simplex method are described fully, and the fast maximum flow algorithm of Malhotra, Kumar and Maheshwari is presented. There is a chapter on applications, nicely combining practical and theoretical implications of the results.

Finally the author covers some more advanced topics: triangular factorizations, generalized upper bounds, and Dantzig-Wolfe decomposition. The implementations of Bartels-Golub and Forrest-Tomlin are described, along with the more recent schemes of Reid and Saunders. The book concludes with an appendix on the ellipsoid method, complementing an informative discussion of the efficiency of algorithms in theory and practice in Chapter 4.

In general, the author is lucid and engaging in style, presenting complicated material clearly and concisely with many examples and economic interpretations. There are some illuminating historical references, and well-chosen exercises describe extensions (for instance, cyclic polytopes—or rather, their duals—are introduced in a series of problems). However, there are some drawbacks. I have already mentioned the lack of geometric motivation until Chapter 17—this is of course a matter of personal taste. Also surprising is the scrupulous avoidance of subscripts or transposes on vectors; partly for these reasons the author never writes an elementary matrix as a rank-one perturbation of the identity matrix, which makes some arguments on updating representations of the basis matrix less clear than one might have hoped. Since the book can be used at a variety of levels, there is a lack of consistency in the mathematical sophistication necessary. It seems unlikely to me that a reader who has not seen matrices before will find the development in Chapter 6 sufficient for easily understanding the "eta factorization" of the basis in the following chapter, let alone the LU factorization in Chapter 24. The organization of material is sometimes confusing: theorems of the alternative, for instance, are considered on pages 144 and 248. Finally, while the text is marred by very few typographical errors (the large-print section heading "Narrow Flow Problems" for "Network Flow Problems" on page 289 notwithstanding), the chapter on triangular factorizations seems to imply that all the triangular factors can maintain unit diagonals, which might well confuse the reader.

These minor flaws do not detract significantly from an important, very up-to-date book with admirable coverage of the crucial implementation details of algorithms for linear programming and network flow problems. I recommend it highly.

MICHAEL J. TODD

School of Operations Research and Industrial Engineering
Cornell University
Ithaca, New York 14853

12[34-00, 35K55, 35Q20, 35R35, 35R60, 45D05].—V. LAKSHMIKANTHAM (Editor), *Trends in Theory and Practice of Nonlinear Differential Equations*, Lecture Notes in Pure and Applied Mathematics, v. 90, Marcel Dekker, Inc., New York and Basel, 1984, xviii + 562 pp., $25\frac{1}{4}$ cm. Price \$59.75.

This volume contains 73 invited and contributed papers presented at an international conference held June 14–18, 1982, at the University of Texas at Arlington.

They summarize recent activities in the theory and application of nonlinear differential equations. A few contributions also deal with numerical methods.

W. G.

13[68C20].—J. A. van Hulzen (Editor), *Computer Algebra*, Lecture Notes in Computer Science (G. Goos & J. Hartmanis, Eds.), v. 162, Springer-Verlag, Berlin, Heidelberg, New York, Tokyo, 1983, xii + 305 pp., 24 cm. Price $14.00.

These are the proceedings of the European Computer Algebra Conference held in London, March 28–30, 1983. The 27 contributions span a wide area of symbolic computation, from miscellaneous applications in differential equations and computational geometry, systems and language features, to computational number theory, polynomial ideal bases and factoring algorithms.

W. G.

14[68–01, 68–03, 68C40, 68D05].—V. A. Uspensky, *Post's Machine*, Translated from the Russian by R. Alavina, Mir Publishers, Moscow, 1983, 88 pp., 20 cm. Price $2.95.

"Post's Little Machine" is a computing device akin to a single tape Turing machine, but somewhat simpler in that, for instance, it is to work with a unary tape alphabet. The book describes Post's machine on an elementary level and develops a number of simple programs. To quote from the preface:

> The author hopes that the present booklet can to a certain extent advance such concepts as "algorithm", "universal computing machine", "programming" in the secondary school, even in its earlier grades. The author's personal experience makes him confident that the schoolchildren of primary school and even children of pre-school age can easily cope with "computations" on the Post machine...

Uspensky develops programs for the successor function for unsigned integers in Chapter 2. The exposition develops more and more complete programs for this problem, gradually generalizing the start-up conditions. Chapter 3 reverses development by analyzing a given program and deducing that it also computes the successor function. Thereafter, programs for adding k unsigned integers are derived.

Having so warmed up the reader to writing programs on Post's machine, Uspensky discusses more advanced programs in Chapter 4: Various arithmetic operations, number-theoretic functions, followed by an intuitive discussion of universal programs. As a supplement, Post's 1936 article "*Finite Combinatory Processes–Formulation* 1" is reprinted.

Computer Science has moved away from assembler languages as first programming language. The rationale, as I understand it, is that a programming system at too low a level impedes understanding because of a high volume of ultimately unnecessary detail. At the time Post advocated his machine we had no programming language notion and the concept of algorithm had not yet been formulated. So Post's