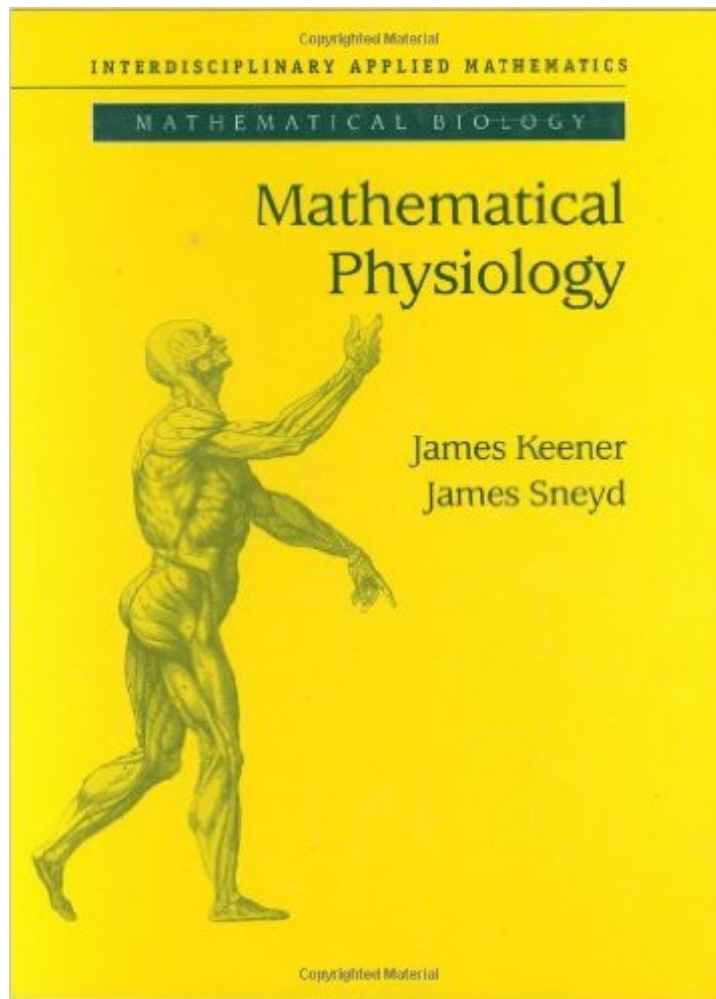


The book was found

# Mathematical Physiology (Interdisciplinary Applied Mathematics)



## Synopsis

Mathematical Physiology provides an introduction into physiology using the tools and perspectives of mathematical modeling and analysis. It describes ways in which mathematical theory may be used to give insights into physiological questions and how physiological questions can in turn lead to new mathematical problems. The book is divided in two parts, the first dealing with the fundamental principles of cell physiology, and the second with the physiology of systems. In the first part, after an introduction to basic biochemistry and enzyme reactions, the authors discuss volume control, the membrane potential, ionic flow through channels, excitability, calcium dynamics, and electrical bursting. This first part concludes with spatial aspects such as synaptic transmission, gap junctions, the linear cable equation, nonlinear wave propagation in neurons, and calcium waves. In the second part, the human body is studied piece by piece, beginning with an introduction to electrocardiology, followed by the physiology of the circulatory system, blood muscle, hormones, and kidneys. Finally, the authors examine the digestive system and the visual system, ending with the inner ear. This book will be of interest to researchers, to graduate students and advanced undergraduate students in applied mathematics who wish to learn how to build and analyze mathematical models and become familiar with new areas of applications, as well as to physiologists interested in learning about theoretical approaches to their work. *Mathematical Reviews*, 2000: "This is neither a physiology book nor a mathematics book, but it is probably the best book ever written on the interdisciplinary field of mathematical physiology, i.e. mathematics applied to modelling physiological phenomena. The book is highly recommended to anybody interested in mathematical or theoretical physiology."

## Book Information

Series: Interdisciplinary Applied Mathematics (Book 8)

Hardcover: 767 pages

Publisher: Springer; Corrected edition (October 1, 1998)

Language: English

ISBN-10: 0387983813

ISBN-13: 978-0387983813

Product Dimensions: 7.5 x 1.6 x 9.5 inches

Shipping Weight: 3 pounds (View shipping rates and policies)

Average Customer Review: 4.0 out of 5 stars [See all reviews](#) (5 customer reviews)

Best Sellers Rank: #2,393,465 in Books (See Top 100 in Books) #99 in [Books > Science & Math](#)

> Mathematics > Applied > Biomathematics #1812 inÂ Books > Textbooks > Medicine & Health Sciences > Medicine > Basic Sciences > Physiology #2459 inÂ Books > Textbooks > Science & Mathematics > Biology & Life Sciences > Anatomy & Physiology

## Customer Reviews

This book is an excellent overview of the major research into the mathematics of physiological processes. The first part of the book covers cellular physiology beginning with a discussion of biochemical reactions in the first chapter. Some of the applications of dynamical systems are nicely illustrated here, especially bifurcation theory. Applications of the diffusion equation follow in the next chapter on cellular homeostasis. The Nernst-Planck electrodiffusion equation is discussed but not derived, and is solved in the constant field approximation. This is complicated somewhat in the next chapter on membrane ion channels, where the potential across the membrane is not assumed to have a constant gradient. There is a discussion of channel blocking drugs in the last section, but unfortunately it is too short. This is an important area of application, with the experimental validation of the mathematical results of utmost importance. The Hodgkin-Huxley and the FitzHugh-Nagumo equations dominate the next chapter on electrical signaling in cells. The phase space analysis of these models is discussed, along with an interesting treatment of the excitability of cardiac cells in the Appendix of the chapter. A very well-written treatment, along with helpful diagrams, of calcium dynamics is given in Chapter 5. The authors show how ignoring the fast variables and transients lead one to a solution of the dynamical problem of the receptor model. Phase space analysis is used extensively in the next chapter on electrical bursting, with emphasis on bursting in pancreatic beta-cells. An interesting discussion on the classification of bursting oscillations is given purely in terms of bifurcation theory.

[Download to continue reading...](#)

Mathematical Physiology (Interdisciplinary Applied Mathematics) Mathematical Biology: I. An Introduction (Interdisciplinary Applied Mathematics) (Pt. 1) Mathematical Biology II: Spatial Models and Biomedical Applications (Interdisciplinary Applied Mathematics) (v. 2) Renal Physiology: Mosby Physiology Monograph Series (Mosby's Physiology Monograph) Foundations of Educational Technology: Integrative Approaches and Interdisciplinary Perspectives (Interdisciplinary Approaches to Educational Technology) Nonlinear Systems: Analysis, Stability, and Control (Interdisciplinary Applied Mathematics) Computational Inelasticity (Interdisciplinary Applied Mathematics) (v. 7) Handbook of Mathematical Functions: with Formulas, Graphs, and Mathematical Tables (Dover Books on Mathematics) Mathematical Control Theory: Deterministic

Finite Dimensional Systems (Texts in Applied Mathematics) Pocket Book of Integrals and  
Mathematical Formulas, 5th Edition (Advances in Applied Mathematics) Knowing and Teaching  
Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the  
United States (Studies in Mathematical Thinking and Learning Series) Respiratory Physiology: The  
Essentials (Respiratory Physiology: The Essentials (West)) Human Anatomy & Physiology (9th  
Edition) (Marieb, Human Anatomy & Physiology) Human Anatomy & Physiology Laboratory Manual,  
Fetal Pig Version (12th Edition) (Marieb & Hoehn Human Anatomy & Physiology Lab Manuals)  
Anatomy & Physiology: The Unity of Form and Function: Anatomy & Physiology: The Unity of Form  
and Function Physiology, (Costanzo Physiology) Guyton & Hall Physiology Review, 2e (Guyton  
Physiology) Guyton & Hall Physiology Review, 3e (Guyton Physiology) Endocrine Physiology,  
Fourth Edition (Lange Physiology Series) Vander's Renal Physiology, 7th Edition (LANGE  
Physiology Series)

[Dmca](#)