Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Chemotactic Motility of Sperm in Shear JEFFREY S. GUASTO, MIT, JEFFREY A. RIFFELL, University of Washington, RICHARD K. ZIMMER, UCLA, ROMAN STOCKER, MIT — Chemical gradients are utilized by plants and animals in sexual reproduction to guide swimming sperm cells toward the egg. This process ("chemotaxis"), which can greatly increase the success of fertilization, is subject to interference by fluid flow, both in the bodily conduits of internal fertilizers (e.g. mammals) and in the aquatic environment of external fertilizers (e.g. benthic invertebrates). We studied the biomechanics of chemotaxing sea urchin spermatozoa using microfluidic devices, which allow for the precise and independent control of attractant gradients and fluid shear. We captured swimming trajectories and flagellar beat patterns using high-speed video-microscopy, to detect chemotactic responses and measure the effect of fluid forces on swimming. This work will ultimately help us to understand how swimming sperm cells actively navigate natural chemoattractant gradients for successful fertilization.

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Date submitted: 01 Aug 2011 Electronic form version 1.4