

Preface

Hugh Davson's original textbook on cell physiology, *A Textbook of General Physiology*, was a true classic and a huge success. The first edition was published in 1951 and the fourth and final edition in 1970. In the past two decades, cell physiology has advanced by leaps and bounds, as, for example, in the area of ion channels and their regulation. The present book attempts to fill the void left by the discontinuation of Davson's monumental book. This book is dedicated to Professor Davson in recognition of the great impact he has had on the dissemination of the principles of cell physiology.

At present, there is a need for a good text on cell physiology. Several good texts on cell biology are available, but these generally treat cell physiology in a superficial and incomplete manner. Therefore, it was our intent to prepare a new work on cell physiology that is high quality, is comprehensive, and covers recent developments (the chapter authors were asked to limit their bibliography to no more than 40 key papers and review-type articles). We hope that the reader will find this book clearly written, thorough, up-to-date, and worthy of being the successor to Professor Davson's book.

This book focuses on physiology and biophysics at the cellular level. Organ systems and whole organisms are essentially not covered, except for unicellular organisms. The major topics covered include ultrastructure, molecular structure and properties of membranes, transport of ions and nonelectrolytes, ion channels and their regulation, membrane excitability, sensory transduction mechanisms, synaptic transmission, membrane receptors, intracellular messengers, metabolism, energy transduction, secretion, excitation-secretion coupling, excitation-contraction coupling, contraction of muscles, cilia and flagellae, photosynthesis, and bioluminescence. These

topics are covered in a comprehensive, but didactic, manner, with each topic beginning in an elementary fashion and ending in a sophisticated and quantitative treatise.

This book is intended primarily for graduate and advanced undergraduate students in the life sciences, including those taking courses in cell physiology, cell biophysics, and cell biology. Selected parts of this book can be used for courses in neurobiology, electrophysiology, secretory biology, biological transport, and muscle contraction. Students majoring in engineering, biomedical engineering, physics, and chemistry should find this book useful to help them understand the living state of matter. Postdoctoral scholars and faculty engaged in biological research would also find this text of immense value for obtaining a better understanding of cell function and as a reference source. Medical, dental, and allied health students could use this book as a valuable comparative text to complement their other textbooks in medical/mammalian physiology. The latter texts often strongly emphasize organ system physiology to the virtual exclusion (in some cases) of cell physiology, membrane biophysics, and mechanisms underlying homeostasis of the entire organism. The chapter authors were asked to include the following aspects wherever appropriate: comparative physiology, developmental changes, pathophysiology, membrane diseases, and molecular biology.

Considering the tremendous amount of new information gained during the past two decades using sophisticated new instruments and techniques, I have recruited a number of outstanding researchers, who are leaders in their respective fields, to contribute to this undertaking. I am delighted that they agreed to participate. It has been my great pleasure and honor to work with them on this important and timely project.

Nicholas Sperelakis