

Preface

Research, development, and design in bioengineering, biomedical engineering, biophysics, physiology, and related fields rely increasingly on mathematical modeling and computational simulation of biological systems. Simulation is required to analyze data, design experiments, develop new technology, and simply to attempt to understand the complexity inherent in biological systems.

This book focuses on practical implementation of techniques to study real biological systems. Indeed, whenever possible, specific applications are developed, starting with a study of the basic operation of the underlying biological, biochemical, or physiological system and, critically, the available data. It is hoped that this data-rich exposition will yield a practical text for engineering students and other readers interested primarily in earthy real-world applications such as analyzing data, estimating parameter values, etc. Thus for the examples developed here, important details of underlying biological systems are described along with a complete step-by-step development of model assumptions, the resulting equations, and (when necessary) computer code. As a result, readers have the opportunity, by working through the examples, to become truly proficient in *biosimulation*.

In this spirit of soup-to-nuts practicality, the book is organized around biological and engineering application areas rather than based on mathematical and computational techniques. Where specific mathematical or computational techniques can be conveniently and effectively separated from the exposition, they have been and can be found in the Appendices. Computer codes implemented in MATLAB® (The MathWorks, Natick, MA, USA) for all of the examples in the text can be found online at the URL <http://www.cambridge.org/biosim>.

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