bibliography of Traub [*Iterative Methods for the Solution of Equations*, Prentice-Hall, 1964] has some entries not subsumed here.

A KWIC index certainly increases the information content of any bibliography, since it provides ready access to sources on specific topics—as far as the titles contain the appropriate keywords. The choice of the "trivial words" in any KWIC index is almost always a matter for some debate. In this case, it appears to be surprising that such words as "system(s)" were excluded while "equation(s)" was not—resulting in over 400 entries in the index.

All in all, in the face of the explosive growth of the scientific literature, we can only be thankful when a man with the wide knowledge and critical facility of Professor Householder undertakes the large task of collecting a bibliography in an area of his interest. It would be highly desirable, however, if such bibliographies could find a more permanent place of their own in the printed literature which would assure them of a wider, continued distribution than is possible for mimeographed reports.

W. RHEINBOLDT

Computer Science Center
University of Maryland
College Park, Maryland 20742

7 [5].—S. D. ÈĬDEL'MAN, *Parabolic Systems*, North-Holland Publishing Co., Amsterdam, and Wolters-Noordhoff Publishing, Groningen, 1969, ii + 469 pp., 23 cm. Price $18.20.

This is a translation of a research monograph which appeared in Russian in 1964. It essentially concentrates on partial differential equations which are parabolic in the sense of Petrovski. The mathematical techniques are mostly classical—Fourier-Laplace transforms, the parametric approach developed by E. E. Levi in 1907, etc. Much of the work in this active field has been done by Russian mathematicians inspired by a famous paper of Petrovski's in 1938.

The translation has a certain awkwardness in the choice of terminology, order of words, etc., which is common in translations. However, no one who is mathematically prepared to read the book should have great difficulty in understanding the text.

There are four chapters and two appendices. In the first chapter, the author derives bounds for the fundamental solution in the Cauchy case. He first discusses the second-order case, then general Petrovski parabolic systems with bounded, Hölder-continuous coefficients. These results are generalized to problems with unbounded coefficients and with less restrictive assumptions on the smoothness of the coefficients. Among other topics, the work of Nash is discussed, as well as the behavior in the neighborhood of singularities and the relation between the fundamental solutions of elliptic and parabolic systems.

The second chapter is devoted to interior Schauder estimates, a discussion of hypoellipticity and Liouville type results.

In the third chapter, the fundamental solution is used to derive existence and uniqueness theorems, in the Cauchy case, for classes of initial data characterized by sharp growth conditions. Other topics include local solvability and continuation results for nonlinear problems and the behavior of solutions when $t \rightarrow \infty$.

The main new contribution of the book is contained in Chapter 4. Mixed initial boundary value problems are treated first for problems with constant coefficients in a halfspace and then for the case of variable coefficients in a general cylindrical domain.

The two appendices discuss the well-posedness of more general parabolic equations and another class of initial-value problems.

OLOF WIDLUND

Courant Institute of Mathematical Sciences
New York, University
New York, New York, 10012

8 [5].—A. R. MITCHELL, *Computational Methods in Partial Differential Equations*, John Wiley & Sons Ltd., Aberdeen, 1969, xiii + 255 pp., 23 cm. Price $11.00.

This book is concerned with the numerical solution of partial differential equations by finite-difference methods. There are six chapters: a review of basic linear algebra; parabolic equations; elliptic equations; hyperbolic systems; hyperbolic equations of second order; applications in fluid mechanics and elasticity. Basically, two classes of problems are considered. One class involves elliptic equations for bounded regions, together with various types of boundary conditions. These lead to systems of linear algebraic equations. The other class of problems involves parabolic or hyperbolic equations. There is a time variable, t, as well as one or more space variables. The desired function satisfies prescribed conditions in a region of the space variables for $t = 0$, and also on the boundary of the region for $t \geqq 0$. Such problems can sometimes be solved stepwise with respect to time by explicit methods. However, considerations of stability and accuracy often make the use of implicit methods desirable. With implicit methods one is faced with the solution of a system of linear algebraic equations at each time step.

In the case of parabolic problems the Crank-Nicolson implicit method is often used. In the case of one space variable, the method can be carried out by solving a tridiagonal system. However, in the case of two space variables, one must solve a more general linear system. One method for doing this is to use the successive overrelaxation method (S. O. R. method) which is analyzed in detail. The author states that the analysis carries over directly to elliptic problems, but does not give the details, particularly concerning the choice of the relaxation factor. Another class of methods considered includes various alternating direction implicit methods (A.D.I. methods) including the Peaceman-Rachford method, the Douglas-Rachford method, D'yakonov's method, and others. These methods are used for parabolic, elliptic, and hyperbolic problems. Still another class of methods, called "locally one-dimensional methods" (L.O.D. methods) are considered. These methods were developed primarily by Russian authors including D'yakonov and others, and the author's treatment appears to be one of the first accounts given in a textbook written in English. Explicit and implicit L.O.D. methods are used for parabolic, elliptic, and hyperbolic problems. Other methods used include the use of "split operators" and "locally A.D.I. methods," both of which are applied to hyperbolic problems.