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Mathematics of Cell Polarization and Motility

In my talk, I will introduce the phenomena of cell motility and explain what are some of the open problems and challenges in this interdisciplinary field. I will then survey some interesting mathematical and computational issues that such research motivates. I will describe work in my group on the partial differential equations that we used to describe how a cell polarizes (decides where is its front and back). Such PDEs describe a phenomenon of wave-pinning stemming from bistable kinetics, substrate depletion, and large disparity in rates of diffusion. I will also briefly describe our computations of 2D cell motility models and what we learned about the interaction between reaction-diffusion and geometry in the evolving cell.

This work is joint with Yoichiro Mori, Alexandra Jilkine, AFM (Stan) Maree, Ben Vanderlei, and William Holmes.