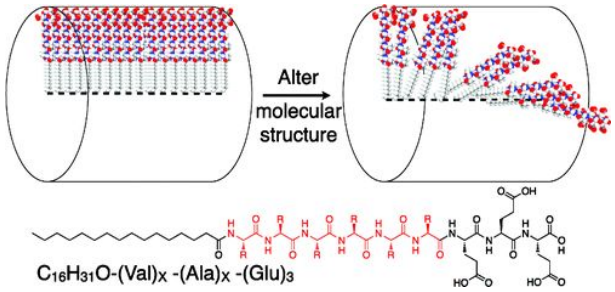
Cell-Responsive Biomaterials

E. Thomas Pashuck
Assistant Professor
Fall 2023

LEHIGH UNIVERSITY | Department of Bioengineering

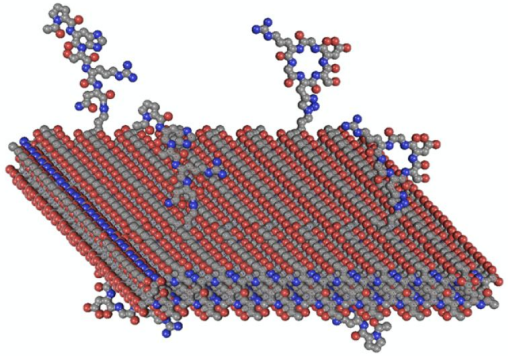
E. Thomas Pashuck

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



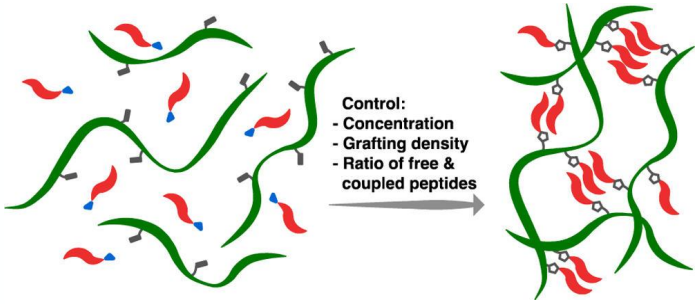
Pashuck, E.T., JACS 2010

Control hydrogel mechanical properties



Pashuck, E.T., ACS Nano 2016

Peptide nano-spacings for selective protein binding

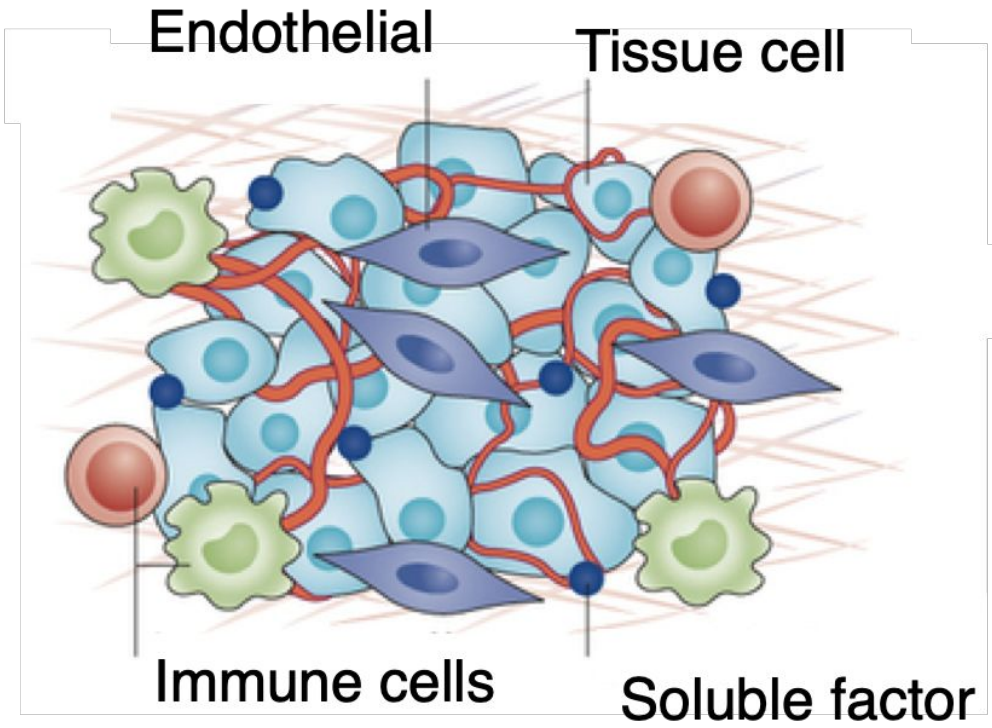


Pashuck, E.T.*, Clarke D.E.* JACS 2017

Hybrid peptide-polymer hydrogels

Recapitulating complex tissue microenvironments

E. Thomas Pashuck



What is the system being studied?

• Post-traumatic osteoarthritis (PTOA) after anterior cruciate ligament (AC

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

E. Thomas Pashuck

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