BE 159: Signal Transduction and Mechanics in Morphogenesis

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Questions to consider: Gross, et al., "Guiding self-organized pattern formation in cell polarity establishment"

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. Be sure you have a clear understanding of what is meant by the terms *feedback*, *guiding cue*, and *transition point*. The latter two are not generic terms, and are specific to this paper, but are important to understand.

2. Why is it important that polarity establishment have guiding cues?

3. The authors talk a lot about robustness. What do they mean by this?

4. How does the "contractile imbalance" that the authors refer to relate to the results of the Mayer, et al. paper?

5. The authors state, "Fluorescence recovery after photobleaching (FRAP) is a technique for determining dissociation rates at steady state." What is FRAP? We typically think of FRAP as a method for determining diffusion coefficients, not dissociation rates. How can they use FRAP to get at dissociation rates?

6. Be sure you understand how all experimental techniques work, including FRAP, co-moving mass-balance imaging, membrane-associated concentration evaluation, particle image velocimetry, RNA interference.

7. You should understand what every term in equations 1-3 and 6 mean.

8. The authors say that in their model "all species obey mass conservation." What does this mean in terms of what genes are being expressed in the embryo?

9. The authors refer to a "Gaussian profile," which has nothing to

do with a Gaussian distribution. What do they mean by "Gaussian profile," and why do they choose it?

10. The authors say that "seven of these parameters are known." What does it mean to "know" a parameter, and do you agree with their claims of "knowing" the parameters?

11. You might say that twenty-eight parameters are a lot. Think about what it means to have a lot of parameters, and if you think having too many parameters might make quantitative comparisons between theory and experiment difficult.