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Ciliary Locomotion in Varying Viscosity Flow PATRICK EASTHAM, Florida State University, Department of Mathematics, KOUROSH SHOELE, Florida State University, Department of Mechanical Engineering — Ciliary locomotion is a common method of transportation employed by bacteria. They must be able to move through their environment at will to seek nutrients as well as avoid dangers. While research into bacteria motility has received considerable attention, very little has been done to consider the effects of a spatially-varying viscosity environment on swimming. This presentation will discuss recent research into how bacteria can take advantage of nutrient-dependent viscosity to generate an asymmetric stress field around their body, potentially increasing free-swimming velocity. First, we analytically show that asymptotically small variations in viscosity due to nutrient concentrations can affect the free-swimming velocity of a bacteria. Then we extend our study to fully nonlinear coupling between nutrient concentration and viscosity and employ the Finite Element method to solve a system containing a convection-diffusion equation for nutrient concentration as well as Stokes flow for stress distribution on the swimmer. We will discuss how the free-swimming velocity profile changes for various nutrient Pecletnumbers and ciliary locomotion modes.

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