formulas and their remainders. The trapezoidal rule, Simpson's rule, and the three-eighths rule are discussed in greater detail. Chapter 7 begins the use of an approach that recurs throughout the book—the construction of formulas of highest degree of precision, sometimes referred to as "Gaussian" formulas. The general theory is set down on the basis of the theory of orthogonal polynomials, and the Gauss-Legendre, Gauss-Jacobi, Gauss-Hermite, and related families, are found, together with their remainder terms. In Chapters 9 and 10 formulas subject to special conditions—the use of some preassigned abscissas, or the restriction to equal coefficients—are treated along similar lines. Chapter 8 is devoted to the so called "best integration formulas"—those defined by regarding the remainder as a linear functional on an appropriate function space, and making its norm minimal. Not much is actually known about these formulas, though they have excited considerable interest. Chapter 11 is devoted mainly to a development of Krylov's: an expansion of the remainder of any quadrature formula in a form similar to the Euler-Maclaurin formula (which is Krylov's formula for the trapezoid rule), and the use of terms of this expansion to improve the accuracy of estimates of integrals. Chapter 12 takes up, in considerable detail, the question of convergence of sequences of quadrature formulas. For analytic integrands a variety of interesting results is proven by function-theoretic methods. Theorems dealing with more general integrands are also given.

The last section of the book, about 55 pages long, is devoted to a topic not usually treated in American texts—numerical indefinite integration; that is, the evaluation of an integral for a considerable number of (equally spaced) values of the upper limit. After an introductory chapter devoted to a very careful discussion of the propagation of errors and stability conditions, two interesting methods due to the author are treated. Each is designed to maximize the degree of precision of the formula while minimizing the number of new values of the integrand to be computed at each step. Some tables of abscissas and coefficients for these methods are given.

The book concludes with appendices listing abscissas and coefficients for the most important Gaussian quadrature formulas. The translator has expanded these tables beyond those given in the original edition.

As this is the only book in English on its subject, it is hardly necessary to recommend it. We are fortunate in the high quality of its writing. The translator has made a real contribution to the English mathematical literature.

SEYMOUR HABER

National Bureau of Standards
Washington 25, D. C.

83[P, X, Z].—HOWARD AIKEN & WILLIAM F. MAIN (editors), *Switching Theory in Space Technology*, Stanford University Press, Stanford, California, 1963, x + 357 p., 26 cm. Price $11.50.

This volume consists of twenty-five papers on switching theory, switching circuits, and related topics presented at the Symposium on the Application of Switching Theory in Space Technology, held at Sunnyvale, California, February

27–28 and March 1, 1962. Despite the title of the symposium, only a minority of the papers are concerned with switching theory or space. Roughly, one-third of the papers are concerned with switching theory; another third are concerned with new switching elements, their physical attributes, fabrication and application (primarily as storage elements); and the remaining papers are concerned with systems and related subjects. The rather broad spectrum of topics should, as the editors intended, make the volume serve as something of a survey of the whole area and make it of interest to a quite broad class of reader. Unfortunately, a number of the papers suffer from inadequate introductions, heavy reliance on prior papers and prerequisite knowledge of rather specialized subjects, thus severely limiting (or, at least, taxing) their audience. As the well-rounded, self-contained presentation of some of the other papers in the volume indicates, such specialized presentation is unnecessary, and there is no doubt that it detracts from the value of the volume.

To supply a somewhat more detailed idea of the contents of the volume, we present the following list of authors and titles:

G. Polya, "Intuitive Outline of the Solution of a Basic Combinatorial Problem"; Günter Hotz, "On the Mathematical Theory of Linear Sequential Networks"; William H. Kautz, "Totally Sequential Switching Circuits"; Eiichi Goto, "Threshold, Majority, and Bilateral Switching Devices"; Franz E. Hohn, "Tyron's Delay Operator and the Design of Synchronous Switching Circuits"; David G. Willis, "Minimum Weights for Threshold Switches"; Heinz Zemanek, "Switching and Information"; V. Belevitch, "On the Realizability of Graphs with Prescribed Circuit Matrices"; J. Paul Roth, "The Theory of Algorithms"; G. W. Patterson, "Analysis and Design Confirmation of Controlled-Flow Nets"; Warren Semon, "General E-Algebras"; Frank F. Stuki, "New Techniques for the Machining and Shaping of Ferrites"; Robert C. Minnick, "Magnetic Comparators and Code Converters"; Jan A. Rajchman, "Computer Memories: Remarks on Possible Future Developments"; Jose Garcia Santesmases, "Nonlinear Resonance Switching Devices"; A. E. Slade, "Superconductive Switches and Storage Devices"; A P. Speiser, "Hydraulic Switching Devices"; J. I. Raffel, "Magnetic Films: New Possibilities, New Problems"; M. E. Browne, J. A. Cowen, and D. E. Kaplan, "Electron Spin-Echo Storage"; A. Van Wijngaarden, "Switching and Programming"; W. R. Abbot, "The Application of System Theory to Space Missions"; David E. Muller, "Asynchronous Logics and Application to Information Processing"; L. B. Heilprin, "Information Storage and Retrieval as a Switching System"; Daniel Hochman, "Space-Borne Digital System for Data Bandwidth Compression"; and Nicholas Szabo, "Recent Advances in Modular Arithmetic".

ERIC G. WAGNER

IBM Corporation
Yorktown Heights, New York

84[Q, X].—KARL FRIEDRICH GAUSS, *Theory of the Motion of the Heavenly Bodies Moving about the Sun in Conic Sections*, Dover Publications Inc., New York, 1963, xvii + 376 p., 24 cm. Price $2.95 (paperbound).

This unaltered reprint of the 1857 English translation of Gauss's *Theoria Motus* is timely, and especially welcome since so little of Gauss is available in English. In