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Book Review: *Nonlinear Dynamics and Chaos*

Nonlinear Dynamics and Chaos. Steven H. Strogatz, Addison-Wesley, Reading, Massachusetts, 1994.

As stated in the preface, this book is intended for students taking a first course in nonlinear dynamics and/or chaos. In that respect I can say that this is a rather remarkable undergraduate textbook. A large number of important concepts in the theory of dynamical systems are described and elaborated on in the exercises and examples without requiring more than basic knowledge of calculus and classical mechanics.

The material is presented in a clear and orderly fashion starting with an overview in which author gives a historical review of the subject area and classifies dynamical systems in terms of their complexity and linearity. Part I of the book contains a study of one-dimensional systems. For such systems the basic concepts necessary for later analysis and exemplified by fixed points, stability analysis, and bifurcations can be introduced without a great deal of complications. The second part of the text describes the additional complicating factors required for the study of higher-dimensional systems. This is done in the framework of two-dimensional systems, where the detailed classification of the dynamical systems can easily be visualized and in which the concepts describing much more complex dynamical behavior can be introduced, such as the general classification of stable points, phase planes, and limit cycles. Finally, in the third part of the book Strogatz introduces the idea of chaos, again taking a historical approach to the subject, starting with the Lorentz equations (but ignoring the contribution of Poincaré) and then proceeding to a discussion of logistic maps. The concept of fractals is discussed at the end of this chapter, but mainly to accompany the last section on strange attractors.

In my opinion this book is a very readable one, even for someone who is totally unfamiliar with the idea of dynamical systems. This feature is due to the author's skillful use of interesting examples, stories, and anecdotes relating to the development of the theory of dynamical systems. This sometimes gives the book a novel-like character, motivating the reader to

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continue on to the next topic. However, the exercises at the end of each section are an important element in the exposition and should not be skipped. Despite the fact that there are numerous solved examples running through the body of the text, these exercises are necessary to develop the reader's confidence in his or her mastery of the subject and are well placed. This book is also very well suited for use as supplementary reading in a graduate course on the subject, due to its clear presentation and abundance of definitions. However, I would not recommend this book for use as a reference book only. In that regard, the one and only thing that I could think of that would improve the book is the addition of a short summary at the end of each section as a fast reference. In summary, this is an excellent book and it was certainly a great pleasure reviewing it.

Sinisa Pajevic
Division of Computer Research and Technology
National Institutes of Health
Bethesda, Maryland 20892
email: pajevic@chaya.dcrt.nih.gov