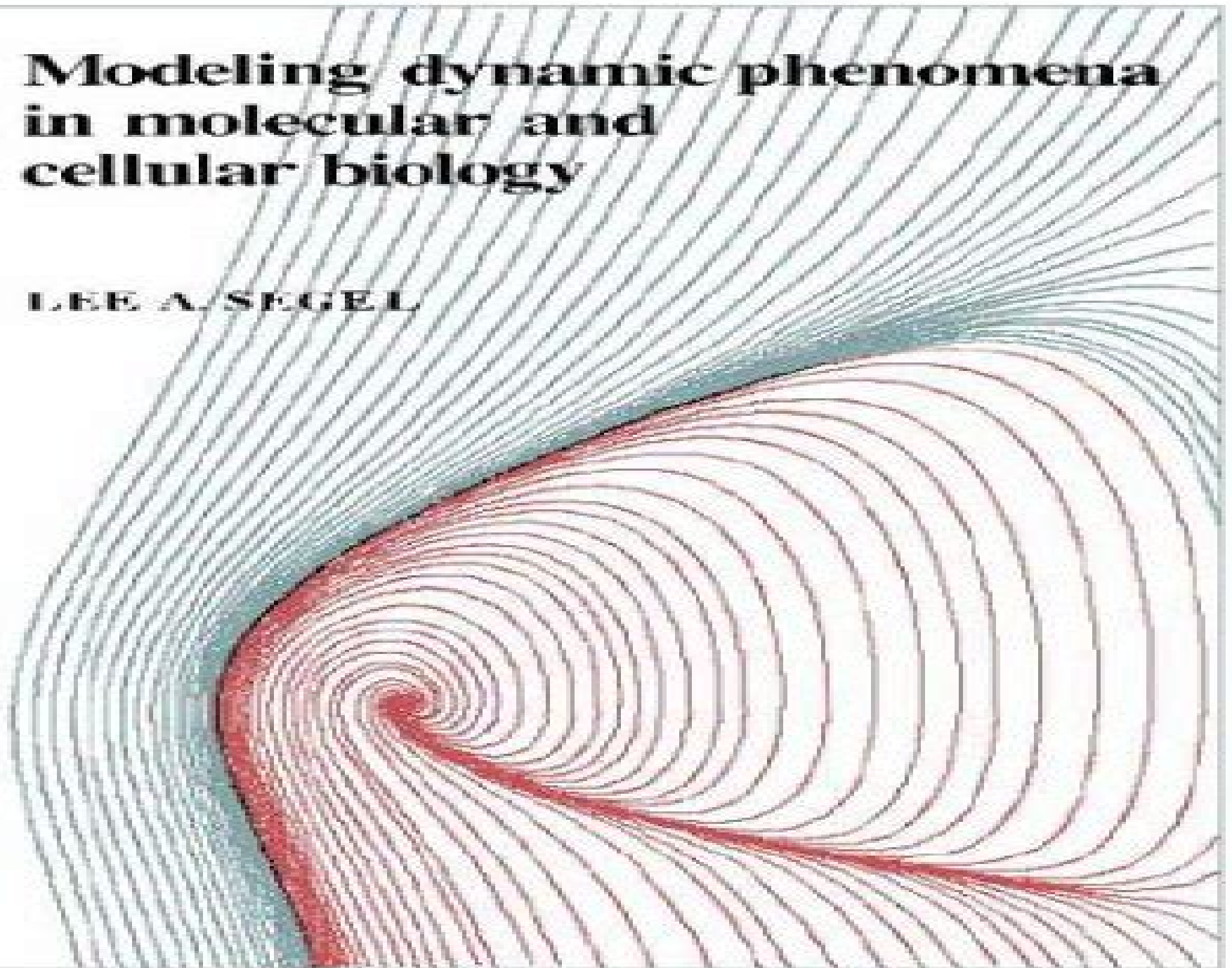


Modeling dynamic phenomena in molecular and cellular biology

LEE A. SEGEL



Modeling Dynamic Phenomena In Molecular And Cellular Biology

Dietmar P.F. Möller



Modeling Dynamic Phenomena In Molecular And Cellular Biology:

Modeling Dynamic Phenomena in Molecular and Cellular Biology Lee A. Segel, 1984-03-30 The dynamic development of various processes is a central problem of biology and indeed of all the sciences The mathematics describing that development is in general complicated because the models that are realistic are usually nonlinear Consequently many biologists may not notice a possible application of theory They may be unable to decide whether a particular model captures the essence of a system or to appreciate that analysis of a model can reveal important aspects of biological problems and may even describe in detail how a system works The aim of this textbook is to remedy the situation by adopting a general approach to model analysis and applying it several times to problems drawn primarily from molecular and cellular biology of gradually increasing biological and mathematical complexity Although material of considerable sophistication is included little mathematical background is required only some exposure to elementary calculus appendixes supply the necessary mathematics and the author concentrates on concepts rather than techniques He also emphasizes the role of computers in giving a full picture of model behavior and complementing more qualitative analysis Some problems suitable for computer analysis are also included This is a class tested textbook suitable for a one semester course for advanced undergraduate and beginning graduate students in biology or applied mathematics It can also be used as a source book for teachers and a reference for specialists

MODELING DYNAMIC PHENOMENA IN MOLECULAR AND CELLULAR BIOLOGY Lee A. Segel, 1987 *Dynamical Systems for Biological Modeling* Fred Brauer, Christopher Kribs, 2015-12-23 *Dynamical Systems for Biological Modeling* An Introduction prepares both biology and mathematics students with the understanding and techniques necessary to undertake basic modeling of biological systems It achieves this through the development and analysis of dynamical systems The approach emphasizes qualitative ideas rather than explicit computation Nonlinear Dynamics and Chaos J. M. T. Thompson, H. B. Stewart, 2002-02-15 Nonlinear dynamics and chaos involves the study of apparent random happenings within a system or process The subject has wide applications within mathematics engineering physics and other physical sciences Since the bestselling first edition was published there has been a lot of new research conducted in the area of nonlinear dynamics and chaos Expands on the bestselling highly regarded first edition A new chapter which will cover the new research in the area since first edition Glossary of terms and a bibliography have been added All figures and illustrations will be modernised Comprehensive and systematic account of nonlinear dynamics and chaos still a fast growing area of applied mathematics Highly illustrated Excellent introductory text can be used for an advanced undergraduate graduate course text *Trends in Nonlinear Analysis* Markus Kirchilionis, Susanne Krömker, Rolf Rannacher, Friedrich Tomi, 2013-04-17 Applied mathematics is a central connecting link between scientific observations and their theoretical interpretation Nonlinear analysis has surely contributed major developments which nowadays shape the face of applied mathematics At the beginning of the millennium all sciences are expanding at increased speed Technological ecological economical and medical

problem solving is a central issue of every modern society Mathematical models help to expose fundamental structures hidden in these problems and serve as unifying tools to deepen our understanding What are the new challenges applied mathematics has to face with the increased diversity of scientific problems In which direction should the classical tools of nonlinear analysis be developed further How do new available technologies influence the development of the field How can problems be solved which have been beyond reach in former times It is the aim of this book to explore new developments in the field by way of discussion of selected topics from nonlinear analysis *Dictyostelium* Richard H. Kessin, 2001-01-11

Dictyostelia are soil amoebae capable of extraordinary feats of survival motility chemotaxis and development Characterised by their ability to transform from a single celled organism into an elaborate assemblage of thousands of synchronously moving cells Dictyostelids are often referred to as social amoebae and have been the subjects of serious study since the 1930s Research in this area has been instrumental in understanding many problems in cellular biology Beginning with the history of Dictyostelids and discussing each stage of their development this book considers the evolution of this unique organism analyses the special properties of the Dictyostelid genome and presents in detail the methods available at the time of the book's original publication in 2001 to manipulate their genes Representing the synthesis of such material and with an emphasis on combining classical experiments with modern molecular findings this book will be essential for researchers and graduates in developmental and cellular biology **A Course in Mathematical Modeling** Douglas D. Mooney, Randall J. Swift, 2021-11-15

The emphasis of this book lies in the teaching of mathematical modeling rather than simply presenting models To this end the book starts with the simple discrete exponential growth model as a building block and successively refines it This involves adding variable growth rates multiple variables fitting growth rates to data including random elements testing exactness of fit using computer simulations and moving to a continuous setting No advanced knowledge is assumed of the reader making this book suitable for elementary modeling courses The book can also be used to supplement courses in linear algebra differential equations probability theory and statistics **Advanced Simulation in Biomedicine** Dietmar P.F. Möller, 2012-12-06

This book presents a collection of invited contributions each reflecting an area of biomedicine in which simulation techniques have been successfully applied Thus it provides a state of the art survey of simulation techniques in a variety of biomedical applications Chapter one presents the conceptual framework for advanced simulations such as parallel processing in biological systems Chapter two focuses on structured biological modeling based on the bond graph method This is followed by an up to date account of advanced simulation of a variety of sophisticated biomedical processes The authors provide many insights into how computer simulation techniques and tools can be applied to research problems in biomedicine The idea for this book arose out of the daily work by experts in their field and reflects developing areas Therefore I think the material is timely and hope that the work described will be an encouragement for others It is the objective of this book to present advanced simulation techniques in biomedicine and outline current research

as well as to point out open problems in this dynamic field Finally I wish to express my thanks to those colleagues who have made this book possible with their contributions

Mathematical Biophysics Andrew Rubin, Galina Riznichenko, 2013-11-26 This book presents concise descriptions and analysis of the classical and modern models used in mathematical biophysics The authors ask the question what new information can be provided by the models that cannot be obtained directly from experimental data Actively developing fields such as regulatory mechanisms in cells and subcellular systems and electron transport and energy transport in membranes are addressed together with more classical topics such as metabolic processes nerve conduction and heart activity chemical kinetics population dynamics and photosynthesis The main approach is to describe biological processes using different mathematical approaches necessary to reveal characteristic features and properties of simulated systems With the emergence of powerful mathematics software packages such as MAPLE Mathematica Mathcad and MatLab these methodologies are now accessible to a wide audience

Mathematics as a Laboratory Tool John Milton, Toru Ohira, 2021-08-11 The second edition of Mathematics as a Laboratory Tool reflects the growing impact that computational science is having on the career choices made by undergraduate science and engineering students The focus is on dynamics and the effects of time delays and stochastic perturbations noise on the regulation provided by feedback control systems The concepts are illustrated with applications to gene regulatory networks motor control neuroscience and population biology The presentation in the first edition has been extended to include discussions of neuronal excitability and bursting multistability microchaos Bayesian inference second order delay differential equations and the semi discretization method for the numerical integration of delay differential equations Every effort has been made to ensure that the material is accessible to those with a background in calculus The text provides advanced mathematical concepts such as the Laplace and Fourier integral transforms in the form of Tools Bayesian inference is introduced using a number of detective type scenarios including the Monty Hall problem

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