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Book Review

by Steven G. Krantz

Steven H. Strogatz, *Nonlinear Dynamics and Chaos*, Addison-Wesley Publishing, Reading, 1994. ISBN 0-201-54344-3.

The world is full of cookie cutter books about fractals, chaos, and dynamical systems. To a Greek chorus background chant of "Me too," many an author tells us how chaos and fractals provide a new paradigm of nature; but then these authors generally tell us the same old story of the von Koch snowflake curve, the Peano space filling curve, the Cantor set, and other self-similar mathematical phenomena. They spend most of the remainder of the book describing the mathematical machinery pertaining thereto. In short, the promised analysis of physical phenomena is rarely forthcoming—at least not in any satisfying detail—and the books therefore not very satisfying.

The book under review is a refreshing departure from that dreary norm. To be sure, the first couple of pages revel in a cloying overuse of hyperbole, but the bulk of the book really tells us how to apply bifurcation theory, phase plane analysis, Lorenz equations, strange attractors, and other artifacts of non-linear analysis to the study of insect outbreak, love affairs, weakly nonlinear oscillators, cryptography, chemical chaos, and many other concrete situations. The diversity of examples is both striking and compelling.

The book is intended for a genuinely broad audience. Only single variable calculus, and a smattering of multi-variable ideas, is requisite of the reader. The book is informal, but honest. In other books I have actually seen a "strange attractor" defined as an attractor that behaves strangely. This is surely a difficult notion to explain to a tyro, but it is a measure of Strogatz's skill that he does it so well.

I think that students will find this book both readable and enticing. Exercise sets are ample, and will give students and the instructor plenty to discuss. The author encourages students to *try* things; in fact he is successful in conveying the notion that in mathematics you are (if you wish) in control, that you can challenge and verify and modify what you read. Strogatz knows the mathematics, knows the physics, and knows the relevant software. He gives the student a convincing and admirable picture of a scientist at work.

More than any undergraduate book that I have seen in recent years, the book by Strogatz is one that can lure students into the mathematical sciences, make them want to change their major, spark in them some real intellectual curiosity. At my university we have a new undergraduate course on dynamical systems; but we have been frustrated in finding an appropriate text. When I next teach the course, I shall certainly use Strogatz's book.