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Swimming in gels HENRY FU, Brown University, CHARLES WOLGEMUTH, University of Connecticut Health Center, VIVEK SHENOY, THOMAS POWERS, Brown University — Many swimming microorganisms must move through viscoelastic fluids and gels. In this talk I focus on swimming through gels. First, unlike incompressible fluids, a gel can have compressional modes with relative motion between polymer and solvent fractions. In a continuum model for a gel, we show that compressibility can increase the swimming speed of Taylor's swimming sheet. The zero-frequency shear modulus of a gel requires altered boundary conditions on the swimmer. Second, many biological gels are heterogeneous on the lengthscale of swimming microorganisms, necessitating non-continuum models that treat the gel network and swimmer on equal footing. We show that a random network modeled as dilute, immobile spherical obstacles increases the average swimming speed of a Golestanian three-sphere swimmer.

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