and with the nice selection of problems included, the book can serve as a text for a very interesting secondary excursion into the realm of matrix theory.

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15[3, 3.25].—I. S. DUFF & G. W. STEWART (Editors), *Sparse Matrix Proceedings*, SIAM, Philadelphia, Pa., 1978, xvi + 334 pp., 24 cm. Price $21.50.

The papers in this book were presented at the Symposium on Sparse Matrix Computations held in Knoxville, Tennessee on November 2–3, 1978. Fourteen papers were presented on applications, software, and algorithms. The programming committee has tried to present an up-to-date account of developments in the area of sparse matrix computations.

J. H. B.

16[13.05].—CLAUDE JABLON & JEAN CLAUDE SIMON, *Applications des Modèles Numérique en Physique*, Interdisciplinary System Research 53, Birkhäuser Verlag, Basel, Stuttgart, 1978, 283 pp., 23 cm. Price Fr. 48.–.

This volume is written, in particular with physicists in mind, to explain the rules and help avoid pitfalls in numerical computation. The introduction is unusual in that it includes a discussion of the representation of mathematical models by computer programs from the aspects of linguistics and the theory of computation. The book then explains the basic concepts of numerical computation and goes on to treat numerical methods for a nonlinear equation, interpolation and approximation, and differential equations. The depth of treatment varies considerably and, as is reasonable in a book aimed at physicists, parabolic and elliptic partial differential equations are given relatively much space. The final chapter contains a useful discussion of the role of numerical models in physics and gives some hints on how to structure and document a Fortran program.

This book does not attempt to give a complete coverage of numerical methods, but even so the topics could have been better chosen. The most striking omission is that there is no systematic treatment of numerical methods of linear algebra. For example, eigenvalue problems, which certainly arise very frequently in physical applications, are not at all treated here. I also think that some space should have been devoted to methods for solving minimization problems and systems of nonlinear equations. The hope, expressed by the authors on page 13, that ideas in the (very short) section on solving a single nonlinear equation should enable a reader to tackle systems of nonlinear equations, seems to me to be very optimistic. I would have much preferred a modern treatment on spline approximation to the long section devoted to approximation by sums of translated functions. In the last chapter I missed a comment on the importance of portability.

The fact that descriptions in this book are very much from a user physicist's point of view might attract readers. I liked the introduction and the final chapter best.

However, the presentation is often rather superficial and to a large extent the book does not present state of the art methods. Therefore, there are several other books (in the English language) which I would rather recommend to a physicist or engineer. Unfortunately, these books are not even referenced in this text.

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17[5.00].—W. L. Wendland, *Elliptic Systems in the Plane*, Fearon-Pitman, Belmont, California, 1979, xi + 404 pp., 24 cm. Price $64.95.

The numerical solution of elliptic boundary value problems is an active area of research, as readers of this journal know. Most of the computational effort in this subject is devoted to two-dimensional problems, if only because of the cost of higher-dimensional calculations. On the other hand, the theory of elliptic boundary value problems is well developed, and the theory has simplifications for problems of two independent variables. This book gives, in the first part, a treatment of boundary value problems for elliptic systems in two independent variables, and in the second part, a treatment of the numerical solution of these problems. The result is an unusual collection of material that is worthy of consideration by those that are seriously interested in the subject.

The first part of the book is devoted to the solvability and regularity theory for elliptic systems in two independent variables. Various normal forms for these systems are given, and the Fredholm character of the problem is established by a homotopy argument. Formulas for the index of the problem are given. There is a brief discussion of nonlinear problems. Several integral equation formulations of these problems are also given. There is no discussion of piecewise smooth coefficients or domains, or of systems that are elliptic in the more general sense of Agmon-Douglis-Nirenberg, topics of current interest to numerical analysts.

The second part of the book is devoted to a theoretical analysis of numerical methods for the solution of elliptic boundary value problems. There are chapters on integral equation methods, finite difference methods, and a final chapter on least squares and Galerkin methods. In each case, the treatment includes the formulation of the method and an error analysis. The chapter on integral equations includes a section on numerical methods for conformal mapping. The chapter on difference equations starts with matrices of positive type and bounds for the discrete Green's function for the Laplace equation, as found in the classical papers of Bramble, Hubbard, and Thomée. The discrete Green's function is used to cast the discrete boundary value problem into a system of discrete integral equations, and error estimates are obtained for the solution of this system. The final chapter develops the theory of weighted least squares methods of a first order elliptic system. A final section relates this to Galerkin methods for second order systems, and gives an error analysis, including L_∞ error estimates.

This book contains a lot of mathematics. It is written in a somewhat compressed style, but each chapter contains an introduction which carefully explains the material