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Coordination of Flow and Traction in Migration of Amoeboid Physarum polycephalum: Model and Measurement OWEN LEWIS, University of Utah, ROBERT GUY, UC Davis, SHUN ZHANG, JUAN CARLOS DEL ALAMO, UC San Diego — In this research, we develop a computational model of crawling Physarum based on the Immersed Boundary Method. Our model incorporates the effects of cell cytoplasm, the internal cytoskeleton and adhesions to the substrate. Cytoplasmic flows and traction stresses predicted by the model are compared to experimentally measured values obtained using simultaneous Traction Force Microscopy (TFM) and Particle Image Velocimetry (PIV). Of particular interest are stresses generated by flow and how transmission of stresses to the substrate is coordinated. We identify methods of adhesion-flow coordination which are consistent with experiments. Certain consisten coordinations are seen to be "optimal" with regards to crawling speed, and robust to perturbations in the extracellular environment.

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