The algebraic eigenvalue problem; Iterative methods for the solution of simultaneous linear equations; Ordinary differential equations; Partial differential equations; The solution of simultaneous non-linear equations and optimization; Monte Carlo methods.

E. I.

3 [2.05, 2.35, 3, 4].—H. R. SCHWARZ, H. RUTISHAUSER & E. STIEFEL, translated by P. Hertelendy, *Numerical Analysis of Symmetric Matrices*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1973, xi + 276 pp., 24 cm.

Here we have a translation of a book that grew out of course notes by Professor Schwarz who drew from notes by the late Professor Rutishauser of Switzerland. Very good courses they must have been, with the derivation of the mathematical problems given as much emphasis as the numerical methods to solve them. This book would be a good text for a senior-level course in the United States.

After a first chapter on basics, including Choleski's decomposition tailored to band matrices, the four remaining chapters are entitled: Relaxation Methods, Data Fitting, Eigenvalue Problems, and Boundary Value Problems. Sixteen Algol procedures are developed in the text and Fortran IV versions are given in an appendix. It is not claimed that these programs are the last word in sophistication, clarity was the watchword. It is worth pointing out that the translation of the procedures was fairly easy because programs of this sort do not depend on the Algol features, such as recursion and block structure, which have no counterpart in Fortran. The authors are experienced at exposition and the book seems to be well written, well translated, and well laid out. Somehow the clarity of thinking, so characteristic of the authors, comes through in their written words.

It is not incumbent upon a textbook to be up to date, but in the field of numerical methods it is highly desirable. In this respect, there is a most puzzling defect in part of the book. I can only conclude that the text was actually written in 1964, although the German version did not come out until 1968. How else can one explain the fact that the eigenvalue chapter is a beautiful presentation of methods, some of which are ten years out of date? The QR algorithm is not mentioned, but LR and QD receive close attention. For positive definite tridiagonal matrices, there appears to be some advantage in using the QD formulation, but in practice it is a nuisance to have to maintain positive definiteness when using shifts.

Another little clue to the time lag in publication is the fact that the Sturm sequence algorithm is used in its standard form instead of the simpler, more convenient version in which the successive quotients of the polynomials are evaluated, rather than the polynomials themselves. These quotients are just the diagonal elements of U in the LU decomposition.

These are comparatively minor criticisms of a work which takes a very nice, coherent set of topics and presents them so well.

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