Physics Colloquium
Swimming in Viscoelastic Fluids and Gels

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Abstract:
While the basic principles of swimming in Newtonian fluids are well understood, in many cases the natural environments which microorganisms navigate are non-Newtonian fluids or even gels, which result in different swimming behavior. For example, mammalian sperm swim through mucus in the female reproductive tract. I discuss how viscoelastic response affects swimming shapes and speeds of flexible swimmers such as sperm. Next, I describe issues that arise for swimmers moving through viscoelastic gels. First, swimming through solids such as gels requires altered boundary conditions on the swimmer, and unlike incompressible fluids, a gel can have compressional modes with relative motion between polymer and solvent fractions. In addition, many biological gels are heterogeneous on the lengthscale of swimming microorganisms. I discuss the effect of microstructure heterogeneity in both continuum and microscopic models of swimming.

Tuesday, December 10th, 2013
4:00-5:00 pm
Goudsmit Conference Room, LP 208