J. Fluid Mech. (1987), *vol.* 185, *p.* 599
Printed in Great Britain

REVIEW

Nonlinear Dynamics and Chaos. By J. M. T. Thompson and H. B. Stewart. Wiley, 1986. 376 pp. £19.50.

The subtitle of this book is *Geometrical Methods for Engineers and Scientists*, which correctly identifies an appropriate audience while slightly overstating the contents. It is actually an excellent book for someone who wants to get an idea about modern dynamical systems methods for studying nonlinear ordinary differential equations and mappings without having to worry with detailed explanations of the methods, and I would happily recommend it to anyone who was interested in learning a little of what is going on in the field. It covers a wide range of topics in a well organized way, is amply illustrated with figures and well motivated by simple physical examples (blocks and springs etc.).

As a mathematician, though, I would attach a health warning before lending it to a friend. This would say something along the lines of, 'Beware: reading this book may damage your critical faculties'. There are frequent oversimplifications, an urge to name things which could easily lead you to believe that bifurcation theory was a dead duck (there are, according to the book, two kinds of codimension-one bifurcation from a three-dimensional attractor – these are the 'chaotic explosion' and the 'chaotic blue-sky catastrophe' – both names in fact cover a multitude of sins) and occasional simplifying fibs. Theorems are very rarely stated precisely and are never proved, and geometric methods are not described in sufficient detail for them to be usable in problems arising in the course of one's own work. Roughly speaking, I think this is fine. Certainly I would not like to have to concoct the sentences that left the book as readable as it is now while conveying a little more of the subtlety of the subject. Nonetheless, I wish they were there. The reader without the health warning is either going to come away thinking that a 'chaotic attractor' is a well-understood object (which it is not), or, if slightly more diligent in his reading or enquiring of mind, frustrated that not all parts of the story hang together quite so well as the text leads you to believe. My own reaction was to feel that the book was trying, gently, to bamboozle me, but I did not really mind.

The book ends with a section called 'Applications to the Physical Sciences' including a short essay by Harry Swinney on observations of chaos in various systems, including Rayleigh–Bénard convection and the Couette–Taylor system, which readers of the *Journal of Fluid Mechanics* may find interesting (though it has been previously published elsewhere). Here we see that real systems can and do show similar behaviour to that of the finite-dimensional systems considered in the first three-quarters of the book, though the discussion is more on the level of matching up phenomenologies than of real explanation. Such, however, is the state of the art, and in these chapters as in the previous ones my only real criticism is that the exciting and interesting problems raised by these examples are hidden behind the desire to make definite (but mathematically ill-defined) statements about what is going on.

It is, perhaps, too easy to be critical in a review, so I shall end as I began in a more positive vein. The field of Nonlinear Dynamics is an interesting and active one and this book will certainly start you off in a relatively painless way. It has a good index and lots of references and if you are excited by it, as you well may be, there are many much less readable books and papers to consult when the details begin to worry you.

Colin Sparrow