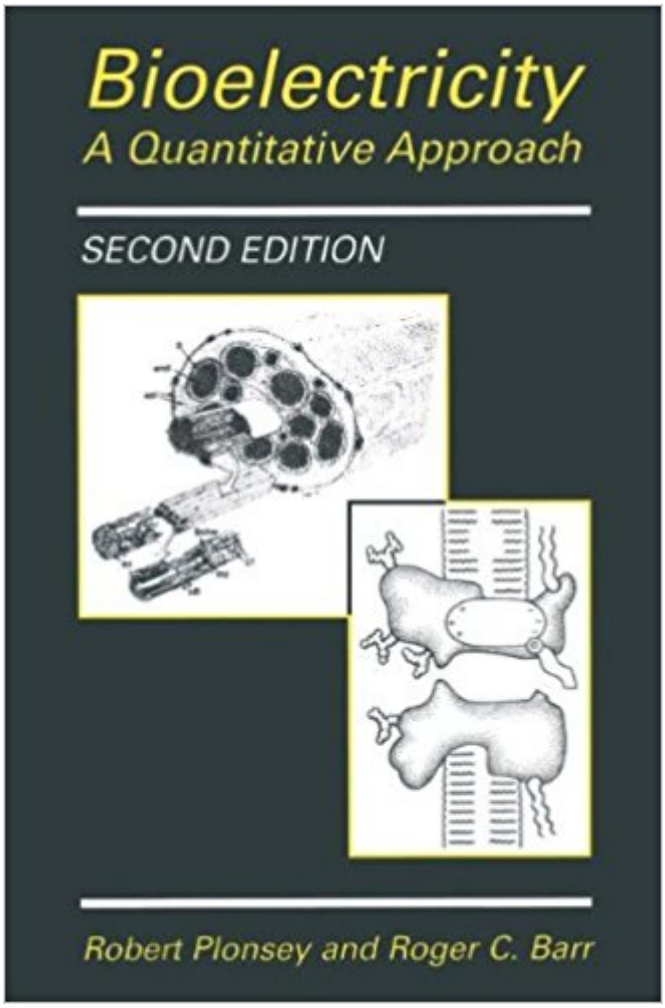
Bioelectricity: A Quantitative Approach



Synopsis

In the first edition of Bioelectricity, Plonsey and Barr provided an introduction to electrophysiology following a quantitative approach. In this second edition they address new discoveries in the field of ion channels. The text is an introduction to electrophysiology utilizing a quantitative approach. It describes the principles of electrical fields, using basic principles from science and engineering while taking the biological applications into consideration. The book thus provides an introduction to the quantitative description of underlying electrophysiology with illustrative application to cardiac electrophysiology and functional electrical stimulation. The book can be used as a bridge to more advanced texts, particularly those that stress a quantitative approach.

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Customer Reviews

Praise for Previous Editions:"This fine text, by two well-known bioengineering professors at Duke University, is an introduction to electrophysiology aimed at engineering students. Most of its chapters cover basic topics in electrophysiology: the electrical properties of the cell membrane, action potentials, cable theory, the neuromuscular junction, extracellular fields, and cardiac electrophysiology. The authors discuss many topics that are central to biophysics and bioengineering [and] the quantitative methods [they] teach will surely be productive in the future." IEEE Engineering in Medicine and Biology "The authorsâ ™ goal in producing this book was to provide an introductory text to electrophysiology, based on a quantitative approach. In attempting to achieve this goal, therefore, the authors have opened the book with a useful, and digestible,

introduction to various aspects of the mathematics relevant to this field, including vectors, introduction to Laplace, Gaussâ ™s theorem, and Greenâ ™s theorem. This book will be useful for students in medical physics and biomedical engineering wishing to enter the field of electrophysiological investigation. It will also be helpful for biologists and physiologists who wish to understand the mathematical treatment of the processes and signals at the center of the interesting interdisciplinary field." Medical and Biomedical Engineering and Computing --This text refers to the Paperback edition.

Bioelectricity: A Quantitative Approach Robert Plonsey and Roger C. BarrThe 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 unifying these experimental observations through mathematical descriptions based on electromagnetic field theory, electrochemistry, etc., which underlies these experiments. In turn, these quantitative materials provide an understanding of many electrophysiological applications through a relatively small number of fundamental ideas. Bioelectricity: A Quantitative Approach, is the new edition of the classic introductory text to electrophysiology. It covers many topics that are central to the field including:- electrical properties of the cell membrane- action potentials- cable theory- electrical stimulation- extracellular waveforms- cardiac electrophysiology- function stimulation (FES)Organized as a textbook for the student needing to acquire the core competencies, Bioelectricity: A Quantitative Approach will meet the demands of advanced undergraduate or graduate coursework in biomedical engineering and biophysics. Key Features:New Detailed IllustrationsExample Problems Useful Appendixes and Study GuidesAuthors:Robert Plonsey is a Pfizer-Pratt Professor Emeritus of Biomedical Engineering at Duke University. He received the PhD in Electrical Engineering from University of California in 1955. He received the Dr. of Technical Science from the Slovak Academy of Science in 1995 and was Chair, Department of Biomedical Engineering, Case Western Reserve, University, 1976-1980, Professor 1968-1983. Awards: Fellow of AAAS, William Morlock Award 1979,Â Centennial Medal 1984,Â Millenium Medal 2000, from IEEE Engineering in Medicine and Biology Society, Ragnar Granit Prize 2004, (First) Merit Award, 1997, International Union for Physiological & Engineering Science in Medicine, the Theo Pilkington Outstanding Educator Award, 2005, Distinguished Service award, Biomedical Engineering Science, 2004, ALZA distinguished lecturer, 1988. He was elected Member, National Academy of Engineering, 1986 ("For the application of electromagnetic field theory to biology, and for distinguished leadership in the emerging profession of biomedical engineering").Roger C. Barr is

Professor of Biomedical Engineering and Associate Professor of Pediatrics at Duke University. In past years he served as the Chair of the Department of Biomedical Engineering at Duke, and then as Vice President and President of the IEEE Engineering in Medicine and Biology Society. He received the Duke University Scholar-Teacher Award in 1991. He is the author of more than 100 research papers about topics in bioelectricity and is a Fellow of the IEEE and American College of Cardiology. This text is a product of interactions with students, and in this regard he has taught the bioelectricity course sequence numerous times.Praise for Previous Editions:"This fine text, by two well-known bioengineering professors at Duke University, is an introduction to electrophysiology aimed at engineering students. Most of its chapters cover basic topics in electrophysiology: the electrical properties of the cell membrane, action potentials, cable theory, the neuromuscular junction, extracellular fields, and cardiac electrophysiology. The authors discuss many topics that are central to biophysics and bioengineering [and] the quantitative methods [they] teach will surely be productive in the future." IEEE Engineering in Medicine and Biology"The authorsâ ™ goal in producing this book was to provide an introductory text to electrophysiology, based on a quantitative approach. In attempting to achieve this goal, therefore, the authors have opened the book with a useful, and digestible, introduction to various aspects of the mathematics relevant to this field, including vectors, introduction to Laplace, Gaussâ ™s theorem, and Greenâ ™s theorem. This book will be useful for students in medical physics and biomedical engineering wishing to enter the field of electrophysiological investigation. It will also be helpful for biologists and physiologists who wish to understand the mathematical treatment of the processes and signals at the center of the interesting interdisciplinary field." Medical and Biomedical Engineering and Computing. --This text refers to the Paperback edition.

Not that it will necessarily help you with your class, but it is good form to buy the book of the person who is teaching you something for free. With that in mind, I wanted to rate this higher, and I am probably being a little generous with 4 stars. The book is missing some pieces....The sample problems seem to be an afterthought. They are collected in the last chapter of the book, and none are worked out. There is a PDF for the answers. The answers are overly terse and don’t provide complete coverage. There are also too few figures and explanatory drawings. Way too little. I was also disappointed with the xerographic b/w printing. Picky yes, but not so much for an expensive book.On the positive side, this is a very mathematical book and it certainly lives up to its quantitative billing. You will do well to remember your Calc3. Also, this 3rd edition is very logically organized and shows years of mastery teaching the material. I would also give high marks for the passion of the

authors and the occasional, but useful, commentary about the novelty of certain systems. It helps increase interest in the material.PS Coursera ClassThe Coursera class is perhaps 1/5 as technical as this book. The class uses math that you would expect a biology student to know, whereas this book is clearly based on engineering mathematics. Being mathematical, I find the book quite understandable, with the math supporting the message. For non-mathematicians, the opposite effect may prevail. In my case, the book is definitely a big help in the course, if only to see the material in a different format and with a different approach. Evidently, there is much more to bioelectricity than what is in the course.

Just go look up the Erratum for this thing. The publisher has known about how error prone this book is and still hasn't reissued or issued a better version. Some of my favorites include page 25 where the author writes the equation R = rho*A/L instead or R = rho*L/A (resistance of a wire, elementary stuff), page 133 where the conductive equivalents wrongfully have potential differences, and the majority of the solution manual to be just plain wrong. Seriously, don't even bother using the dang thing.This book is horribly edited and I implore professors looking to assign this book to look elsewhere unless they want their office hours filled with confused students. It is a scam at $70.

I think this book has the potential to be successful. It's fairly well written with explanations that are usually clear, even to persons with minimal biological background. However, it suffers tremendously from the errors that pervade each chapter. From the trivial errors such as misspellings and significant errors like incorrect formulae, it seems that nobody bothered to proofread this edition of the book (3rd). Derivations also tend to be rather difficult to follow, either due to errors, unclear assumptions, or mislabeled or missing equations. I suspect that much of the book was scanned and edited from the previous edition since there are numerous typos that are substitutions of similar looking letters (e.g. I->l). Even worse, many of the original figures in the book are awfully unclear, confusing the subject rather than clarifying it. In many graphs, axis are missing labels and captions are no more helpful. Many of the figures look like they were drawn in MS Word. All in all, a disappointing textbook, especially for a 3rd edition.

Begins with the necessary physics and vector calculus.Steps logically and clearly through the physics ofdiffusing ions in solution separated by membranes. Presents classic Hodgkin-Huxley formulation and develops analytic and computer models of excitable axon. Covers basics of ECG and heart vector rotation. All exercises in the book focus on extension of topics and

experimentation. Written for the engineer/scientist at the senior undergrad level.

This book is next only to "From Neuron to Brain" to understand Neuroscience Basics. It covers a bunch of other topics other than Neuroscience. Worth a reading!

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