BE 159: Signal Transduction and Mechanics in Morphogenesis

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Questions to consider: He, et al., "Apical constriction drives tissue-scale hydrodynamic flow to mediate cell elongation"

Following are some questions that it will be helpful to understand when reading the paper. They are definitely not exhaustive, but useful to help you understand the motivation of the work and the experimental protocols.

1. Look carefully at Supplemental Data Figure 1. Make sure you understand the geometry of the setup. When looking at the images of beads in the AB-ML plane (as in Fig. 1c), why do the beads look elongated?
2. Make sure you understand what a Stokeslet is and what an Oseen tensor is.
3. How does particle image velocimetry (PIV) work? This technique is used in many studies of developmental processes and measurement of forces exerted by cells.
4. What is the value in doing the experiment without cell membranes?
5. What is meant by a "virtual cell?"
6. What was the purpose of pulling a ferrofluid through the embryo? What result did this experiment establish?
7. The authors claim that apical constriction powers cytoplasmic movement. They do not estimate how much power. Estimate the power (energy per time) necessary to drive the observed cytoplasmic flow. Does your estimate seem reasonable?