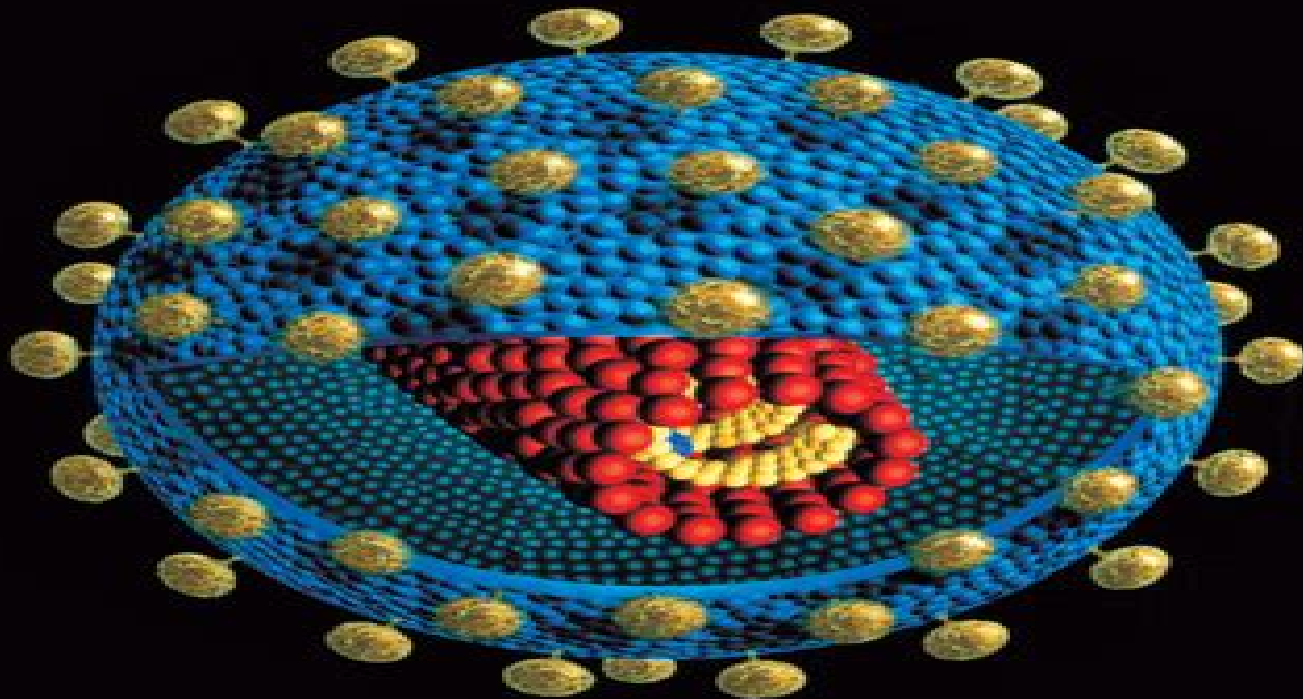


Modeling Differential Equations in Biology

Clifford Henry Taubes



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Modeling And Differential Equations In Biology

Jacek Banasiak, Mirosław Lachowicz



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Modeling and Differential Equations in Biology Theodore Allen Burton, 1980

Introduction to Mathematical Biology Ching Shan Chou, Avner Friedman, 2016-04-27 This book is based on a one semester course that the authors have been teaching for several years and includes two sets of case studies The first includes chemostat models predator prey interaction competition among species the spread of infectious diseases and oscillations arising from bifurcations In developing these topics readers will also be introduced to the basic theory of ordinary differential equations and how to work with MATLAB without having any prior programming experience The second set of case studies were adapted from recent and current research papers to the level of the students Topics have been selected based on public health interest This includes the risk of atherosclerosis associated with high cholesterol levels cancer and immune interactions cancer therapy and tuberculosis Readers will experience how mathematical models and their numerical simulations can provide explanations that guide biological and biomedical research Considered to be the undergraduate

companion to the more advanced book *Mathematical Modeling of Biological Processes* A Friedman C Y Kao Springer 2014 this book is geared towards undergraduate students with little background in mathematics and no biological background

Lectures on Nonlinear-differential-equation Models in Biology James Dickson Murray, 1977 *Mathematical Models for Society and Biology* Edward Beltrami, 2002 *Mathematical Modeling for Society and Biology* engagingly relates mathematics to compelling real life problems in biology and contemporary society It shows how mathematical tools can be used to gain insight into these modern common problems to provide effective real solutions Beltrami's creative non threatening approach draws on a wealth of interesting examples pertaining to current social and biological issues Central ideas appear again in different contexts throughout the book showing the general unity of the modeling process The models are strikingly novel and based on issues of real concern Most have never appeared in book form Through the relevance of these models mathematics becomes not just figures and numbers but a means to a more refined understanding of the world **A Course in Mathematical Biology** Gerda de Vries, Thomas Hillen, Mark Lewis, Johannes Müller, Birgitt Schöfisch, 2006-07-01 This is the only book that teaches all aspects of modern mathematical modeling and that is specifically designed to introduce undergraduate students to problem solving in the context of biology Included is an integrated package of theoretical modeling and analysis tools computational modeling techniques and parameter estimation and model validation methods with a focus on integrating analytical and computational tools in the modeling of biological processes Divided into three parts it covers basic analytical modeling techniques introduces computational tools used in the modeling of biological problems and includes various problems from epidemiology ecology and physiology All chapters include realistic biological examples including many exercises related to biological questions In addition 25 open ended research projects are provided suitable for students An accompanying Web site contains solutions and a tutorial for the implementation of the computational modeling techniques Calculations can be done in modern computing languages such as Maple Mathematica and MATLAB

Methods of Small Parameter in Mathematical Biology Jacek Banasiak, Mirosław Lachowicz, 2014-04-19 This monograph presents new tools for modeling multiscale biological processes Natural processes are usually driven by mechanisms widely differing from each other in the time or space scale at which they operate and thus should be described by appropriate multiscale models However looking at all such scales simultaneously is often infeasible costly and provides information that is redundant for a particular application Hence there has been a growing interest in providing a more focused description of multiscale processes by aggregating variables in a way that is relevant to the purpose at hand and preserves the salient features of the dynamics Many ad hoc methods have been devised and the aim of this book is to present a systematic way of deriving the so called limit equations for such aggregated variables and ensuring that the coefficients of these equations encapsulate the relevant information from the discarded levels of description Since any approximation is only valid if an estimate of the incurred error is available the tools the authors describe allow for proving that the solutions to the

original multiscale family of equations converge to the solution of the limit equation if the relevant parameter converges to its critical value. The chapters are arranged according to the mathematical complexity of the analysis from systems of ordinary linear differential equations through nonlinear ordinary differential equations to linear and nonlinear partial differential equations. Many chapters begin with a survey of mathematical techniques needed for the analysis. All problems discussed in this book belong to the class of singularly perturbed problems, that is, problems in which the structure of the limit equation is significantly different from that of the multiscale model. Such problems appear in all areas of science and can be attacked using many techniques. *Methods of Small Parameter in Mathematical Biology* will appeal to senior undergraduate and graduate students in applied and biomathematics as well as researchers specializing in differential equations and asymptotic analysis.

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