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Rheological and boundary effects on microswimmers THOMAS MONTENEGRO-JOHNSON, DANIEL LOGHIN, DAVID SMITH, University of Birmingham — Two important environmental factors impacting cell motility are the rheological properties of the surrounding fluid and the presence of boundaries. In this talk we will present simulations that explore the relationship between microswimmer, fluid rheology and boundary features, with a particular emphasis on the example of human sperm. Human sperm must navigate the labyrinthine structure of human fallopian tubes, actively bending their flagella in order to propel themselves through physiological mucus. Sperm trajectories are greatly affected by boundaries, scattering over features such as steps and ripples. We present simulations of scattering sperm-like swimmers in confined geometries, comparing these results to experiments of swimmers in microchannels. The rheological properties of mucus also affect sperms' ability to penetrate. Using the method of femlets, a new finite element technique entailing an immersed force representation of the swimmer with a body-fitted mesh, we present novel physical mechanisms through which shear-thinning, an important property of physiological mucus affects microscopic swimmers. In particular, we show that these effects are sensitive to the swimming stroke employed, and present example reciprocal swimmers that violate Purcell's Scallop Theorem.

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