

PREFACE

Plant biologists have a long history of using small molecules (e.g., MW < 500 Da) to explore developmental, physiological, and metabolic pathways. Compared to molecular genetic approaches used to study biological processes in plants, the roots of plant chemical biology became well established in the first decades of the twentieth century with the discovery of plant growth regulators or plant hormones. Since this time, the capacity of organic synthetic chemists to create and characterize the effect of small molecules provided the basis for understanding processes such as cell elongation through the action of auxins, the stimulation of cell division via the activity of cytokinins, the control of fruit senescence by gibberellins, and the influence of abscisic acid on seed dormancy. In addition, naturally occurring molecules as well as synthetic analogues formed the basis for genetic screens that looked for resistant or hypersensitive mutant plants. During the past 30 years, this approach led to the discovery of cellular components and pathways that integrate environmental and developmental information into regulated phenotypic outcomes.

Plant Chemical Biology provides tools that overcome the pleiotropic effects of plant hormones. A single hormone makes defining the role of specific components or signaling pathways a challenge. The capacity to identify novel compounds that stimulate or inhibit a subset of a signaling cascade holds tremendous promise for refining our understanding of these pathways. The coupling of this potential with advances in combinatorial chemistry offers exciting opportunities to develop new tools for basic and applied applications. In recent years, the querying of large collections of diverse compounds through the use of robust assays has led to an impressive array of new discoveries in the field of plant biology.

This book intends to provide advanced students and professionals in plant biology—molecular biologists, physiologists, biochemists, or those active in agriculture, horticulture, or agronomy—a summary of key aspects of plant chemical biology. Even as the pace of progress in this subfield accelerates, we hope that you will discover in the following chapters a summary of key findings to date, as well as an overview of the available compound collections, principles of assay design, and the translatability of these new tools to applied settings. In this day and age, no volume provides an encyclopedic review. We hope that our selection of topics reveals one of the ways that the quest for understanding biological processes drives the innovation of new technologies, which in turn propel our understanding of the biology.

We thank the authors of this collection. Their expertise and experience allows each topic to be handled with insight and depth. Without their contributions and patience, this book would not have been possible. We thank our institutions, Macalester College and VIB, for their support during the preparation of this book. Finally, we acknowledge the steadfast encouragement of our spouses, Lynn Overvoorde and Eva Vermeulen, and our children, Mia, Anika, Vigdis, Sigun, and Eldrid, during this process.

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