Title: The role of mechanics in organ size and shape robustness of Arabidopsis

Abstract:

Development is remarkably reproducible, producing organs with the same size, shape, and function repeatedly from individual to individual. Yet, these reproducible organs are composed of highly variable cells. My laboratory focuses on the mechanisms that produce cellular heterogeneity and organ size and shape robustness. We use a combination of genetics, live imaging, computational image processing, mechanical assays, and computational modeling to determine how robustness emerges from the dynamics of cell division, cell growth, mechanics, and gene expression. We use Arabidopsis sepals as a model system because sepals are relatively unresponsive to the environment, there are four sepals on each flower so robustness can be assessed easily, and sepals are accessible for imaging and manipulation. To identify mechanisms giving rise to robustness of organ size and shape, we screened for mutants with variable sepal size and shape, presumably disrupting these mechanisms. A common theme emerging from analysis of the first three variable organ size and shape mutants is a role for mechanics in generating robustness.

Short biography:
Dr. Adrienne Roeder has had a longstanding interest in combining biology with computation since she was an undergraduate student at Stanford where she majored in Biology with a minor in Mathematical and Computational Science. She received her PhD from UC San Diego in 2005 studying fruit development and seedpod dehiscence in Arabidopsis. Then she was a postdoctoral scholar at Caltech where she was involved in establishing the computational morphodynamics approach to understanding morphogenesis by combining live imaging, image processing, and computational modeling. Now she is the Nancy M. and Samuel C. Fleming Term Associate Professor in the Weill Institute for Cell and Molecular Biology and the School of Integrative Plant Science, Section of Plant Biology at Cornell University. Her lab uses a computational morphodynamics approach to study how cell sizes and organ sizes are controlled in Arabidopsis. Through this research, the themes emerging are the importance of stochasticity and heterogeneity at the cellular level which the plant utilizes to develop robust organs with the correct size, shape, and functions.
Best,
Adrienne

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