computational fluid dynamics (CFD) and the rest. The book under review is not the place to find out about random choice methods in two or more space dimensions nor to find out how vortex methods are implemented. However, the method of lines is mentioned in Chapter 9. By and large the CFD community is not much concerned with general purpose numerical libraries nor with portable software.

Since the summer school that launched this book was inspired by the high degree of sophistication attained in some libraries, it is quite appropriate that the book should reflect that achievement. One can now find well-tested software covering most recognized special tasks in the areas of matrix computations, ordinary differential equations, integral equations, definite integrals, elliptic and parabolic partial differential equations, approximation and optimization. It is pleasant to work in a mathematical field that leads to tangible products.

It is strange that many engineers are happy to use FORTRAN and the elementary functions it provides, yet still, in the 1980s, will write their own programs to integrate a system of differential equations. If the day comes when the working engineer routinely builds his (or her) programs using high-level building blocks from libraries such as NAG, then it will be due, in part, to the availability of books such as 'Numerical Algorithms'.

B. N. P.

35[76B15].—I. KINNMARK, *The Shallow Water Wave Equations: Formulation, Analysis and Application*, Lecture Notes in Engineering, Vol. 15, Springer-Verlag, New York, 1985, xxv + 187 pp., 24 cm. Price $18.00.

The modelling of wave propagation in shallow water has a long history, especially with the need to understand and predict tides. While much of the tidal work since the time of Laplace is based on the hydrostatic approximation and a linear approximation to the conditions at the free surface, it was already appreciated by Boussinesq in 1886 that small nonlinear effects at the free surface could also play a decisive role in the evolution of long waves—our understanding of the propagation of tsunamis is based on such models. Thus, the modelling of longwave phenomena in practical situations, trying to balance the effects of dispersion, nonlinearity, dissipation, irregular bottom topography, the influence of the earth's rotation, and the role of atmospheric interaction in the generation of waves, is known to be an intricate process. It follows that a book purporting to discuss the formulation, analysis and applications of the shallow water wave equations will have lots of interesting fluid dynamics to discuss. Not so. In fact, the present volume provides a discussion of the pros and cons of various methods for obtaining numerical approximations to the solution of Laplace's tidal equations. So the term 'formulation' here refers to considerations of whether or not it is better to take the equations in conservation form for numerical computation, and 'analysis' refers to stability considerations for numerical approximations to the model equations.

When obtaining numerical solutions to the tidal equations, the problems of aliasing, associated with grid-scale discretization error, are known to be a major source of difficulty and so the main focus of these lecture notes is, in fact, directed towards the development of methods that suppress grid-scale oscillations. Thus, the central theme and the main thrust of the book concerns linear stability analyses of various formulations of the equations together with some examples, based on model problems, of the relative efficacy of the various methods. In a final brief chapter, entitled 'Applications', a specific example associated with the southern region of the North Sea is considered in the light of the preceding discussions.

The red-covered Springer series of lecture notes aims to provide rapid, refereed publication of topical items, longer than ordinary journal articles, but shorter and less formal than most monographs and textbooks. This relative informality probably accounts for the narrow theme of the book, but even then I found the book to be unappealing on several counts. Too much of the discussion revolves around detailed elaboration of highly specific issues, utilizing quite standard methods of analysis and presenting detail of little interest to the general reader: to wit, the twenty-five pages of text and tables concerning the character of roots of low-degree polynomials. I felt that with a little extra mathematical sophistication the same material and concepts could have been presented far more succinctly, opening up the possibility of greater elaboration of the modelling procedures. As an example, there is no discussion in the book of how boundary conditions are to be incorporated into the models and yet, in the chapter on applications, an arbitrary truncation of the natural flow domain is made on which so-called 'open boundary conditions' are applied, but never defined. Also I would dearly have liked the presentation of quantitative convergence studies to enable a more direct comparison of the relative merits of the various methods under discussion. And, as implied above, there is no discussion whatsoever of the physics underlying the models or of their application to the practical world.

At a more mundane level, the English expression is sometimes a little awkward and punctuation is often lacking, especially with regard to displayed formulae. The text is aimed at a very narrow engineering audience. I do not see it as being of general interest to readers of *Mathematics of Computation.*

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36[35Q20, 35–02].—P. L. SACHDEV, *Nonlinear Diffusive Waves*, Cambridge Univ. Press, Cambridge, 1987, vii + 246 pp., $23\frac{1}{2}$ cm. Price $49.50.

The nonlinear diffusive waves of the title are waves satisfying Burgers' equation

$$u_t + uu_x = \frac{\delta}{2}u_{xx} \qquad (1)$$

or one of its generalizations. Burgers' equation is often used as a simplified model of turbulence and is remarkable because it may be linearized using the Cole-Hopf transformation. For contrast, the author also discusses some nonlinear waves that are not diffusive and some diffusion processes that are not waves. The Korteweg-deVries soliton, solving an equation like (1) with the term u_{xx} replaced by $-u_{xxx}$, is the nondiffusive nonlinear wave discussed here. The discussion is however exceedingly brief, presumably because of the extensive treatments to be found in many