J. Fluid Mech. (2000), *vol.* 408, *p.* 346. Printed in the United Kingdom

BOOK REVIEW

Modelling with Differential and Difference Equations. By G. FULFORD, P. FORRESTER & A. JONES. Cambridge University Press, 1997. 405 pp. ISBN 0 521 44618 X. £19.95 (paperback).

This clearly written textbook is based on a course given to first-year university students. The mathematical level is comparable to a first-year calculus course, which many of the students who used the material were taking simultaneously. The writing is crisp and the main ideas of each topic are clearly and succinctly introduced. The topics of differential and difference equations are discussed together in a way that many instructors are likely to find appealing. The book has basically three themes: (i) introducing differential equations using models from mechanics; (ii) introducing and applying difference equations drawing on examples from economics, finance, population growth, and genetics, and (iii) additional applications of differential equations from the physical sciences. Some computer exercises are suggested, though a user of the book may have wished for a more complete link to one of the common mathematical computer packages available, such as Maple, Mathematica or Matlab.

Most sections end with a selection of problems, which are clearly explained and expand on material discussed in the text. The authors' aim is clarity and diversity of applications, rather than say sophistication of the mathematical methods or the mathematical examples. In the case of differential equations, the authors are content, with only a few exceptions, to consider constant-coefficient first-order and second-order equations. Topics are well motivated and, for example, there are sections on simple harmonic motion, simple heat loss including the influence of insulation, and mixing in tanks and lakes. Near the end of the book there is some discussion of coupled equations. In the chapters on difference equations, the discrete version of the logistic equation is introduced and the chaotic response discussed.

Readers of *JFM* will be happy to learn that the authors incorporate some examples from fluid mechanics including Stokes drag, a description of Reynolds numbers, and an application to the Milliken oil-drop experiment. Some kinematics of particle motion is also discussed.

Overall, this book is likely to appeal to those interested in a first course in mathematical modelling where the mathematical sophistication is kept to a minimum. It seems quite possible that, with some selection, the book would be useful for a one-semester university course. The combination of differential and difference equations, and so the ability to draw on applications spanning mechanics, economics, population growth, etc. would make the course appealing to many students.

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