CBST Seminar

Center for Biomanufacturing Science & Technology

UNIVERSITY OF DELAWARE

DATE:

April 20, 2017

TIME:

1:30 p.m.

LOCATION:

366 Colburn Lab

Dr. Jennifer Curtis

Department of Physics

Georgia Institute of Technology

Dr. Curtis is an associate professor at Georgia Institute of Technology. She received her B.A. in physics from Columbia University and her Ph.D. in physics from The University of Chicago. She was a Post Doctoral Research and Alexander von Humboldt Fellow at the University of Heidelberg. Her research interests include cell biophysics, cell mechanics of adhesion, migration and dynamics, immunophysics and immunoengineering, hyaluronan glycobiology and synthase, and the physics of tissues. Curtis lab is primarily focused on the physics of cell-cell and cell-extracellular matrix interactions, in particular within the context of glycobiology and immunobiology. Our newest projects focus on questions of collective and single cell migration in vitro and in vivo; immunophage therapy, and the study of the molecular biophysics and biomaterials applications of the incredible enzyme, hyaluronan synthase.

Dr. Curtis is an Editorial Board Member of the Biophysical Journal, and a member of the American Physical Society, and International Society of Hyaluronan Science. She has authored numerous papers and publications, and recently was the recipient of the NSF Faculty Early Development CAREER Award and the Georgia Tech College of Science Faculty Mentor Award.

"Natural and Synthetic Hyaluronan Polymer Brushes for Tissue Regulation and Biomaterials Applications"

In this talk, I will present two stories about our lab's studies of unusually thick natural and synthetic hyaluronan polymer brushes and their relevance to biological function, disease, and biomaterials applications. The first story focuses on the cell-surface bound polymer brush formed by many cell types – a hyaluronan-rich glycocalyx. I will present data that demonstrates that this thick hyaluronan brush plays an underappreciated role in mediating cell surface access to nanoparticles and molecules. Further, our data suggest that hyaluronan at the cell substratum can exert a significant repulsive force which mechanically regulates cell adhesion in concert with focal adhesions. This result raises important questions about whether cell integration into tissues is regulated by the orchestration of repulsive and adhesive elements, as opposed to the current paradigm which describes regulation as arising solely from adhesive-type interactions mediated by integrin. In the second story, I will introduce a new class of regenerative polymer brushes and hyaluronan biomaterials, fabricated by dense distributions of the enzyme hyaluronan synthase. These brushes are among the thickest reported in the literature, are biocompatible and biodegradable, are stimulus responsive, easily functionalized, extremely non-fouling and most uniquely can be regenerated after removal. I will briefly introduce the fabrication and characterization of the brushes and discuss future applications.