17[41-02, 65-02].—WILL LIGHT (Editor), *Advances in Numerical Analysis*, Vol. II: *Wavelets, Subdivision Algorithms, and Radial Basis Functions*, Clarendon Press, Oxford, 1992, viii+210 pp., 24 cm. Price \$49.95.

This volume is devoted to three major topics in theoretical multivariate approximation. It contains three chapters, each reflecting a course of lectures at the Fourth Summer School in Numerical Analysis, University of Lancaster, 1990. The authors-lecturers and titles are as follows. 1. Charles K. Chui, "Wavelets and Spline Interpolation" (32 pages); 2. N. Dyn, "Subdivision Schemes in Computer-Aided Geometric Design" (63 pages); 3. M. J. D. Powell, "The Theory of Radial Basis Function Approximation in 1990" (106 pages). As explained in the preface, the exposition in the lectures (and the chapters) was to be "pitched at such a level that researchers and graduate students could both gain something useful from the courses". The level of expository writing is high, and the volume can be recommended for introducing the reader rapidly to the subjects addressed, and bringing her up to date in each.

E. W. C.

18[65-01, 65N38].—GOONG CHEN & JIANXIN ZHOU, *Boundary Element Methods*, Computational Mathematics and Applications, Academic Press, London, 1992, xx+646 pp., $23\frac{1}{2}$ cm. Price \$87.00.

The object of the book is to present both the mathematical and the numerical background involved in the study of boundary integral methods. The authors have selected and synthetized, from many authors and books, all the tools which are necessary for a study of the subject.

The first three chapters contain a digest of the essential tools in functional analysis needed:

- Introduction to Sobolev spaces with the essential results (including some proofs)
- Sketch of the theory of distribution with many examples, including most of the usual finite part integrals.

In Chapter 4, they introduce pseudodifferential operators in $\mathbf{R}^n$. These are the classical elliptic ΨDOs considered as operators on Sobolev spaces. Then, in §4.4, they apply this theory to boundary integral operators (multiple-layer potentials for the Laplacian). Surprisingly, their definition of the symbol is wrong (formula (4.66), page 99), and they in fact compute the symbol of the image by the mapping (flattening $\partial\Omega$) of the Laplacian. This operator is different from the Laplacian, but not too much, so that their result is almost correct and the error does not affect the rest of the book. In §4.5, they present the Calderón operator, in a quite general and complicated manner. But the basic results are clearly obtained. They end this chapter with a classical but neat presentation of the Fredholm theory in Sobolev spaces, with some applications to boundary integral equations for the Laplacian.

Chapter 5 is devoted to a presentation of finite element theory with all the classics:

- Variational formulation and Lax-Milgram theorem
- Inf. Sup. conditions

- The main families of finite elements
- Inverse inequality and Aubin-Nitsche theorem.

It has the merit of being short and comprehensible.

The rest of the book is devoted to applications of the previously introduced tools. In Chapter 6 the Laplace equation is considered and the authors present the essentials of Giraud's theory, i.e., the $C^{0,\alpha}$ theory of the potentials and jump properties associated with the Laplacian, and they deduce all the classical limit behavior at the boundary of these potentials. Using then the pseudodifferential operator results in the case of data in some Sobolev spaces, they extend these properties. They also give the coerciveness property of the simple-layer potential (with a wrong historical reference). We also must mention that the finite parts used by the authors are incorrect to treat the double-layer potentials (page 279 and following). There follow some numerical examples, quite elementary, but interesting from the pedagogical point of view. Chapter 7 is devoted to the Helmholtz equation. It contains a nice presentation of most aspects of the problem, including the radiation condition, the problem of interior eigenvalues and also some nice numerical experiments (in color). Chapter 8 concerns the plate problem and is rather confusing, although the main ideas are quite clear. The presentation of the triple or quadruple layer is probably original but only sketched. Chapter 9 contains a classical treatment of elastostatics and would be simplified by the use of a quotient space. Chapter 10 contains some aspects of error estimates with emphasis on approximation by splines (and collocation).

In conclusion, despite some weaknesses, the book is well written and quite clear. Most of the material is largely classical and already contained in some text books. But the selection of topics is good in general, and it is probably one of the first self-contained books on the subject of boundary integral equations (except [1]). This is its main interest that will make it very useful for Ph.D. students working on this subject.

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1. R. Dautray and J.-L. Lions, *Analyse mathématique et calcul numérique pour les sciences et les techniques*, tome 3, Masson, Paris, 1985.

19[65-06, 65Lxx, 93-06].—EDWARD J. HAUG & RODERIC C. DEYO (Editors), *Real-Time Integration Methods for Mechanical System Simulation*, NATO ASI Series, Series F: Computer and Systems Sciences, Vol. 69, Springer, Berlin, 1991, viii+352 pp., 25 cm. Price $79.00.

Among the many published proceedings, this one from an August 1989 NATO Advanced Research Workshop can be strongly recommended. The authors of the 18 contributions work in mechanical engineering and numerical mathematics. All come from industries, universities, and research institutes. The talks deal with the numerical performance of multibody system formulations for specific examples and in general. The resulting mathematical model is a differential-