Dynamic Genetics: Experimental and Computational Approaches to the Arabidopsis Shoot Apical Meristem

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Presentation Number: 10.4.1

Keyword: Arabidopsis, meristem, computation

The shoot apical meristem (SAM) is a permanent population of stem cells that provides for all of the above-ground tissue in a growing Arabidopsis plant. Despite consisting of only a few hundred cells, the SAM is highly structured, and planes, patterns, and numbers of cell divisions are highly regulated. The cells in the SAM control their division and patterns of gene expression based upon cell-cell communication â€“ the SAM is a network of interacting cells that maintain their states and activities dynamically. We have developed a new set of methods for studying the SAM, and are developing computational methods for modeling it. The new analytic methods allow, via confocal microscopy and image analysis, three-dimensional time-lapse imaging over several days. Use of fluorescent markers allow visualization of gene expression domains and meristematic regions, and gene constructs of various sorts allow real-time manipulation of cell-celll communication. Computational modeling is in its early stages, but already sheds light on the possible mechanisms for primordium localization and meristem patterning.