
Preface

Tissue morphogenesis encompasses a diverse array of processes that transforms unpatterned populations of cells into the distinct tissue structures of the mature organism. The creation of complex, multicellular tissue architectures is critical for organ formation and eventual function. The study of tissue morphogenesis is a rich one, with key conceptual advances emerging from several model organisms. Recent advances have benefited from collaborations between developmental biologists and physicists and engineers, who bring sophisticated analysis techniques as well as theoretical paradigms. This volume highlights the major techniques, both experimental and computational, for the study of tissue morphogenesis, divided into several sections, with specific focus on techniques to image, manipulate, model, and analyze tissue morphogenesis.

This book comprises 22 chapters authored by 68 leading experts from institutions in the USA, Canada, Puerto Rico, France, Austria, the Netherlands, Hungary, Switzerland, Turkey, and Taiwan. This diverse group includes developmental biologists, cell biologists, engineers, and systems biologists working on a large variety of both classical and innovative model systems.

We have divided the book into five parts, based on either methodology or model system. Given that tissue morphogenesis is a dynamic process, and given the seemingly enormous advances in imaging technologies over the past 5 years, the first part (Chapters 1–9) comprises nine chapters devoted to imaging analysis of tissue morphogenesis. This part includes chapters on using imaging techniques to measure the mechanical properties of morphogenetic tissues, the forces that they either exert or experience, or the corresponding changes in cell dynamics or gene expression. The second part (Chapters 10–13) comprises four chapters focused on culture models of tissue morphogenesis, including both cell-based and organ explant models. The third part (Chapters 14–17) comprises an additional four chapters that describe techniques for manipulating cells and tissues *in vivo*, including classical tissue recombination experiments as well as more recently developed laser-based tissue ablation approaches. The fourth part (Chapters 18–19) contains two chapters describing novel model systems to investigate tissue morphogenesis. The fifth and final part (Chapters 20–22) comprises three chapters that describe the use of computational models in understanding tissue morphogenesis.

This book is intended to serve as a primary resource for both fundamental and practical understanding of the techniques used to uncover the basis of tissue morphogenesis. The book is intended to be a primary source for academics and professionals working in developmental biology, tissue engineering, and medicine.

NJ, USA

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Tissue Morphogenesis

Methods and Protocols

Nelson, C.M. (Ed.)

2015, XII, 351 p. 106 illus., 76 illus. in color. With online
files/update., Hardcover

ISBN: 978-1-4939-1163-9

A product of Humana Press