

# Preface

Development of the cerebral cortex, the center for higher brain functions such as cognition, memory, and decision making, is one of the major targets of current research. This book reviews recent progress in cortical development research, focusing on the mechanisms of neural stem cell regulation, neuronal diversity and connectivity formation, and neocortical organization. The cerebral cortex is divided into many areas, including motor, sensory, and visual cortices, each of which consists of six layers containing a variety of neurons with different activities and connections. Such diversity of neuronal types and connections is generated at various levels. First, the competency of neural stem cells changes over time, giving sequential rise to distinct types of neurons and glial cells: initially deep layer neurons, then superficial layer neurons, and lastly astrocytes. The activities and connections of neurons are further modulated via interactions with other brain regions, such as the thalamocortical circuit, and via input from the environment. Extensive studies are gradually elucidating the mechanisms by which the diversity in such neuronal types and connections is formed. To accelerate exchanges of the most recent findings and interactions among leading researchers, we organized a symposium titled “Cortical Development” in Okazaki, Japan, held March 10–13, 2012, which was supported by a Grant-in-Aid for Scientific Research on the Innovative Area “Neural Diversity and Neocortical Organization” from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. The symposium was very timely and attracted many young researchers, who were eager to interact with leading researchers and learn about the most recent hot topics. Because the symposium was so successful, we decided to publish a book on cortical development and asked the researchers in this field to contribute chapters. We were happy that many of them responded positively and, although they were very busy, contributed chapters that review hot topics in this field. Many of the topics discussed in the symposium are included in this book.

We are pleased to be able to publish this book, and we would like to thank all the authors who contributed state-of-the-art reviews to it. We also thank our editorial partners, Mr. Kaoru Hashimoto and Ms. Mari Hata at Springer Japan, for their initial suggestion and continued promotion of the project.

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