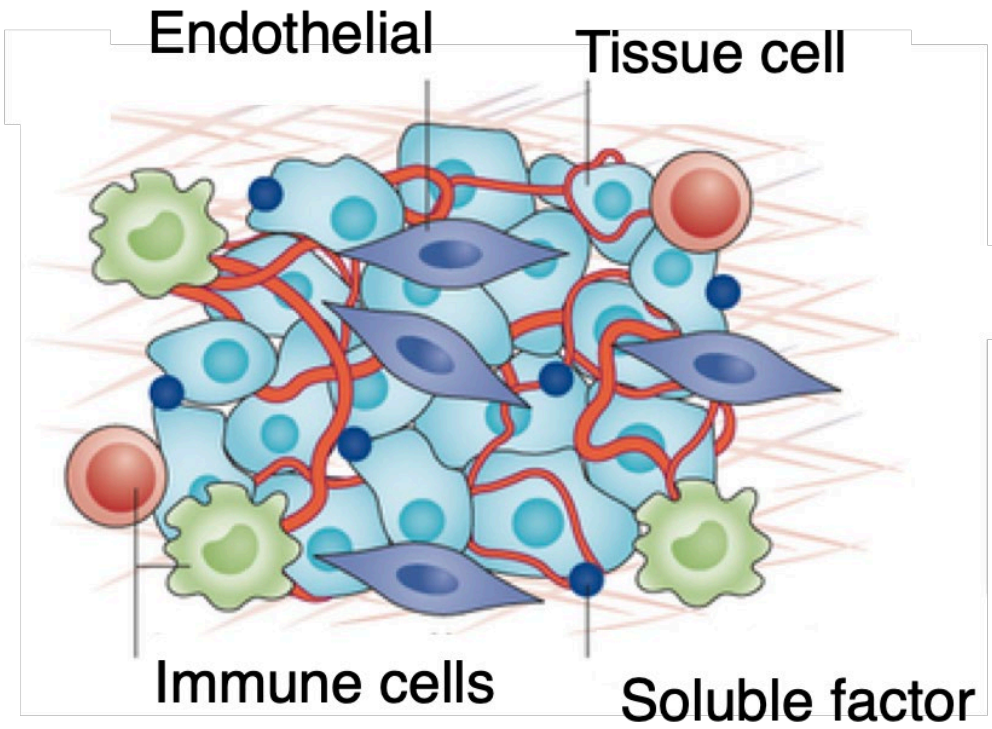


**What is the system being studied?**

• Tissue mimics for regenerative medicine

**Why is this topic significant?**

• All tissues contain multiple cell types working together towards physiological functions

**How is this topic studied?**

• In vitro cultures using three-dimensional biomaterials

**What are the future directions of this research?**

• Cell-responsive biomaterials to signal encapsulated cells

• Create independent niches for each cell type within a hydrogel

# Designing Cell-Responsive Biomaterials

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**How can we better understand biological systems?**

- Utilize novel activity-based assays to identify enzyme substrates
- Quantify cell-specific spatio-temporal enzyme expression

**How can we use this to design biomaterials?**

- Convert enzymatic activity into changes in the local biomaterial
- Design hydrogels which can independently signal multiple cell types through regeneration