Book Review

Cell Physiology Source Book by N. Sperelakis, editor

Academic Press, San Diego, 1995. 738 pages. $99.00

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This book is dedicated to Hugh Davson, whose classic *A Textbook of General Physiology* was first published in 1951. The fourth, and final, edition of the book was published in 1970. For at least two generations of cell physiologists and biophysicists, Davson's gem was first a favorite textbook and later a cherished and well-worn reference book. The organization of *Cell Physiology Source Book* parallels that of Davson's text to a considerable extent. In the preface to this book, Nicholas Sperelakis expresses the "... 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 ..." In significant measure, the book fulfills these objectives.

As Sperelakis notes in his preface, there are several outstanding cell biology textbooks that are appropriate for graduate and advanced undergraduate students. These texts do an excellent job of describing the molecular and biochemical bases of particular cellular processes, but cell biology texts leave off, in most cases, where the going gets biophysical. *Cell Physiology Source Book* helps to fill this gap. To choose one example, among many, to illustrate this point: the chapter on Biophysics of the Nuclear Envelope by L. J. DeFelice and M. Mazzanti describes the structure and function of the nuclear envelope and the nuclear pore complex, then goes on to describe patch electrode studies of the electrophysiology of the nuclear envelope, and concludes with a theoretical exposition of the electrical and osmotic forces across the nuclear envelope. It is not possible to delineate precise boundaries between biological disciplines, but an emphasis on biophysical methods and concepts is one feature that distinguishes cell or general physiology from cell biology.

Major topics covered in the book include structure and function of membranes, transport of ions and nonelectrolytes, ion channels and their regulation, membrane excitability, sensory transduction, synaptic transmission, signal transduction mechanisms, excitation-secretion coupling, muscle contraction, cilia and flagellae, bioluminescence, and photosynthesis. The selection of topics and their treatment reflects the scope of current research in cell physiology and biophysics, the desire to cover many of the areas in Davson's text, and the intent to deal with biophysical topics not dealt with in most other textbooks. Just under half of the chapters deal with topics that relate to cellular electrophysiology (e.g., resting potentials, action potentials, cable theory, ion channels, synaptic transmission, etc.). This will be useful for many students and other readers because courses and books on cell biology (and even on neuroscience) frequently give relatively short shrift to these topics, particularly their biophysical aspects. For those who need refreshing on the basics, there is a 12-page appendix that reviews relevant aspects of electricity and cable properties. Three chapters on basic cellular electrophysiology are adapted from *Physiology,* N. Sperelakis and N. O. Banks, editors, 1992, Little Brown, Boston.

In his foreword to *Cell Physiology Source Book,* Davson comments on the special circumstances that allowed a single scholar to survey the whole of general physiology: "... I wrote the book during the two years immediately following the end of World War II. Thus, for several years—in Great Britain for as many as ten years—very little original academic physiology and new research had been published ..." Given the explosive growth of knowledge in cell physiology and biophysics in the 25 years since Davson's 4th and final edition, it is unreasonable to expect one person to produce such a textbook. *Cell Physiology Source Book* has 50 chapters and 49 authors.

Areas of investigation that were undeveloped in 1970 are treated in this book, including the following chapters: Calcium as an Intracellular Second Messenger: Mediation by Calcium Binding Proteins (J. R. Dedman and M. A. Kaetzel); Patch-Clamp Techniques and Analysis (R. Y. K. Pun and H. Lecar); Ion Channels in Nonexcitable Cells (B. Nilius); Regulation of Ion Channels by Phosphorylation (N. Sperelakis); Ion Channels that are Directly Regulated by G Proteins (A. Yatani); and Cyclic Nucleotide-Gated Ion Channels (A. L. Zimmerman).

Davson's textbooks, being wholly written by him, were notable for their unity of style and consistent depth of treatment. This book lacks these qualities. Some of the chapters are bare-bones reviews, such as the well-written chapter (10 pages) on signal transduction mechanisms by R. G. Sleight and M. A. Lieberman. Others are in-depth expositions, such as the thorough and beautifully illustrated chapter (27 pages) on ameboid movement, cilia, and flagella by E. S. Kaneshiro. Students and instructors will find that this book serves as primary reading on some topics, but not for others. The decision to call this a *Source Book,* rather than a textbook, is well taken.

Certain of the chapters deal with topics that are frequently neglected or treated briefly in most books intended for students. Among these are the following: Biophysical

Chemistry of Cellular Electrolytes (J. C. Freedman); Osmosis and the Regulation of Cell Volume (C. M. Baumgarten and J. J. Feher); Intracellular pH Regulation (R. W. Putnam); Excitation-Secretion Coupling (N. Gallo-Payet and M. D. Payet); Physiological Effects of Pressure on Cell Function (T. K. Akers).

Most of the chapters in *Cell Physiology Source Book* are up-to-date, clearly written, and enhanced by high quality figures and illustrations. *Cell Physiology Source Book* will be useful for advanced undergraduate and graduate students studying cell physiology, cell biophysics, electrophysiology, and biological scientists in many fields. The book is particularly suitable for introducing cell physiology to students with training in the physical sciences and for introducing cell biophysics to students with backgrounds in biology.