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## Preface

Intercellular communication is an essential biological process during the coordination of development in multicellular organisms. Plants are sessile organisms that require communication between cells and tissues also for facing the constant challenges from the environment. To enable direct cell-to-cell communication, plants have evolved plasmodesmata (PD), plasma membrane-lined, gated cell wall microchannels that provide cytoplasmic continuity between cells. The system of PD forms a tightly regulated symplasmic communication network by which plants exert cell-to-cell and systemic control over cell fates, epigenetic states, and defenses against biotic and abiotic stresses. Communication through PD involves both selective and nonselective movement of various molecules that function in diverse biological processes. A continuously expanding range of non-cell-autonomous proteins and RNA molecules is known to move from cell to cell through PD to play crucial roles in developmental and defense signaling. Moreover, viruses exploit PD for intercellular and systemic spread, which often results in serious crop diseases. Given these diverse and important implications of PD-mediated macromolecular trafficking, an increasing number of researchers are interested to further explore the structure and regulation of PD as well as the molecular and cellular mechanisms by which informational macromolecules are targeted to PD, move through the channel, and act in recipient cells.

This book aims to provide a unique compendium of currently applied methods to address these important questions. The two chapters in Part I present overviews about current knowledge regarding (1) PD structure and their function during development and (2) the role of viruses as models for addressing cellular mechanisms in macromolecular trafficking and movement through PD. This introductory part is followed by 19 chapters that provide detailed experimental protocols for imaging PD (Part II), the isolation and structural analysis of PD (Part III), the analysis of PD conductivity and regulation (Part IV), and studying cellular mechanisms by which macromolecules are targeted to PD and transported through the channel (Part V). The experimental protocols are written by leading experts with hands-on experience in the respective method. The major goal of this book is to deliver detailed information about the specific practical procedures and thus to enable their reproduction and application in PD-related research in other laboratories. I hope that the growing research community interested in PD will accept this book as a useful reference for the coming years.

I greatly acknowledge the contribution of all the authors who contributed to this book and shared their laboratory secrets and useful hints in the Notes sections. I also thank the series editor, John M. Walker, for his continuous support in developing this volume.

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