

Preface

The regulation of transcription is a central step in the control of gene expression in plants and it therefore plays an essential role in development and in the way plants cope with environmental influences. Through combinatorial control, a wide variety of transcription factors precisely determines the transcription level of target genes as well as their spatial and temporal expression pattern. It has emerged in recent years that the nuclear environment of the genome critically affects the regulated transcription of genes. Thus, genes are packaged into a complex nucleoprotein structure termed chromatin, generally repressing their transcription. At the same time the dynamic chromatin structure offers an opportunity for the regulation of gene expression mediated, for instance, by histone modifiers and chromatin-remodelling activities. In this volume, authors from leading laboratories have prepared chapters addressing the different mechanisms that cooperate in the regulation of transcription in plants, and links between transcriptional regulation and biotechnological applications have also been considered.

The book begins with chapters describing the structure and function of transcription factors and assistant architectural proteins as well as their interplay with promoter regions (Chapters 1–3). These chapters provide insights into the protein–DNA and the protein–protein interactions that are crucial for the regulation of transcript initiation. Chapters 4 and 5 focus on the role of histone modifications, histone variants and chromatin remodelling, priming the chromatin for transcription. Various effects of DNA methylation on transcription are addressed in Chapters 5 and 7. Chapter 6 is devoted to matrix attachment regions and their connection to transcriptional gene silencing. In Chapters 7 and 8, the special features of transcription by RNA polymerase I and the transcription of plastid genes are described. In the following chapters some well-studied examples of transcriptional regulation in plants are explored. Chapter 9 deals with the transcriptional regulation of flowering time, while Chapter 10 describes how floral organ identity is under the combinatorial control of MADS-domain transcription factors. Chapter 11 focuses on plant defense responses that are regulated by transcriptional networks. In Chapter 12, the temperature-regulated expression of genes upon heat- and cold-stress is described. The final two chapters are dedicated to the discussion of some aspects related to applied plant biotechnology. Chapter 13 summarises the principles and applications of inducible transcription systems for research and biotechnology. In Chapter 14, the potential of engineering transcriptional networks in crop plants is discussed.

Through the availability of genome sequences and ‘high-throughput’ approaches, the research in the field of transcriptional regulation is currently moving in a new direction. This volume considers the ‘genomic perspectives’ as well as the

thorough 'case-by-case' studies that have revealed many of the principles known about the regulation of transcription in plants. The book is intended to provide a guide into this exciting topic for researchers and teachers in the field of plant biology.

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Klaus D. Grasser