

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Locomotion of microorganisms near a no-slip surface in a viscoelastic fluid SHAHRZAD YAZDI, Department of Chemical Engineering, The Pennsylvania State University, AREZOO ARDEKANI, Department of Aerospace and Mechanical Engineering, University of Notre Dame, ALI BORHAN, Department of Chemical Engineering, The Pennsylvania State University — Microorganisms are exposed to complex fluids in their natural habitats, especially during biological processes. In many of these processes, microorganisms swim in confined domains such as spermatozoa in mucus of mammalian reproduction tracts or bacteria in extracellular polymeric matrices during biofilm formation. Thus, it is important to understand the kinematics of propulsion in a viscolastic fluid near a no-slip surface. We used a squirmer model with a time-reversible body motion to analytically investigate the swimming kinematics in an Oldroyd-B fluid near a no-slip surface. Our results show that the time-averaged propulsion for a pusher (puller) is towards (away from) the no-slip surface. We present the swimming trajectory as a function of Deborah number, initial distance from the surface, and initial swimming direction.

Shahrzad Yazdi
Department of Chemical Engineering, The Pennsylvania State University

Date submitted: 02 Aug 2013

Electronic form version 1.4