Preface

Dyneins are biological molecular motors that move along microtubules and drive a surprisingly wide range of essential cellular processes such as beating of cilia and flagella, vesicular transport, and mitosis. Since the discovery of dynein more than half a century ago, this molecular complex has attracted many researchers because of its mysterious shape, enormous size, and intricate way of motility. However, the intricacy of the dynein molecular complex had also hampered our understanding of its structural and motile properties, and progress in dynein research was relatively slow until recently.

The first edition of the *Handbook of Dynein*, edited by Linda A. Amos and myself, was published in 2012. For that book, we had asked 15 groups of authors to describe new views on different aspects of dynein. The chapters included topics such as the history of dynein research, molecular composition of the dynein molecule, structural details of dynein motor domains, motile properties of different outer and inner arm dyneins, motility and regulation of dynein, details of some methods such as preparation of dynein, single-molecule measurements, and electron microscopic analysis.

After the publication of the first edition, however, great progress has been made in the field of dynein research, including determination of the crystal structures of the motor domains, and high-resolution cryo-EM structures of the dynein molecule with associated proteins, so that current understanding of the structural and functional properties of dynein has reached a much higher level.

In this second edition, 10 of the 14 chapters are written by the same groups of authors as in the first edition, but the contents have been largely updated and rearranged. In addition, we have added four new chapters, which describe dynein in intraflagellar transport, dynein in endosome and phagosome maturation, and

force-producing properties of single and multiple dynein molecules at high resolution.

The first part of the new edition (Chapters 1–4) discusses the structures of dynein and associated proteins, including high-resolution structures of dynein obtained by X-ray crystallography and cryo-electron microscopy. Chapters 5–10 focus on the mechanistic properties and cellular functions of cytoplasmic dynein and intraflagellar dynein. The last four chapters (Chapters 11–14) describe axonemal dynein. Research in the dynein field is still advancing rapidly, a situation to be celebrated, but which has the inevitable side-effect of making it impossible to include some of the most recently available findings. Nevertheless, we believe that this book will be useful for frontline researchers as well as for advanced students studying cell biology, molecular biology, biochemistry, biophysics, and structural biology.

I would like to thank all the authors for their contribution to this book. It was enjoyable to interact with authors in different parts of the world, including Japan, Europe, the United States, and India. I would also like to thank the staff at Jenny Stanford Publishing.

Keiko Hirose
March 2019