REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

1[2.10, 7].—O. V. BABURIN & V. I. LEBEDEV, "O vychislenii tablits korneĭ i vesov polinomov Érmita i Liagerra dlia $n = 1(1)101$" ("On the calculation of a table of zeros and weights of Hermite and Laguerre polynomials for $n = 1(1)101$"), *Zh. Vychisl. Mat. i Mat. Fiz.*, v. 7, 1967, pp. 1021–1030.

Herein are described the mathematical and computational details (including error estimates) of the electronic digital calculation of the zeros of the first 101 Hermite and Laguerre polynomials, respectively, and of the coefficients (weights) for the associated quadrature formulas

$$\int_a^b p(x)f(x)dx = \sum_{k=1}^{n} B_k F(x_k) + R_n ,$$

where $F(x_k) = p(x_k)f(x_k)$; $p(x) = e^{-x^2}$, $a = -\infty$, $b = \infty$, for Gauss-Hermite quadrature; and $p(x) = e^{-x}$, $a = 0$, $b = \infty$, for Gauss-Laguerre quadrature.

Excerpts of this table that are reproduced in this paper consist of 16S values of the zeros, x_k, and weights, B_k, for $n = 60$, 100, and 101 for the Hermite polynomials (Tables 1–3), and for $n = 60$ and 100 for the Laguerre polynomials (Tables 4, 5).

This reviewer has compared the contents of Table 5 with the corresponding 24S values in the unpublished table of Berger & Danson [1], and has detected just two discrepancies; namely, the first two values of B in Table 5 are too high by three units and one unit, respectively, in the last decimal place. A comparison of the zeros of both the Hermite and Laguerre polynomials when $n = 60$ (Tables 1 and 4) with the corresponding 30S approximations in the tables of Stroud & Secrest [2] has revealed no discrepancies. Comparison of the corresponding weights was not possible, inasmuch as Stroud & Secrest tabulate coefficients A_i, which are equal to $p(x_i) \cdot B_i$, in the notation of this paper.

So far as the reviewer is aware, the data constituting Tables 2 and 3 appear to be new.

Appended to this informative and useful paper is a list of the nine references that are cited in the text.

J. W. W.

1. B. S. BERGER & R. DANSON, *Tables of Zeros and Weights for Gauss-Laguerre Quadrature*, ms. deposited in UMT file. (See *Math. Comp.*, v. 22, 1968, pp. 458–459, UMT **40**.)

2. A. H. STROUD & D. SECREST, *Gaussian Quadrature Formulas*, Prentice-Hall, Englewood Cliffs, N. J., 1966. (See *Math. Comp.*, v. 21, 1967, pp. 125–126, RMT **14**.)

2[4, 5, 6].—SUSAN J. VOIGHT, *Bibliography on the Numerical Solution of Integral and Differential Equations and Related Topics*, Report 2423, Naval Ship Research and Development Center, Washington, D. C., November, 1967, ii, 526 pp., 27 *cm*.

This is a valuable reference. It covers various aspects of the numerical solution of differential (ordinary and partial) and integral equations including methods of solution, computer programs for developing solutions and existence and properties of the solutions. Mixed type equations are also covered. Related topics such as matrix manipulation have been included to some extent in view of their application to particular methods.

Books, journals and research reports (both government and industry) are referenced. The time period is mostly 1960–1966, though numerous earlier references are also presented.

There are essentially four parts. The first is a bibliography of entries giving title and source of article, where it is reviewed, abstracted, etc. In illustration of the review aspect, the bibliography notes where an article has been reviewed in *Mathematical Reviews*, *Computing Reviews*, *Nuclear Science Abstracts*, etc. The entries in this part are not completely alphabetized by author. Here each entry is given an accession number to facilitate cross-referencing with other parts. The second part is an author index. The third part is a source index listing the source abbreviations used throughout the volume. The fourth part and perhaps the most useful for information retrieval is a Key-Word-In-Context (KWIC) index of titles of articles. This is not a subject index but rather a list of all the titles each permuted about all the significant words in the title.

There are three appendices. Appendix A describes the bibliography format. Appendix B gives a key which tells the language in which an article is written. Appendix C presents a transliteration scheme from the Cyrillic alphabet. Additional information on the project and its development is found in the introduction.

The value and usefulness of this volume to all research workers is clear. We hope that steps are being taken to continually update the literature of the subject at hand, and to extend these ideas to other segments of the mathematical literature.

Y. L. L.

3[4, 5, 6, 7, 13.15].—R. Sauer & I. Szabo, Editors, *Mathematische Hilfsmittel des Ingenieurs*, Part I: G. Doetsch, F. W. Schäfke & H. Tietz, Authors, Springer-Verlag, New York, 1967, xv + 496 pp., 24 cm. Price $22.00.

This is the first volume of a projected four-volume set. Though labelled as a handbook for engineers, the material is useful to all applied workers. The present volume is divided into three parts.

The first part written by H. Tietz is on function theory. Here in 84 pages are covered the rudiments (mostly without proof) of complex variable theory, elliptic functions, and conformal mapping.

The second part written by F. W. Schäfke deals with special functions. The special functions are conceived as those functions of mathematical physics which emerge by separation of the 3-dimensional wave equation $\Delta u + k^2 u = 0$ by use of certain orthogonal coordinate systems. To this class of functions, the Γ-function is also appended. The latter is treated in the first section. Separation of the wave equation in various coordinate systems is taken up in the second section. The next eight sections deal with cylinder functions, hypergeometric function (the Gaussian ${}_2F_1$), Legendre functions, confluent hypergeometric functions, special functions which satisfy the relation $a(x, \alpha)(dy/dx)(x, \alpha) + b(x, \alpha)y(x, \alpha) = y(x, \alpha + 1)$, orthogonal polynomials (mostly classical), Mathieu functions and spheroidal functions. For the most part, proofs are given. A considerable amount of material is covered in 145 pages, though much valuable material was evidently omitted in view of space requirements. A short list of books on the subject of special functions is provided. Here the *Handbook of Mathematical Functions with Formulas, Graphs and Mathematical Tables*, Applied Mathematics Series 55, U. S. Government Printing Office, Washington, D. C., 1964 (see *Math. Comp.*, v. 19, 1965, pp. 147–149) is conspicuous by its absence.

The third part of the handbook written by G. Doetsch is on functional transformations. It is the longest of the three parts (253 pages). After an introduction to the subject and Hilbert space (Chapter 1), Fourier transforms (both two-sided and one-sided) are taken up in Chapter 2. Basic results including existence theorems and rules are clearly outlined. Classically, some serious drawbacks to transform theory arose, for in the applications one often encountered functions for which the transforms diverged. Also considerable formalism had become quite common in the use of transforms (e.g., the Dirac δ function). In recent times, a discipline called "Distribution Theory" has been constructed which provides a rigorous framework for the development of a transform theory to meet the deficiencies noted above. The present handbook is noteworthy in that it contains an appendix giving pertinent results on distribution theory, and in Chapter 2 there is presented a modified distribution theory and its connection with Fourier transforms. For physical applications, considerable attention is devoted to idealized filter systems (Fiktive Filtersysteme) and realizable filter systems. In the idealized situations, the topics covered include frequency and phase response, distortion, and high, low, and band pass systems. Chapter 3 is concerned with Laplace transforms and their inversions. Applications are made to ordinary and partial differential equations. Physical applications include vibration problems and analysis and synthesis of electrical networks. The two sided Laplace transforms and Mellin transform are treated in Chapter 4. The two-dimensional Laplace transform is the subject of Chapter 5. A discretized version of the Laplace transform known as the Z-transform is developed in Chapter 6 along with applications to difference equations. Chapter 7 treats finite transforms including those known by the name of Fourier (i.e., finite exponential, cos and sin transforms), Laplace and Hankel. An appendix gives short tables of the following transforms: Fourier, Laplace (one- and two-dimensional), Mellin, Z, finite cos and sin.

Y. L. L.

4[7].—V. A. Ditkin & A. P. Prudnikov, *Formulaire pour le Calcul Opérationnel*, Masson & Cie, Éditeurs, Paris, 1967, 472 pp., 25 cm. Price F 65.

This translation from the Russian gives tables for the evaluation of one- and two-dimensional Laplace transforms (actually p-multiplied Laplace transforms which are called Laplace-Carson transforms) and their inverses. Thus the one-dimensional and two-dimensional transforms tabulated are of the form

$$\bar{f}(p) = p \int_0^\infty e^{-pt} f(t) dt\,,$$

$$\bar{f}(p, q) = pq \int_0^\infty \int_0^\infty e^{-px-qy} f(x, y) dx dy\,.$$

Chapter 1 [2] gives $\bar{f}(p)$ [$f(t)$] for a given $f(t)$ [$\bar{f}(p)$] while Chapter 3 [4] gives $\bar{f}(p, q)$ [$f(x, y)$] for a given $f(x, y)$ [$\bar{f}(p, q)$]. The influence of the book *Tables of Integral Trans-*

forms by A. Erdélyi, W. Magnus, F. Oberhettinger, and F. G. Tricomi, Vol. 1, McGraw-Hill Book Co., New York, 1954 (see *MTAC*, Vol. 10, 1956, pp. 252–254) is marked in that the arrangement of the one-dimensional material under review is much akin to that of the work just mentioned. The current work contains more transforms than the Erdélyi et al. volume. For example, there are transforms of numerous sectionally rational functions and Mathieu functions. Aside from this, there appear to be few if any transforms which can not be readily deduced from those in the latter volume.

The list of transforms in Chapters 3 and 4 are the most extensive I have ever seen. True, these results can be built up from the pertinent material in Chapters 1 and 2. Nonetheless, applied workers should appreciate the short cuts provided by the present tables.

We have spot checked various portions of the tables against other lists. The only error found is formula 1.1.4. There in the $f(t)$ column for $(at - b)$ read $f(at - b)$. Regretfully, the printing of the tables is incredibly poor. We have not seen the original Russian edition and so do not know if the present tables were reset or are a photocopy of the original.

Y. L. L.

5[7].—Vincent P. Gutschick & Oliver G. Ludwig, *Table of Exact Integrals of Products of Two Associated Legendre Functions*, Department of Chemistry, California Institute of Technology and Department of Chemistry, Villanova University. Ms. of 40 computer sheets deposited in the UMT file.

Let

$$I(l_1, m_1, l_2, m_2) = \int_{-1}^{1} P_{l_1}^{m_1}(x) P_{l_2}^{m_2}(x) dx .$$

This manuscript table presents exact (rational) values of all nonvanishing and nonredundant integrals I, where the l's and m's individually assume all integer values from 0 to 12, inclusive.

An introduction of three pages explains the method of computation and gives other pertinent information.

For a technique to compute a generalization of this integral, see a paper by J. Miller [1]. Another related paper is one by S. Katsura and his coworkers [2].

Y. L. L.

1. James Miller, "Formulas for integrals of products of associated Legendre or Laguerre functions," *Math. Comp.*, v. 17, 1963, pp. 84–87.

2. S. Katsura, Y. Inoue, S. Hamashita & J. E. Kilpatrick, *Tables of Integrals of Threefold and Fourfold Products of Associated Legendre Functions*, The Technology Reports of the Tôhoku University, v. 30, 1965, pp. 93–164. [See *Math. Comp.*, v. 20, 1966, pp. 625–626, RMT **98**.]

6[7].—T͡s. D. Lomkat͡si, *Tablit͡sy Elliptiches͡koĭ Funkt͡sii Veĭers͡htrassa* (*Tables of Weierstrassian Elliptic Functions*), Computation Center of the Academy of Science of the U.S.S.R., Moscow, 1967, xxxii + 88 pp., 27 cm. Price 1.06 roubles (paperbound).

An elaborate mathematical introduction to these tables was prepared by V. M.

Beliakov and K. A. Karpov. Starting with the standard definition of the Weierstrass elliptic function $z = \wp(u; g_2, g_3)$ as the inverse of the function

$$u = \int_z^\infty \frac{dz}{(4z^3 - g_2 z - g_3)^{1/2}},$$

it gives a detailed discussion of the properties of that function, as well as formulas for the evaluation thereof corresponding to complex values of u. A section is devoted to a discussion of the numerical evaluation of $\wp(u; g_2, g_3)$ for large values of g_2 when $g_3 = \pm 1$. This is supplemented by a discussion of the evaluation of the Jacobi elliptic function $\mathrm{sn}(u, m)$, together with an auxiliary table of $K(m)$ to 8D for $m = 0.4980(0.0001)0.5020$, with first differences. The relevant computational methods are illustrated by the detailed evaluation of $\wp(0.2; 100, 1)$ and $\wp(0.3; 100, -1)$ to 7S.

The two main tables, which were calculated and checked by differencing on the Strela computer, consist of 7S values (in floating-point form) of $\wp(u; g_2, g_3)$ for $g_2 = 3(0.5)100$, $g_3 = 1$, and $g_2 = 3.5(0.5)100$, $g_3 = -1$, respectively, where in both tables $u = 0.01(0.01)\omega_1$. Here ω_1 represents the real half-period of the elliptic function. It should be noted that for the stated range of the invariants g_2 and g_3, the discriminant $g_2^3 - 27g_3^2$ is nonnegative, so that the zeros e_1, e_2, e_3 of $4z^3 - g_2z - g_3$ are all real.

A description of the contents and use of the tables, including details of interpolation (with illustrative examples) is also given in the introduction.

Appended to the introduction is a listing of the various notations used for this elliptic function and a useful bibliography of 19 items.

An examination of the related tabular literature reveals that these tables are unique; indeed, Fletcher [1] in his definitive guide to tables of elliptic functions mentions no tables of $\wp(u; g_2, g_3)$ when g_2 and g_3 are real and the discriminant is positive.

J. W. W.

1. ALAN FLETCHER, "Guide to tables of elliptic functions," *MTAC*, v. 3, 1948, pp. 229–281.

7[7].—ROBERT SPIRA, *Tables of Zeros of Sections of the Zeta Function*, ms. of 30 sheets deposited in the UMT file.

This manuscript table consists of rounded 6D values of zeros, $\sigma + it$, of $\sum_{n=1}^{M} n^{-s}$ for $M = 3(1)12$, $0 < t < 100$; $M = 10^k$, $k = 2(1)5$, $-1 < \sigma$, $0 < t < 100$; $M = 10^{10}$, $0.75 < \sigma < 1$, $0 < t < 100$. No zero with $\sigma > 1$ was found. A detailed discussion by the author appears in [1] and [2].

J. W. W.

1. R. SPIRA, "Zeros of sections of the zeta function. I," *Math. Comp.*, v. 20, 1966, pp. 542–550.
2. R. SPIRA, "Zeros of sections of the zeta function. II", *ibid.*, v. 22, 1968, pp. 163–173.

8[7, 8].—W. RUSSELL & M. LAL, *Table of Chi-Square Probability Function*, Department of Mathematics, Memorial University of Newfoundland, St. John's, Newfoundland, Canada, September 1967, 77 pp., 28 cm. One copy deposited in the UMT file.

Herein are tabulated to 5D the values of the chi-square distribution function

$$1 - F_n(\chi^2) = [2^{n/2}\Gamma(n/2)]^{-1} \int_{\chi^2}^{\infty} x^{n/2-1} e^{-x/2} dx$$

for $n = 1(1)50$, $\chi^2 = 0.001(0.001)0.01(0.01)0.1(0.1)107$. As explained in the introductory text, those values that round to 0 or 1 to 5D have been omitted. It should be particularly noted that the tabulated values are those of the complementary function, $1 - F_n(\chi^2)$, and not those of $F_n(\chi^2)$ as implied in the introduction.

The tabulated values were obtained by appropriately rounding 8S floating-point values calculated on an IBM 1620 Mod. I system, employing an iterative procedure due to R. Thompson [1].

A spot check made by the authors with corresponding entries in the tables of Pearson & Hartley [2] revealed no discrepancies.

The abbreviated bibliography contains no reference to the extensive tables of Harter [3], which include 9D values of the incomplete gamma-function ratio

$$I(u, p) = 2^{-n/2}\{\Gamma(n/2)\}^{-1} \int_0^{\chi^2} e^{-x/2} x^{n/2-1} dx ,$$

where $u = \chi^2/(2n)^{1/2}$ and $p = n/2 - 1$.

Hence, we have the relation $F_n(\chi^2) = I(\chi^2/(2n)^{1/2}, n/2 - 1)$, which reveals that entries in the two tables are generally not readily comparable.

Because of the conveniently small increment in χ^2 throughout, the present table should provide a useful supplement to the cited tables of Pearson & Hartley.

J. W. W.

1. Rory Thompson, "Evaluation of $I_n(b) = 2\pi^{-1} \int_0^\infty (\sin x/x)^n \cos (bx)dx$ and of similar integrals," *Math. Comp.*, v. 20, 1966, pp. 330–332.

2. E. S. Pearson & H. O. Hartley, *Biometrika Tables for Statisticians*, Vol. I, third edition, Cambridge University Press, Cambridge, 1966.

3. H. Leon Harter, *New Tables of the Incomplete Gamma-Function Ratio and of Percentage Points of the Chi-Square and Beta Distributions*, U. S. Government Printing Office, Washington, D. C., 1964.

9[9].—Dov Jarden, *Recurring Sequences*, Second Edition, Riveon Lematematika, 12 Gat St., Kiryat-Moshe, Jerusalem, 1966, ii + 137 pp. Price $6.

The second edition, which has been produced on a more durable paper, is an enlargement and revision of the first. The enlargement comes from the inclusion of eight new articles, while the revision consists mainly of the inclusion of many new prime factors in the two factor tables in the work.

In general, the book is a collection of short papers by the author on various questions concerning the Fibonacci numbers U_n, their associated sequence V_n, and other recurring sequences. Representative titles are, "Divisibility of U_{mn} by $U_m U_n$ in Fibonacci's sequence," "Unboundedness of the function $[p - (5/p)]/a(p)$ in Fibonacci's sequence," and "The series of inverses of a second order recurring sequence." There is also a large chronological bibliography on recurring sequences.

Among the new articles is one of general interest to Decaphiles, "On the periodicity of the last digits of the Fibonacci numbers," where the period mod 10^d is shown to be 60, 300, and $15 \cdot 10^{d-1}$ for 1, 2, and $d \geqq 3$ final digits.

The two revised factor tables, which were provided by the reviewer, are at present the most extensive in the literature.

Of these, the first table is a special table giving the complete factorization of $5U_n^2 \pm 5U_n + 1$ for odd $n \leqq 77$, the two trinomials being the algebraic factors in

$$V_{5n}/V_n = (5U_n^2 - 5U_n + 1)(5U_n^2 + 5U_n + 1) ,$$

n odd.

The second table is the general factor table for U_n and V_n with $n \leqq 385$. The overall bound for prime factors is 2^{35} for $n < 300$ and 2^{30} for $300 \leqq n \leqq 385$. It also shows that U_n and V_n are completely factored up to $n = 172$ and $n = 151$ respectively. The table gives as well an indication for the incomplete factorizations whether their cofactors are composite or pseudoprime. The introduction to this table provides the further information that U_n is prime for $n \leqq 1000$ iff $n = 3, 4, 5, 7, 11, 13, 17, 23, 29, 43, 47, 83, 131, 137, 359, 431, 433, 449, 509, 569, 571$, while V_n is prime for $n \leqq 500$ iff $n = 0, 2, 4, 5, 7, 8, 11, 13, 16, 17, 19, 31, 37, 41, 47, 53, 61, 71, 79, 113, 313, 353$. The number U_{359}, which was only known to be a pseudoprime at the time of publication of the tables, has since been shown to be a prime by the reviewer.

John Brillhart

University of Arizona
Tucson, Arizona 85721

10[9].—K. E. Kloss, M. Newman & E. Ordman, *Class Number of Primes of the Form* $4n + 1$, National Bureau of Standards, 1965, 15 Xeroxed computer sheets deposited in the UMT file.

This interesting table lists the first 5000 primes of the form $4n + 1$—from $p = 5$ to $p = 105269$. For each such prime p is listed the class number $h(p)$ of the real algebraic quadratic field $R(\sqrt{p})$. Alternatively, this is also the number of classes of binary quadratic forms of discriminant p. The table is similar to that announced in [1], and was computed about five years ago on an experimental machine, the NBS PILOT. The method used was the classical one of listing all reduced forms and counting the "periods" into which they fall. Appended are short extensions: the class numbers for the first 100 primes $4n + 1 > 10^6$ and for the first $35 > 10^7$.

In [1], Kloss reports that about 80% of these primes have class number 1. We have tallied the following more detailed statistics: the number of examples with class number 1, 3, 5, etc. that occur among the first 1000, 2000, etc. primes.

Table

	$h = 1$	3	5	7	9	11	13	15	17	19	21	23	25	27	29	>30
1000	816	101	35	22	9	6	5	2	1	—	1	—	—	1	—	1
2000	1622	213	70	36	19	10	8	7	2	2	1	2	1	3	—	4
3000	2420	306	111	58	34	13	14	13	7	5	2	2	4	3	1	7
4000	3198	422	145	79	50	19	20	16	9	8	5	3	7	4	2	13
5000	3987	522	183	98	66	29	28	20	11	11	7	4	10	4	4	16

It will be noted that Kloss's 80% is remarkably steady. Similarly, a little over 10% have class number 3, 3.6% have class number 5, 2% have class number 7, 1.2% have class number 9, etc. *Queries*: What is this 80%? More generally, what is this distribution? Can it be deduced now from some heuristically reasonable postulates, if not yet more rigorously? Gauss, in §304 of his *Disquisitiones*, raises the question whether the number of examples of one class/genus does not tend to some *fixed fraction* of the total number of examples as the *determinant* goes to infinity. There are two differences between his population and the present one. Gauss is concerned with all (nonsquare) positive *determinants*, and here we have the $4n + 1$ prime *discriminants*. This latter implies that we have one genus only here, and an odd class number. Nonetheless, the similarity of the two propositions is obvious.

It may be helpful to add that for primes $p = 8n + 1$ the class number is the same whether p is regarded as the discriminant or the determinant. And the same is true for those primes $8n + 5$ where there is a solution of

$$x^2 - py^2 = 4\,, \qquad x \equiv y \equiv 1 \pmod 2\,.$$

But if there is no solution, as for $p = 37$, 101, etc., then Gauss's class number (for determinants) is 3 times that listed here (for discriminants). The distribution for determinants would therefore differ somewhat from that shown above, but it should also be studied, particularly as its analysis may be easier. There are then simpler relations among the class number, the solution of the Pell equation, and the corresponding Dirichlet series. It would also be of interest to study the distribution for the primes $8n + 1$ taken alone. Here, the prime 2 must be represented by one of the quadratic forms, and that should have a heavy influence on the outcome.

Turning our attention to a different aspect of this data, we list the sequence of primes $p = 4n + 1$ for which a larger class number occurs than for any smaller prime.

p	h	p	h	p	h
229	3	401	5	577	7
1129	9	1297	11	7057	21
8761	27	14401	43	32401	45
41617	57	57601	63	90001	87

It will be noted that most of these p are of the form $(4m)^2 + 1$. This guarantees a relatively small solution for the Pell equation, and, therefore, a relatively large class number. In fact, one has

$$\frac{\log\,(4m + \sqrt{p})}{\sqrt{p}}\,h = \sum_{k=0}^{\infty} \left(\frac{p}{2k+1}\right)(2k+1)^{-1}\,,$$

and since the Dirichlet series on the right can grow as O (log m), and since it does so grow if p has numerous small prime quadratic residues: 3, 5, 7, etc., the class numbers shown are therefore roughly proportional to m. In a case such as $p = 14401 = 120^2 + 1$, where the Dirichlet series, $L = 1.964$, is fortuitously large, the class number, $h = 43$, is also fortuitously large—ahead of its time, so to speak.

D. S.

1. K. E. Kloss, "Some number-theoretic calculations," *J. Res. Nat. Bur. Standards Sect. B*, v. 69B, 1965, pp. 335–336.

11[12].—Allen Forte, SNOBOL3 *Primer*, The Massachusetts Institute of Technology, Cambridge, Mass., 1967, ix + 107 pp., 21 cm. Price $3.95.

SNOBOL is the most powerful string-processing language which is at present widely available. In its most recent form, SNOBOL4, it permits data which are character strings, patterns, real numbers, and arrays, as well as a facility for programmer-defined structures. It has sophisticated and convenient facilities for string assignment, concatenation, pattern matching, and substitution, and permits compilation and execution of statements computed during execution. This short paperback book describes an earlier and less powerful version, SNOBOL3. It is directed at the nonscientist and nonprogrammer, and is written in a simplified and informal style, with a tendency to be cute. A total of 86 pages are used to describe the language, compared with 48 in the original paper introducing SNOBOL3.

The material presented is interspersed with a number of exercises and their solutions. The author uses the notion of assigning a name to a string, rather than the usual and more accurate one of assigning a value to a name, and fails to point out explicitly that statements are executed sequentially in the absence of branches. The combination of a typographical error on p. 65 and a further error at the top of p. 66 renders the explanation of the interpretive CALL function highly confusing. This reviewer thinks that an introductory book such as this should teach mainly by example, giving explanations as they are necessary. The author does this very effectively in describing indirect referencing by showing successive simplifications and generalizations of a simple program. Perhaps this should have been done earlier in the book.

A more serious objection is that SNOBOL3 is not upward compatible with SNOBOL4. However, the book does provide a *less* intimidating introduction to programming for the linguist or musician, and could serve excellently as either incidental reading for courses in the humanities or as a path to the more stimulating and informative reference papers on SNOBOL.

Malcolm C. Harrison

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