
Preface

Plants provide humankind with food, fibre and timber products, medicinal and industrial products as well as ecological and climate sustainability. Understanding how a plant grows and develops is central to providing the ability to cultivate plants to provide a sustainable future. 'Molecular Cell Biology of the Growth and Differentiation of Plant Cells' encompasses cell division, cell enlargement and differentiation; which is the cellular basis of plant growth and development. Understanding these developmental processes is fundamental for improving plant growth and the production of special plant products, as well as contributing to biological understanding. The dynamics of cells and cellular organelles are considered in the context of growth and differentiation, made possible particularly by advances in molecular genetics and the visualization of organelles using molecular probes. There is now a much clearer understanding of these basic plant processes of cell division, cell enlargement and differentiation. Each chapter provides a current and conceptual view in the context of the cell cycle (6 chapters), cell enlargement (5 chapters) or cell differentiation (9 chapters).

The cell cycle section examines the regulation of the transitions of the cell cycle phases, proteins of the nucleus which houses most of the genomic information, the division of key energy-related organelles - chloroplasts, mitochondria and peroxisomes and their transmission during cell division. The final chapter in this section deals with the transitioning from cell division to cell enlargement.

The cell enlargement section considers the organisation of the cell wall, the new technical strategies being used, the biosynthesis and assembly of cellulose microfibrils and signaling dependent cytoskeletal dynamics. There are then chapters on the regulation of auxin-induced, turgor driven cell elongation and hormonal interactions in the control of cell enlargement.

The cell differentiation section considers the regulation of the cell dynamics of the shoot and root apical meristems, the procambium and cambial lateral meristems as well as nodule ontogeny in the legume-rhizobia symbiosis. There are chapters on asymmetric cell divisions, stem cells, transdifferentiation, genetic reprogramming in cultured cells and the paradox of cell death in differentiation. The final chapter deals with the protein bodies and lipid bodies of storage cells.

Each chapter is written by specialists in the field and the book provides state of the art knowledge (and open questions) set out in a framework that provides a long term reference point. The book is targeted to plant cell biologists, molecular biologists, plant physiologists and biochemists, developmental biologists and those interested in plant growth and development. The chapters are suitable for those already in the field, those plant scientists entering the field and graduate students. The cover images are taken from Chapters 5 and 12.

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