Abstract:
In the course of this talk, I will outline the basic concepts of self-assembly, and I will point out critical differences between self-assembly mechanisms occurring at the molecular versus mesoscopic length scales. In particular, I will demonstrate how magnetic and electric manipulation techniques, which are considered too weak for molecules, are capable of overcoming hydrodynamic forces and the effects of Brownian motion on mesoscale objects, larger than about 10 nanometers. I will also demonstrate how novel self-assembly mechanisms can be designed to take advantage of the long-range nature of repulsive forces to perform programmable operations on colloidal objects dispersed in fluids. Through this talk, I will review general design scaling principles in the context of particular applications in cell printing, drug delivery, and biochemical analysis.