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Editorial

Foreword

An essential feature of land plants is their sedentary lifestyle. Their relatively simple organization linked to a rigid anatomy contrasts with the complexity of higher animals, which have to move in order to find their food. Plant cells are firmly attached to their neighbours by the wall encasing each one. This wall consists of a complex mixture of polysaccharides and other polymers secreted by the cell and assembled into an organized network. The pattern of plant growth contributes to this rigid anatomy. Cells are added progressively through the activity of structures named meristems, which are composed of pluripotent stem cells that permit organ initiation. A variety of meristem types, defined by their position, contribute to plant development. The root and the shoot apical meristems, (RAM and SAM respectively), enable roots and shoots to grow indefinitely. In addition to the vertical growth of stems and roots, lateral organs are produced. Shoot meristems give rise to leaves, and both roots and shoots exhibit branching patterns. Unlike animals, whose basic adult body plan is established during embryogenesis, plants elaborate their forms throughout their live through programs of development ending with organ senescence and programmed cell death. Through the regulated proliferation of meristematic cells and their recruitment into tissues and organs, plants are able to produce complex and variable forms adapted to their local environments.

Many intriguing developmental biology questions are raised by plant systems. How are meristems established and maintained? What is the major regulator of organogenesis? How is indeterminate growth maintained? Are plant hormones key players involved in development? How is shoot branching controlled during development and in response to stem ablation, for instance by herbivores? How does the phloem development regulate the transport of nutrients and signalling molecules and consequently plant development? How is anisotropic cell expansion determined? How do plants convert most photosynthesized products into biopolymers for use in the formation of woody rigid tissues? How are the emergence and patterning of leaf primordial and lateral roots regulated? What are the genetic and molecular control of organogenesis and morphogenesis? What is the role of very-long-chain fatty acids in plant development? How do transcription factors modify the gene expression implicated in hormone synthesis and degradation?

Answers to these questions are now starting to emerge from new approaches that combine molecular biology, genetics, genomics, cytology, and physiology. In this issue, the authors give us insights into these answers from their own work and from the recent literature.

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