Preface

The cell cycle is one of the most comprehensively studied biological processes, particularly given its importance for growth and development and in many human disorders. No other field as the cell cycle has benefited from an extensive interplay between research performed on a diversity of model organisms. Studies on yeast, worms, flies, frogs, mammals and plants have contributed to a kind of universal picture on how the basic cell cycle machinery is regulated. The use of these many divergent organisms also instigated an understanding of how evolution modified the basic cell cycle machinery in order to cope with the specific developmental and environmental challenges in each organism. However, much of this picture is based on experiments performed on single cells. Indeed, it is surprising to note that the role of the cell cycle machinery during development has received relatively little attention. To understand how, in different organisms, the basic cell cycle machinery integrates with development is an important scientific challenge for the coming years. In this book, the authors hope to convince the reader that plants offer exceptional opportunities to significantly contribute to such a challenge.

The first seven chapters review our current understanding of the basic machinery that propels cells from phase to phase during the cell cycle. The plant cell cycle is governed by Ser/Thr kinases, known as cyclin-dependent kinases (CDKs; reviewed in Chapter1), which require for activity the interaction with cyclins (Chapter 2). Furthermore, the activity of these CDKs is controlled by the interaction with CDK inhibitory proteins (Chapter 3), ubiquitin-dependent proteolysis (Chapter 4) and protein phosphorylation (Chapter 5). E2F/DP transcription factors (Chapter 6) also play a key role in cell cycle progression, and their activity is controlled by retinoblastoma-related (RBR) proteins (reviewed in Chapter 7).

The second part, consisting of eight chapters, summarizes our current knowledge on how the basic cell cycle machinery is integrated with development. Chapter 8 reviews how quiescent root pericycle cells enter the cell cycle during the initiation of lateral root formation. Chapter 9 discusses the role of the cell cycle during leaf development. Many plant organs contain polyploid cells resulting from a process called endoreduplication (Chapter 10). Endoreduplication also plays an important role in trichome development (Chapter 11), tomato fruit formation (Chapter 12) and endosperm development (Chapter 13). As plant development is orchestrated by plant hormones, it is not surprising that components of the cell cycle machinery are also directly modulated by hormones (Chapter 14). Finally,

environmental stresses negatively affect the cell cycle and consequently growth (Chapter 15).

I sincerely hope that this book will stimulate scientists to further explore how cell cycle control works in concert with development.

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