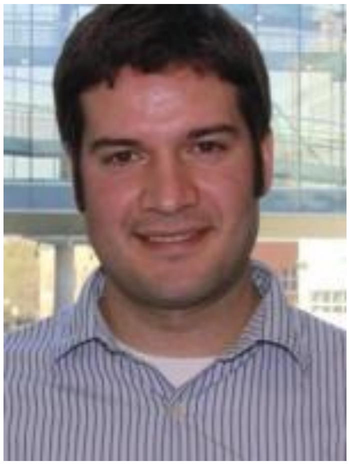
MECHANICAL ENGINEERING COLLOQUIUM SERIES 2014-2015

Mechanical Engineering Lecture in Bioengineering

Mechanical Design of DNA Nanostructures and Measurement Devices



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on Friday, May 8th at 4:00pm in 3-270

Structural DNA nanotechnology is a rapidly emerging field with great potential for applications such as single molecule sensing, drug delivery, and manipulating molecular components. Major advances in the last decade have enabled the precise design and fabrication of DNA nanostructures with unprecedented geometric complexity; however, relative to natural biomolecular machines, the functional scope of DNA nanotechnology is limited by an inability to design dynamic mechanical behavior such as complex motion, conformational dynamics, or force generation. Taking inspiration from methods used in macroscopic machine design, we have recently developed DNA nanostructures with well-defined 1D, 2D, and 3D motion including hinges, linear joints, and mechanisms with defined planar or spatial motion paths as well as bi-stable nanostructures that can undergo conformational changes via "snap-through" transitions. A major goal of this work is to develop devices where mechanical behavior can be exploited to probe nanoscale physical properties (e.g. viscosity) or interactions (e.g. molecular forces). We have currently designed a two-state device where the kinetics of conformational transitions can serve as a reporter of local osmotic pressure. Given that these devices are ~50-100nm in size, in the future, they could implemented to probe physical properties such as pressure, viscosity, forces, or shear flow in systems such as complex fluids, nano- or micro-fluidic devices, or even in biological cells.

Refreshments will be served before the seminar.
Please contact Tony Pulsone at pulsone@mit.edu with any questions.

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