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Sperm Have Got The Bends[1] MEURIG GALLAGHER, Centre for Systems Modelling and Quantitative Biomedicine, University of Birmingham, JACKSON KIRKMAN-BROWN, Institute for Metabolism and Systems Research, University of Birmingham, DAVID SMITH, School of Mathematics, University of Birmingham — The journey of development begins with sperm swimming through the female reproductive tract en route to the egg. In order to successfully complete this journey sperm must beat a single flagellum, propelling themselves through a wide range of fluids, from liquified semen to viscous cervical mucus. It is well-known that the beating tail is driven by an array of 9 microtubules surrounding a central pair, with interconnecting dynein motors generating shear forces and driving elastic wave propagation. Despite this knowledge, the exact mechanism by which coordination of these motors drives oscillating waves along the flagellum remains unknown; hypothesised mechanisms include curvature control, sliding control, and geometric clutch. In this talk we will discuss the mechanisms of flagellar bending, and present a simple model of active curvature that is able to produce many of the various sperm waveforms that are seen experimentally, including those in low and high viscosity fluids and after a cell has 'hyperactivated' (a chemical process thought to be key for fertilization). We will show comparisons between these simulated waveforms and sperm that have been experimentally tracked, and discuss methods for fitting simulated mechanistic parameters to these real cells.

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