

PREFACE

This volume of "Developmental Signaling in Plants" is essentially the continuation of Volume 35 in a collective effort to examine the current state of our knowledge and research on the Signaling Pathways in Plants. Volume 35 focuses on the discussion of hormonal signaling in plants, whereas Volume 40 explores functions of selective molecules and enzymes exerting functions in different tissues or cellular compartments, including mobile RNAs in phloem sieves, receptor kinases on the plasma membrane, histone-modifying enzymes in the nucleus, calcium sensor kinases on membrane systems, and redox enzymes on thylakoid membrane.

Phloem serves as a unique highway system of plants. Among different types of molecules being distributed via this highway, various classes of RNAs that move along the phloem system are particularly interesting because they transport not only materials but also signaling information. Eleftheria Saplaoura and Friedrich Kragler discuss the function of viral RNAs, small interfering RNAs, microRNAs, transfer RNAs, and messenger RNAs transported through phloem and possible mechanisms facilitating RNA distribution via phloem. Although calcium signaling across different cellular membrane systems is ubiquitous in different evolutionary lineages, the mechanism and function mediating plant response to environmental stresses is particularly critical to the well-being of plants as sessile organisms. Girdhar Pandey and colleagues describe how the sensor-responder complex calcineurin B-like protein (CBL)/CBL-interacting protein kinases and the associated phosphorylation networks mediate plant stress signals. Different from animals that rely on adaptive and innate immune systems for defense, plants primarily count on innate immunity to detect and fight against pathogen invasions. The plasma membrane system serves as not only barrier defending cells against invading pathogens but also information gateway that leads to the innate immunity. Mary Wildermuth and colleagues provide an overview on plant-microbe interactions with focus on function of endoduplication during these interactions. Kai He and Yujun Wu contributed a review concerning specifically on receptor-like kinases and their roles in pathogen-associated molecular pattern-triggered immunity. Redox homeostasis is another important type of signaling mechanism in both animals and plants. In plants, however, light represents a critical environmental factor that triggers redox change through photosynthesis in the chloroplast.

Aigen Fu discusses an intriguing proposition that in addition to the photosynthetic oxygen-evolving electron transport chain, chloroplasts may also possess a respiratory electron chain on the thylakoid membrane. This process is not only important to chloroplast function and plant development, but also vital in protecting plants from environmental stresses. Most signaling processes in plants are eventually transduced into the nucleus to achieve specific genome expression patterns as a response to the initial signals and a way to adapt to these signals. Keqiang Wu and colleagues review the functions and molecular mechanisms of acetyltransferases and histone deacetylases in plant growth and development. Reversible histone acetylation is one of the best-known forms of nuclear protein modification instrumental to the control of gene expression in response to internal and external signals.

We thank all the authors who contribute to this volume of the *Enzymes*. We would also like to express our appreciation to Hannah Colford at Elsevier for handling and copyediting of this volume.

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