# Preface

ALMOST ALL CELLS ARE POLARIZED, THAT IS, they are spatially asymmetric. Although many prokaryotes and archaea are polarized, the focus of this volume is on eukaryotes. Much of what we know about cell polarity has been learned from studies of single-celled eukaryotes, particularly the yeast *Saccharomyces cerevisiae*, which has been a major model system for nearly all aspects of cell biology. Much of the fundamental molecular mechanisms of polarity that are reviewed in this volume, such as the exocyst, were first discovered in *S. cerevisiae*.

Cell polarity plays an especially important role in multicellular animals (i.e., metazoa). Cells in metazoa are organized into tissues. The most fundamental type of tissue in metazoa is epithelial tissue, in which epithelial cells are arranged in a layer that forms a barrier separating two compartments. An outer layer of epithelium covers the outside of the organism, such as the epidermis in mammals. In the simplest metazoans, there is a single internal cavity or tube, lined by a layer of epithelial cells. In more complex metazoans, such as mammals, there are many internal organ systems, such as the digestive, respiratory, urinary, and circulatory systems, each lined by a single layer of specialized epithelial cells. In all cases, these epithelial cells are highly polarized. Much of this volume is focused on epithelial cells, both because their polarity has been particularly well studied and because of their relevance to human disease.

This volume starts with the basic molecular mechanisms of cell polarity, such as the roles of membrane lipids and proteins involved in polarized membrane trafficking, including the exocyst and molecular trafficking machinery, such as molecular motors. We then turn to specific modifications of the cell surface, such as cilia and microvilli, as well as laminins, extracellular matrix proteins that are crucial for cell polarization. Epithelial cells play vital roles in transport of many ions and molecules across epithelial tissue layers, and the membrane trafficking of the transporters involved is considered next. How epithelial cells are arranged into tubes, including the specialized structures of the liver, is the following topic. As epithelial tissues are often exposed to the outside world, they are a barrier to interaction with the microbiome, which is considered next. Finally, both epithelial and nonepithelial cells can migrate as collective groups of cells, and the polarity of this cell migration is the topic of the final chapter.

Richard Sever at Cold Spring Harbor Laboratory Press has been talking to me for years (even before he moved to the United States) about doing a project on cell polarity, and so he deserves the credit for instigating this volume. Without the professionalism and dedication of Barbara Acosta at the Press, this project would not have come into being. I especially thank the contributors for their stellar chapters; I learned an immense amount from each of them. Many of the authors are former members of my laboratory. Indeed, in some small sense, this volume is a sort of Festschrift, as I am 60 years old as I write these words. I further thank all of the members of my laboratory since I started as a Whitehead Fellow in 1984 and subsequently moved to UCSF in 1989; the intellectual contributions from each of them has added greatly to the scientific community. Finally, I thank my family, my wife Emily Leah Silverman, PhD, MDiv, for more than 30 years of love, truly an *Eshet Chayil*, as well as our children Ari, Zeke, and Raphie.

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