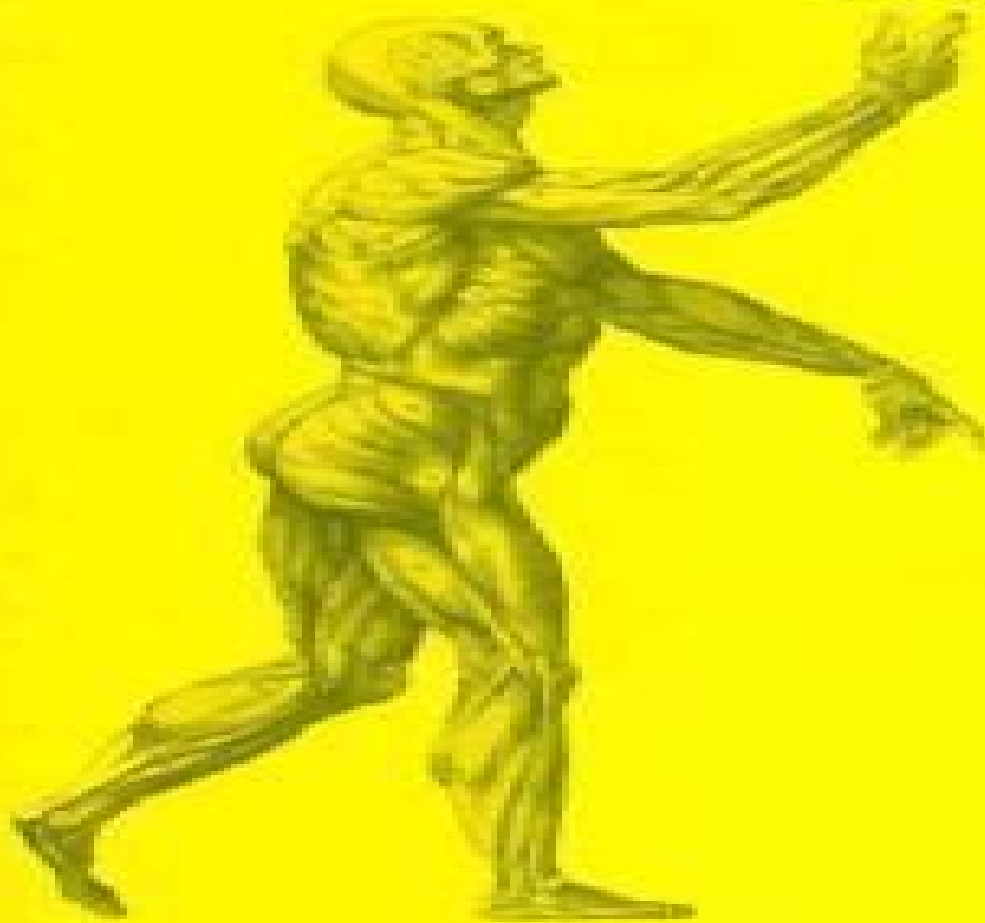


INTERDISCIPLINARY APPLIED MATHEMATICS

MATHEMATICAL BIOLOGY

Mathematical Physiology

James Keener
James Sneyd



Mathematical Physiology Mathematical Physiology

James Keener, James Sneyd



Mathematical Physiology Mathematical Physiology:

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An Introduction to Mathematical Physiology and Biology J. Mazumdar, 1999-08-19 This textbook is concerned with the mathematical modelling of biological and physiological phenomena for mathematically sophisticated students A range of topics are discussed diffusion population dynamics autonomous differential equations and the stability of ecosystems biogeography pharmacokinetics biofluid mechanics cardiac mechanics the spectral analysis of heart sounds using FFT techniques The last chapter deals with a wide variety of commonly used medical devices This book is based on courses taught by the author over many years and the material is well class tested The reader is aided by many exercises that examine key points and extend the presentation in the body of the text All students of mathematical biology will find this book to be a highly useful resource

Mathematical Physiology James

Keener, James Sneyd, 2009-01-06 Divided into two volumes the book begins with a pedagogical presentation of some of the basic theory with chapters on biochemical reactions diffusion excitability wave propagation and cellular homeostasis The second more extensive part discusses particular physiological systems with chapters on calcium dynamics bursting oscillations and secretion cardiac cells muscles intercellular communication the circulatory system the immune system wound healing the respiratory system the visual system hormone physiology renal physiology digestion the visual system and hearing New chapters on Calcium Dynamics Neuroendocrine Cells and Regulation of Cell Function have been included

Mathematical Physiology: Cellular physiology James P. Keener, 2009 **Introduction to Mathematical Physiology and Biology**, 1999 *Applied Mathematical Models in Human Physiology* Johnny T. Ottesen, Mette S. Olufsen, Jesper K. Larsen, 2004-02-01 This book introduces mathematicians to real applications from physiology Using mathematics to analyze physiological systems the authors discuss models reflecting current research in cardiovascular and pulmonary physiology In particular they present models describing blood flow in the heart and the cardiovascular system as well as the transport of oxygen and carbon dioxide through the respiratory system and a model for baroreceptor regulation This is the only book available that analyzes up to date models of the physiological system at several levels of detail both simple real time models that can be directly used in larger systems and more detailed reference models that show the underlying physiological mechanisms and provide parameters for and validation of simpler models The book also covers two dimensional modeling of the fluid dynamics in the heart and its ability to pump and includes a discussion of modeling wave propagation throughout the systemic arteries **Mathematical Physiology; Blood Flow and Electrically Active Cells** H. Melvin Lieberstein, 1973 *An Introduction to Mathematical Modeling in Physiology, Cell Biology, and Immunology* James Sneyd, American Mathematical Society, In many respects biology is the new frontier for applied mathematicians This book demonstrates the important role mathematics plays in the study of some biological problems It introduces mathematicians to the biological sciences and provides enough mathematics for bioscientists to appreciate the utility of the modelling approach The book presents a number of diverse topics such as neurophysiology cell biology immunology and human genetics It examines how research is done what mathematics is used what the outstanding questions are and how to enter the field Also given is a brief historical survey of each topic putting current research into perspective The book is suitable for mathematicians and biologists interested in mathematical methods in biology **Mathematical Modeling in Renal**

Physiology Anita T. Layton, Aurelie Edwards, 2014-08-06 With the availability of high speed computers and advances in computational techniques the application of mathematical modeling to biological systems is expanding This comprehensive and richly illustrated volume provides up to date wide ranging material on the mathematical modeling of kidney physiology including clinical data analysis and practice exercises Basic concepts and modeling techniques introduced in this volume can be applied to other areas or organs of physiology The models presented describe the main homeostatic functions performed

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Mathematical Modeling and Validation in Physiology Jerry J. Batzel, Mostafa Bachar, Franz Kappel, 2012-12-14 This volume synthesizes theoretical and practical aspects of both the mathematical and life science viewpoints needed for modeling of the cardiovascular respiratory system specifically and physiological systems generally Theoretical points include model design model complexity and validation in the light of available data as well as control theory approaches to feedback delay and Kalman filter applications to parameter identification State of the art approaches using parameter sensitivity are discussed for enhancing model identifiability through joint analysis of model structure and data Practical examples illustrate model development at various levels of complexity based on given physiological information The sensitivity based approaches for examining model identifiability are illustrated by means of specific modeling examples The themes presented address the current problem of patient specific model adaptation in the clinical setting where data is typically limited

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The Mathematical Approach to Physiological Problems Douglas Shepard Riggs, 2012-05-01 Mathematical and Computational Methods in Physiology, 1981 *Solutions Manual to An Introduction to Mathematical Physiology and Biology 2nd Edition* Nathaniel D. Jewell, Jagannath Mazumdar, 2002 *Mathematical Cardiac Electrophysiology* Piero Colli Franzone, Luca Franco Pavarino, Simone Scacchi, 2014-10-30 This book covers the main mathematical and numerical models in computational electrocardiology ranging from microscopic membrane models of cardiac ionic channels to macroscopic bidomain monodomain eikonal models and cardiac source representations These advanced multiscale and nonlinear models describe the cardiac bioelectrical activity from the cell level to the body surface and are employed in both the direct and inverse problems of electrocardiology The book also covers advanced numerical techniques needed to efficiently carry out large scale cardiac simulations including time and space discretizations decoupling and operator splitting techniques parallel finite element solvers These techniques are employed in 3D cardiac simulations illustrating the excitation mechanisms the anisotropic effects on excitation and repolarization wavefronts the morphology of

electrograms in normal and pathological tissue and some reentry phenomena The overall aim of the book is to present rigorously the mathematical and numerical foundations of computational electrocardiology illustrating the current research developments in this fast growing field lying at the intersection of mathematical physiology bioengineering and computational biomedicine This book is addressed to graduate student and researchers in the field of applied mathematics scientific computing bioengineering electrophysiology and cardiology **Mathematical Aspects of Physiology** F. C. Hoppensteadt, 1981 **Mathematical and Computational Methods in Physiology** L. Fedina, B. Kanyár, B. Kocsis, 2013-10-22 Mathematical and Computational Methods in Physiology discusses the importance of quantitative description of physiological phenomena and for quantitative comparison of experimental data An article explains the homeostasis of the body with a focus on the controlling aspects This section evaluates the concepts of modern physiology and biocybernetics The canal ocular reflex and the otolith ocular reflex in man stimulates eye rotations compensatory for head angular and linear displacements The book enumerates some modelling and simulation to observe the visual vestibular interaction during angular and linear body acceleration A section on the determination of cardiovascular control is given The text reviews the mathematical models of the biological age of the rat A numerical simulation of water transport in epithelial junctions is explained comprehensively A chapter analyzing the computer simulation of drug receptor interaction is presented The book will provide useful information to zoologists doctors ophthalmologists students and researchers in the field of medicine

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