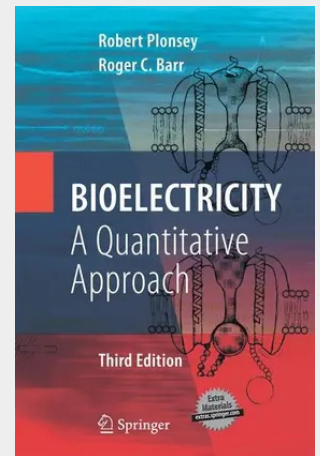


Bioelectricity

A Quantitative Approach

This new edition of the classic introductory text to bioelectricity (electrophysiology) is aimed at biomedical engineering students. It expands on the developments since the successful last edition. The book is authored by two eminent biomedical engineering professors at Duke University who discuss many topics that are central to biophysics and bioengineering and the quantitative methods employed. In addition, this classic text will be complemented by a Bioelectricity Solutions Manual, sure to aid the speed and assimilation of the "Teaching Text" material to the new Biomedical Engineering student. In the first edition of Bioelectricity, Plonsey and Barr provided an introduction to electrophysiology following a quantitative approach. In the second edition they address new discoveries in the field of ion channels and provide an introduction to electrophysiology utilizing a quantitative approach.

The study of electrophysiology has progressed rapidly because of the precise, delicate, and ingenious experimental studies of many investigators. The field has also made great strides by utilizing these experimental observations through mathematical descriptions based on electromagnetic field theory, electrochemistry, etc., which underlie these experiments. In turn, these quantitative materials provide an understanding of many electrophysiological applications through a relatively small number of fundamental ideas. This text is an introduction to electrophysiology, following a quantitative approach. The first chapter summarizes much of the mathematics required in the following chapters. The second chapter presents a very concise overview of the principles of electrical fields and the concomitant current flow in conducting media. It utilizes basic principles from the physical sciences and engineering but takes into account the biological applications. The following six chapters are the core material of this text. Chapter 3 includes a description of how voltages/currents exist across membranes and how these are evaluated using the Nernst-Planck equation. The membrane channels, which are the basis for cell excitability, are described in Chapter 4. An examination of the time course of changes in membrane voltages that produce action potentials are considered in Chapter 5. Propagation of action potentials down fibers is the subject of Chapter 6, and the response of fibers to artificial stimuli, such as those used in cardiac pacemakers, is treated in Chapter 7. The voltages and currents produced by these active processes in the surrounding extracellular space is described in Chapter 8.



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