
Analyzing the components of transport advection fields in auxin dynamics at the shoot apical meristem

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Abstract

Plants grow at the tip of their axes where populations of undifferentiated cells, called meristems, regularly produce new organs. These organs altogether create remarkable patterns, such as whorls or spirals. In the last 20 years, researchers have sought to find the molecular processes that regulate the emergence of these patterns. Using combinations of advanced imaging techniques, genetics, and modeling, they could come up with a first vision of these molecular processes that has prevailed in the community over the last 15 years. In this vision, organs are regularly initiated due to the periodic accumulation of a plant hormone, auxin, transported in the meristem by a dynamic network of polar transporters. However, recent imaging data of meristems suggest that the observed polarity of these transporters is not enough to explain auxin accumulations. Using in-depth analysis of these new data and FEM modeling of auxin transport, we show that a second transport component plays a major role in the patterning, opening the way to a new interpretation of the molecular mechanisms responsible for organ patterning at the shoot apical meristem.

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