# Preface

Unlike animals, the embryos formed by higher plants after fertilization are tissues with meristem atic capacity. After embryonic development is completed, the shoot apical meristem and root apical meristem can form different new organs at different developmental stages by continuous differentiation. Therefore, cell differentiation and organogenesis are the basis of plant growth and development, which also determines the specificity of different tissues and organs and the diversity of individual plants, and thus become one of the core issues of plant scientific research. The study of these scientific problems are great significance for controlling the growth and development of plants, and the development of directional control techniques for important agronomic traits of crops and economic plants. This book systematically introduces the molecular mechanism of cell differentiation and organogenesis of the model plants *Arabidopsis thaliana* and rice, with focus on growth and differentiation of meristem and specific cells.

The "Innovation Group" program, established by the NSFC, supports internationally competitive research groups in the forefront of the same scientific issue. The Institute of Botany, Chinese Academy of Sciences (IBCAS) has a long history in the field of cell differentiation and organogenesis research. It has a solid research foundation in the fields of plant physiology, plant developmental biology and plant embryology since the 1950s. For example, the results of nucleic acid and protein metabolic and physiological changes in the process of wheat vernalization, *in vitro* induction of floral organs of *Hyacinthus orientalis* and wheat, plant microspore and progenesis and protoplast culture in the 1980s, were concerned by international peers at that time. The research results of these older scientists and the talent echelons trained by them laid a solid foundation for the development of plant biology in the late 1990s, and formed a research group with certain academic characteristics.

In 2008, with Chong Kang as the principle scientist, Liu Chunming, Lin Jinxing, Wang Tai, Hu Yuxin and Huang Shanjin as the academic backbones, the group declared the "NSFC Innovation Group", with Xu Zhihong as academic adviser of the group. After a series of competitive review process, from the CAS recommendation and NSFC anonymous peer review, to report reply and the site inspection of expert group in the laboratory, this group obtained the six-year research program funding of the NSFC. This Innovation Group was gradually formed after more than 10 years of development and the introduction of talents in recent years, based on the original research of the IBCAS. From the 1990s, under the training and guidance of academician Xu Zhihong, aiming at frontier scientific issues of plant molecular developmental biology research, a research group of plant development and reproductive biology in flowering determination, pollen development and fertility was gradually formed. The research backbones who have entered into the IBCAS relatively early, including Chong Kang, Lin Jinxing and Wang Tai, were domestic young scientists grown up in China. They formed a collaborative study team on common interested issues such as

genetic regulation of flowering and meiosis (Wang Tai and Chong Kang), pollen proteomics (Lin Jinxing, Wang Tai and Chong Kang) and rice TILLING mutant library screening (Liu Chunming and Chong Kang), based on inheriting and developing original works. Through the CAS "Hundred Talents Program", outstanding young academic leaders who have made important academic contributions in the field including Dr. Liu Chunming, Dr. Hu Yuxin and Dr. Huang Shanjin from the Netherlands, Singapore and the United States, respectively, were introduced. Among them, Dr. Liu Chunming is an international influential young scientist in the field of cell differentiation and embryo development; Dr. Hu Yuxin has outstanding achievements in the field of genetic regulation of organ differentiation; Dr. Huang Shanjin has an important academic contribution in the field of plant cytoskeleton structure and functional research. The common interest of all the group members is focused on the field of regulatory mechanisms of plant cell differentiation and organogenesis.

In order to summarize the study results of this Innovation Group in recent years, this book is written, titled *Plant Cell Differentiation and Organogenesis*, the same as the name of this Innovation Group. This book is based on the research results of members of "NSFC Plant Cell Differentiation and Organogenesis" Innovation Group and related experts including researcher Meng Zheng, researcher Le Jie, researcher Xu Yunyuan, and associate researcher Zhu Shengwei as the main line, systematically describes the concepts, problems and research systems of plant cell differentiation and organogenesis. With 11 chapters in this book, the principles and roles of cell division, cell differentiation and vesicle trafficking in plant development are elaborated; research progresses on the origins and evolutions of floral organs, the flowering initiation and floral organogenesis are described in detail. The content involves perception of vernalization signals, floral development models, regulatory network of floral organogenesis, and the MADS-box gene family. The polarized growth of pollen tubes and trichomes, root development, and the functional regulation of stem cells are also introduced systematically. Readers of this book will be mainly graduate students, senior undergraduate students and scientific researchers in the field of plant science. With refined structures and large amount of informations, this book introduces not only theories and research progresses, but also research methods. In the background of recent domestic and overseas research progress on related fields, this book focuses on research ideas as the main line, based on the main research results of the relevant research group, highlights the relevant research characteristics as the core, longitudinally discusses dynamics, trying to be an illustrated, concise and understandable academic monograph.

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Xu Zhihong
Chong Kang