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.*

W. G. PRITCHARD

Department of Mathematics
The Pennsylvania State University
University Park, Pennsylvania 16802

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

$$u_t + uu_x = \frac{\delta}{2} u_{xx} \tag{1}$$

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 other texts. The nonlinear diffusion processes chosen for contrast are those satisfying the porous media equations, i.e., those having a diffusion coefficient proportional to a power of the diffusing quantity. These diffusion equations are discussed at some length, and include some recent topics not to be found in other texts. On the whole, about 90% of the text is devoted to Burgers' equation. The analysis is formal with references to the literature for proofs and details. The level of presentation is suitable for advanced undergraduate or beginning graduate courses in applied or engineering mathematics.

The fifth and last chapter of the book is devoted to a compendium of numerical methods for solving nonlinear diffusion equations. Pseudo-spectral numerical methods are emphasized, but the introduction to these methods is cursory. A novice will need to study some other treatment such as that of Gottlieb, Hussaini, and Orszag [3] to obtain a thorough grounding in the subject. The emphasis throughout is placed on summarizing the known results for nonlinear diffusion and nonlinear diffusive waves.

The shortcomings of the text that I noted were these: (i) Although there are many references given to pertinent literature, I found that the author's choices did not always include the first or most significant citation for the topic being discussed. For example, when discussing a class of nonlinear equations that can be solved exactly, Sachdev references the work of Fokas and Yortsos [2] but not the earlier work of Bluman and Kumei [1]. The choices made in such cases seemed arbitrary to me. (ii) The discussion of the Korteweg-deVries equation seemed too brief to be useful, as if the author assumed substantial prior knowledge of solitons and soliton equations. This lack of completeness makes the text of less value than it might have been as a supplementary text in a course on nonlinear partial differential equations.

The book is certainly a useful guide to much of the recent literature on nonlinear diffusion and diffusive waves, providing a very thorough summary of current knowledge of the behavior of solutions to Burgers' equation and its generalizations. As such, it will no doubt become a widely used reference for researchers beginning to explore this part of the fascinating field of nonlinear applied mathematics.

JAMES G. BERRYMAN

Courant Institute of Mathematical Sciences
251 Mercer Street
New York University
New York, New York 10012

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2. A. S. FOKAS & Y. C. YORTSOS, "On the exactly solvable equation $S_t=[(\beta S+\gamma)^{-2}S_x]_x+\alpha(\beta S+\gamma)^{-2}S_x$ occurring in two-phase flow in porous media," *SIAM J. Appl. Math.*, v. 42, 1982, pp. 318–332.

3. D. GOTTLIEB, M. Y. HUSSAINI & S. A. ORSZAG, "Theory and application of spectral methods," in *Spectral Methods for Partial Differential Equations* (R. G. Voigt, D. Gottlieb, and M. Y. Hussaini, eds.), SIAM, Philadelphia, Pa., 1984, pp. 1–54.