It is important to note that most of the computational methods presented in Chapters 2 to 6 refer to functions of real variables. Those algorithms for the elementary functions which are actually implemented on a large number of computers (in particular on those in use in the socialist countries) are given in Appendix 1. Appendix 2 discusses questions of error analysis and Appendix 3 problems of optimization. Appendix 4 gives some tables of useful constants.

An impressive bibliography of more than 400 references, about 60 percent of them referring to publications in Russian, and an index, complete the volume.

Unfortunately, access to this useful handbook is likely to be difficult outside the Soviet Union. In view of the amount of information it contains, one could imagine that a (perhaps updated) English edition would be a valuable complement to the already existing handbooks.

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1. W. J. Cody and W. Waite, *Software manual for the elementary functions*, Prentice-Hall, Englewood Cliffs, N.J., 1980.
2. L. A. Lyusternik, O. A. Chervonenkis, and A. R. Yanpol′skii, *Handbook for computing elementary functions*, Pergamon Press, Oxford, 1965.
3. Y. L. Luke, *Mathematical functions and their approximations*, Academic Press, New York, 1975.

15[68Mxx, 68Q20, 65V05, 65-04].—JEAN-MICHEL MULLER, *Arithmétique des ordinateurs—Opérateurs et fonctions élémentaires*, Etudes et recherches en informatique, Masson, Paris, 1989, 214 pp., 25 cm. Price 215 FF.

This book provides a good introduction to the subject of computer arithmetic, covering most of the major areas in an easy manner. The style is pleasantly narrative—but like many narrative novels—it leaves the reader somewhat disappointed at its lack of depth and detail in places. There are chapters on each of the important topics—Boolean logic, number representations, addition, multiplication, division, and elementary function evaluation. Each has its strengths and its weaknesses.

There are also major omissions. Most notably, perhaps, are the very scant treatment of noninteger representations and arithmetic, and the consequent almost total absence of a discussion of errors in computer arithmetic. Another serious lack, since the book is purported to be a text for courses in this subject, is that there are *no* exercises for the student/reader.

Nonetheless, the overall blend of mathematical theory with some of the practicalities of hardware implementation of algorithms is pleasing. I just wish it could have been expanded to a full and comprehensive treatment of these important topics.

The first chapter (9 pages) provides the reader with a very brief review of Boolean algebra and the various logic gates that are used in integrated circuits.

The inclusion of this review is an attractive feature in helping the book to be self-contained. It also allows subsequent algorithmic discussions to be accompanied by practical considerations and circuit diagrams. This is followed by an all-too-brief introduction to complexity theory, which I found both interesting and frustrating. A more extensive treatment could have been followed up in the subsequent chapters in discussing the efficiency of the algorithms.

Chapter 2 (29 pages) introduces various number representations, concentrating largely on complement forms of integer representation and redundant systems. The floating-point system is given just three pages, with an extra two for rounding errors. There is a short section on new representation systems for real arithmetic—but it is too short. For example, the BCD system is included among the integer representations, but there is no mention of Hull's CADAC real arithmetic system, which uses the decimal base. The work of Matula and Kornerup on arithmetics based on continued fraction representations is also not mentioned. The bibliography of this chapter is somewhat patchy, relying almost entirely on publications of the ACM and the IEEE Computer Society. Surely, for example, Kahan deserves some mention somewhere in connection with the IEEE floating-point standard. The discussion of redundant representations is followed up throughout the rest of the book; some reference at this point to its utility in bit-serial and pipelined arithmetic would help to justify the longest section of this chapter.

Chapter 3 (31 pages) gives a very good treatment of the design of various adders, such as ripple carry, conditional sum, carry skip and carry look-ahead adders, including the Brent and Kung implementation. The use of carry save adders is left until their use within multiplication algorithms in the next chapter. The propagation of carries is discussed both theoretically and algorithmically. The efficiency of the different algorithms is also considered. The final section deals with addition of redundant representations—but still with no motivation for such representations.

Chapters 4 (54 pages) and 5 (32 pages) deal in a similar thorough way with multiplication and division. The multiplication algorithms include decomposition, pipelining and in-line algorithms, which finally provide a reason for devoting so much space to redundant representations. Also included are Wallace and Dadda trees; that is, the use of a tree of carry save adders or half-adders. The theoretical and algorithmic discussions are easily read and convincing. Division is also treated thoroughly—restoring, nonrestoring, in-line and iterative algorithms are all covered efficiently, although within the confined space of this book it seems scarcely necessary to treat Newton's iteration and a special case of it as separate sections. The bibliography for both these chapters is extensive.

The final chapter (39 pages) on elementary function evaluation amounts to a very good treatment of CORDIC-type algorithms, including the scheme for the complex exponential function. What is disappointing is the short shrift given to other methods. Many computer routines are still based on clever use of series expansions and rational functions. The latter topic is reduced to one theorem and 3/4 page. Series are subsumed into polynomial approximation, which consists of a brief introduction to Legendre and Chebyshev polynomials. Whilst this is interesting material, it has little relation to the subject at hand, since no algorithms are presented for such approximations to any of the elementary functions, and there is nothing on the efficient evaluation of either Chebyshev or Legendre series. This efficient evaluation is arguably the principal reason that Chebyshev expansions are genuine *practical* approximation tools.

Overall, I found this book something of a curate's egg.

I cannot envisage using it as a teaching text for its lack of exercises, nor will it form an important reference book in my library, since the treatment too often left me with more questions. What it covers in detail, the basic arithmetic algorithms, are dealt with very well and the style is certainly easy. I just wish it had been twice as long so that the reader is left with more answers and fewer questions. Maybe this implies its likely role—as an introduction for a research student which will prompt him/her to ask some of the questions and perhaps find some of the answers.

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16[62-07, 62A10].—MURRAY AITKEN, DOROTHY ANDERSON, BRIAN FRANCIS & JOHN HINDE, *Statistical Modelling in GLIM*, Oxford Statistical Science Series, Vol. 4, Clarendon Press, Oxford, 1989, xi+374 pp., $23\frac{1}{2}$ cm. Price \$75.00 hardcover, \$35.00 paperback.

This text provides a statistically capable reader with an opportunity to view the interplay between the theory of maximum likelihood estimation using analysis of deviance principles and data analytic techniques available with the GLIM3, Generalized Linear Interactive Modelling, statistical package. For each of a variety of useful exponential family models, the authors present a concise summary of the likelihood approach to model fitting and parameter estimation. An analysis of a specific data set typically follows. Included in this analysis are suitable GLIM commands to implement the chosen model, examples of GLIM output, especially analysis of deviance tables and likelihood ratio tests based on the differences between deviances, discussions about model selection, simplification and adequacy, and graphical tools, available as GLIM macros, that greatly facilitate the entire modelling procedure.

For a data analyst, the strength of the text is in the examples, especially when the authors discuss choices between competing models, where the principle of *parsimony* (see Section 2.1) is applied when formal statistical methods can no longer distinguish between alternative models. The reader may not always agree with the authors' final model selection, but will benefit from observing the data