a third of the present volume, it is by far the longest paper and exceeds perhaps the ideal length of a survey paper for this series. After the groundwork laid in the -94 volume on control of linear diffusion equations, the authors continue in a systematic way to cover boundary control, control of Stokes systems and nonlinear diffusion equations, and control of wave equations and coupled systems. The different sections begin with theoretical considerations and continues with discretization with respect to both time and space, iterative techniques, and finally the results of a large number of numerical experiments.

Numerical Solution of Free Boundary Value Problems, by T. Y. Hou, is concerned with recent advances in developing efficient and stable numerical methods for problems with propagation of free surfaces, such as water waves, boundaries between immisible fluids, vortex sheets, Hele-Shaw cells, thin film growth, crystal growth and solidification. The paper first discusses locally well-posed problems using the boundary integral method, with application to water waves, and in a second part such methods are applied to ill-posed problems of fluid interfaces, mentioning in particular vortex sheets and associated singularity formation. In further sections the stabilizing effect of boundary tension is considered, as well as problems for which the boundary integral method is not suited.

Particle Methods for the Bolzmann Equation, by H. Neunzert and J. Struckmeier, discusses in a rather informal way numerical simulation of rarified gas flows by particle methods. After a section on collision integrals, particle methods are introduced first for the spatially homogeneous and then for the inhomogeneous Bolzmann equation. Practical aspects, relating to collision pair selection, stochastic methods, use of singular limits, domain decomposition, and use of parallelism are touched upon and some numerical results presented.

The New qd Algorithms, by Beresford N. Parlett, presents recent work, in which the author has been involved, concerning methods for computing eigenvalues and eigenvectors of tridiagonal matrices. The new algorithms discussed are based on factoring such tridiagonal matrices into bidiagonal ones and on Rutishauser's LR algorithm.

The numerical mathematics community will look forward to the 1996 volume of Acta Numerica with anticipation.

VIDAR THOMÉE

6[65-01, 65M06, 65N06]—*Numerical solution of partial differential equations*, by K. W. Morton and D. F. Mayers, Cambridge University Press, Cambridge, 1994, 227 pp., $22\frac{1}{2}$ cm, hardcover, $54.95, paperback, $22.95

This is a book that grew out of undergraduate courses at Oxford. The emphasis is on traditional finite difference theory and the use of stability (and consequent emphasis on truncation errors). Stability is considered in L_∞ for parabolic and elliptic problems (using maximum-principles) and in L_2 (von Neumann-Fourier analysis) for hyperbolic and parabolic problems.

The presentation, naturally given in model situations for a course of this nature, is very clear and precise with mention (and most often some analysis) of key practical issues such as curved boundaries.

I believe that, in a first course of this nature, the Lax Equivalence Theorem should come with warning labels: "Do not thoughtlessly discard unstable methods."

(E.g., the Lax-Wendroff method is unstable in all L_p-spaces except $p = 2$.) Its main practical importance is, after all, that many methods which are unstable in $\underline{L_2}$ are "exponentially unstable" and useless.

I further believe that a course of this nature should devote some space to the construction of finite difference methods on irregular meshes, e.g., the control volume method. (Their analysis would be too far afield.) As it is, irregular meshes are presented only in a short section on the finite element method. However, the flashy cover picture is for a highly irregular mesh, as are all those nice pictures given in the introduction to grab the student's attention!

One can always argue with the material selected; I have taught a similar course at Cornell and then placed more emphasis on modern fast iterative methods (and, irregular meshes). By sticking to the straight and narrow in carefully selected material rather than painting with a broad brush, this book should succeed in imparting a critical attitude and feeling to the students for what should or should not be done in a practical solution.

LARS B. WAHLBIN

7[65-01]—*Computer Numerik 1, 2*, by Christoph Überhuber, Springer, Berlin, 1995, (Part 1) xvi + 511 pp., (Part 2) 515 pp., $23\frac{1}{2}$ cm, softcover, DM 78.00

Although, formally, *Computer Numerik* by Christoph Überhuber comes in two parts, both volumes should be regarded as a whole. *Computer Numerik* thus is a comprehensive, 1000 page textbook on numerical computing for practitioners. It bridges the gap between mathematics dominated treatises on numerical analysis on the one hand and recipe-type collections of numerical programs on the other hand.

The first 8 (out of 17) chapters of *Computer Numerik* discuss general aspects of numerical computing like the modelling process, basic numeric concepts, sources and types of errors, modern computing platforms (hardware and languages) and basic issues on commercial as well as public domain software for numerical computing. Modelling related issues and error identification are given particular emphasis and the author develops a fairly elaborate, detailed, sometimes novel (not always standard) terminology and concept formation in this context.

Chapters 9 to 17 deal with different problem classes for which existent numerical software has reached a sufficient state of maturity: Approximation, interpolation, Fourier-transforms, evaluating integrals, linear and nonlinear systems of equations, the eigenproblem, sparse matrices and random number generation. Each of these topics is approached in a way that particularly fits the needs of the practitioner: Mathematical *concepts* are explained in detail while *proofs* or more involved *numerical details* in the algorithms are left out. Limitations and finite precision issues in each problem class are identified so that the reader gets a clear impression of what can realistically be achieved. For each problem class the book points to the relevant available software in commercial numerical libraries like NAG and IMSL and to corresponding state-of-the-art public domain software packages like LAPACK, QUADPACK or ITPACK. All subjects are illustrated by various (more than 500 in total!) impressive and non-trivial example applications. However, I would have liked to see one more chapter on validating numerical techniques (which take round-off into acount) and corresponding software instead of the one and only very short remark on that subject in Chapter 4.