program developed for the statics companion book. It is pretty easy to start some of the examples from the book; however, it is never easy to run someone else's code on your own examples, even though the documentation in this book is quite detailed. Readers will probably need the statics companion book to build their own examples. This is particularly true when the mesh is fine, or the structure has complex geometry, in which case users will most likely need to build their own code to produce the input file. All in all, after some effort, the software can be useful to readers in testing different options of the codes, building their own simple examples, and acquiring some additional experience and knowledge about continuum mechanics and numerical methods for their simulations. This extra feature of the book distinguishes it from similar texts, and I found it most beneficial.

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Stochastic Chemical Reaction Systems in Biology. *By Hong Qian and Hao Ge.* Springer, Cham, 2021. $109.99. xxii+351 pp., softcover. ISBN 978-3-030-86251-0.

This book is an applied mathematics textbook on stochastic analysis and modeling for chemical reactions in biological systems. Chemical reactions are intrinsically stochastic and nonequilibrium, and have both mesoscopic/macroscopic descriptions. Meanwhile, probabilistic principles and techniques can be used to study the mechanism of enzyme reactions, reaction rates, intermediate states, entropy production, nonequilibrium thermodynamics, etc. This timely book is the first textbook that is able to systematically describe and analyze complicated biological systems with a set of probabilistic principles and illustrative reasoning.

Moreover, this textbook is accessible for any graduate students with backgrounds in differential equations. The stochastic modeling, probability theories, nonlinear dynamic systems, illustrative analysis, and associated biological implications for various biochemical systems are introduced in a coherent way with a number of illustrative examples. This book is a one-stop shop. It allows readers, working in various fields in applied mathematics ranging from mathematical biology to stochastic analysis and in other fields of science and engineering, to quickly acquire the stochastic approaches, understand the emergent behaviors in biochemical systems, and then explore frontier topics.

In this book, various biological systems such as cellular enzymatic reactions, protein dynamics, single molecular motors, and gene expression are represented as a chemical reaction equation, which at the mesoscopic scale is reviewed as a counting process for the number of chemical species with specific reaction rates. Through this stochastic viewpoint, the Gibbsian chemical thermodynamics—mainly the energy and the entropic force—can be derived from limiting theorems in probability, including the law of large numbers, the central limit theorem, and the large deviation principle. This enables one to systematically derive the deterministic properties via the passage from mesoscopic to macroscopic dynamics in the thermodynamic limit. Particularly, the law of large numbers gives the macroscopic reaction rate equations. The resulting deterministic dynamic systems give multiple attractors, the phase transition between metastable states, bifurcation phenomena, etc. The large deviation principle for the invariant measures determines the macroscopic energy landscape. This energy landscape not only guides the nonlinear dynamics for the chemical reaction rate equation as a Lyapunov function, but also breaks the macroscopic decomposition for the total entropy production rate into adiabatic and nonadiabatic parts in equilibrium and nonequilibrium reactions. The positive entropy production rate at the nonequilibrium steady states represents the constant exchange of materials and energy between the biological system and the environment.

One issue we had with this book is that some of the mathematical results are not rigorous. However, this is understandable due to the applied nature of this subject. Additionally, there is a lack of related exercises after each chapter, which would be useful for lecturers teaching a related course.

We recommend this book to any graduate students and researchers seeking to learn chemical reactions from a stochastic viewpoint via a unified set of probabilistic principles. This book covers the most important topics in biochemical reactions with intuitive and self-content presentations, making it a good starting point. The high level mathematics of this book also allows the content to be applied to a wide range of models, such as in ecology and population dynamics.

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Introduction to Quantitative Ecology. *By Timothy E. Essington.* Oxford University Press, Oxford, 2021. $45.95. xvi+304 pp., softcover. ISBN 978-0-192-84347-0.

This textbook covers mathematical and statistical approaches to solving problems and gaining insights relevant to ecology, with emphasis on realism and interdisciplinary techniques. It describes itself as being suitable for upper-division undergraduates or incoming graduate students. For readers coming from an ecological background, this is generally accurate. The mathematical prerequisites for understanding this book are calculus, linear algebra, and probability. Topics beyond this are given attention within the book and explained in language that is not overly technical. Concepts that are sufficiently computationally intensive are introduced using mostly plain language, and the reader is referred to Part III of the textbook for more details. For people coming from a more mathematical background, no specialist biological knowledge is required to read this book. Hence, for them, it could serve as a reference for how the techniques that they already know could be applied in an ecological setting.

The focus of this book is on teaching students how they can utilize mathematics in ecology more generally, as opposed to highlighting specific areas of contemporary research. However, several interesting papers from the past decade are referenced throughout the book, and the final section lists some broad research topics in quantitative ecology. This means that there is enough material contained here for those interested in research to take the next step independently.

A major strength of this textbook lies in how it links dynamical models with statistics and real-life data. As stated very early on in the book, these two approaches to quantitative ecology are often separated from each other in undergraduate education (as was the case in my own relatively recent experience). The value of the book is therefore added to by its ability to draw in people from disparate fields, for example, field ecology and more pure forms of mathematics. For those coming into mathematical ecology from a more theoretical background, becoming acquainted with data and how to use it is critical, as it underscores the focus on real-world relevance that applied mathematics is defined by.

The book capably accomplishes this in Parts II and III, which are devoted to statistics, data, and computational techniques. A mathematics undergraduate should have no trouble with the concept that real-world processes can be represented mathematically, although they might find it daunting to determine how to do so. In light of this, the book devotes significant attention to topics such as model selection using the Akaike information criterion, parameter fitting, and sensitivity analysis to unveil which parts of a model have the greatest impact. The book also provides concrete examples of ecological scenarios in which a quantity of interest could be described by each of several different probability distributions. All of this material will naturally be helpful to students that have the mathematical tools but do not yet know how best to apply them. This exploration of data-driven approaches to modeling should be able to convince a mathematician interested in ecology that the intersection of those two fields extends well beyond what can be accomplished by purely analytical means.

Likewise, the book is structured in such a way that it will encourage ecology students willing to make the leap into mathematics. Part I of the book covers dynamical