this requires simplifying assumptions. Thus, the stage is set for as many different opinions as there are investigators.

Separation Methods in Biochemistry is highly recommended to anyone who wishes to become more informed about the possibilities and complexities of fractionation.

LYMAN C. CRAIG
Rockefeller Institute, New York

Dantzig's Simplex Method

Linear Programming and Extensions. George B. Dantzig. Princeton University Press, Princeton, N.J., 1963. xviii + 625 pp. Illus. $11.50.

Linear programming is applicable to many large-scale problems of optimization from economic, industrial, military or administrative situations. It provides specific techniques for the maximization or minimization of linear functions subject to linear constraints and is closely related to game theory, although with different emphasis. Some of its mathematical foundations were laid in Motzkin's 1936 dissertation (Basel, *not* Zurich) on linear inequalities, and its industrial importance was recognized by Kantorivitch in Russia in 1939, but the full-scale development of the subject should probably be dated from Dantzig's introduction of the simplex method in 1947. In recent years, the field has grown tremendously and has given rise to many books, some of a general nature and others restricted to a particular area of application (economic theory, transportation, electrical networks, portfolio selection, and the like). Dantzig's long-awaited book is of the general sort, striking a nice balance between theory and applications.

When one of the "fathers" and recognized leaders in a field writes a book on his specialty, he has reason to hope that it will become *the* book on the subject. He also has reason to fear that, in aiming at a definitive treatment, his book may become unreadable to all but the experts. In my opinion, Dantzig's book comes very close to realizing the hope, and it does pretty well in skirting the danger by designing a certain set of chapters to serve as an introductory text. By almost any measure—number of pages, completeness of bibliography and index, variety of applications, completeness of theoretical discussion, scope of the exercises, or list of acknowledgements in the preface (which is a virtual *Who's Who* of the subject)—Dantzig's book seems to compare favorably with its predecessors.

With the praise, a word of caution. Although the book will be of great value to research workers in the field and to *serious* students of the subject, it does not seem suitable for the reader who wants only a routine working knowledge of the simplex method. For such a reader, less detailed treatment is preferable, but it might well be supplemented by material from Dantzig's book.

Space does not permit a technical discussion of the many strengths and the very few weaknesses of the book, but the chapter headings will indicate its contents: "The linear programming concept" (11 pp.); "Origins and influences" (20 pp.); "Formulating a linear programming model" (31 pp.); "Linear equation and inequality systems" (25 pp.); "The simplex method" (18 pp.); "Proof of the simplex algorithm and the duality theorem" (27 pp.); "The geometry of linear programs" (26 pp.); "Pivoting, vector spaces, matrices, and inverses" (28 pp.); "The simplex method using multipliers" (17 pp.); "Finiteness of the simplex method under perturbation" (13 pp.); "Variants of the simplex algorithm" (13 pp.); "The price concept in linear programming" (23 pp.); "Games and linear programs" (21 pp.); "The classical transportation problem" (17 pp.); "Optimal assignment and other distribution problems" (19 pp.); "The transshipment problem" (17 pp.); "Networks and the transshipment problem" (16 pp.); "Variables with upper bounds" (17 pp.); "Maximal flows in networks" (19 pp.); "The primal-dual method for transportation problems" (9 pp.); "The weighted distribution problem" (20 pp.); "Programs with variable coefficients" (15 pp.); "A decomposition principle for linear programs" (23 pp.); "Convex programming" (28 pp.); "Uncertainty" (15 pp.); "Discrete variable extremum problems" (37 pp.); "Stigler's nutrition model: An example of formulation and solution" (17 pp.); and "The allocation of aircraft to routes under uncertain demand" (24 pp.). There are a 19-page bibliography and an 11-page index.

VICTOR KLEE
University of Washington, Seattle, and Boeing Scientific Research Laboratories

New Books

Mathematics, Physical Sciences, and Engineering

Acta Imeko, 1964. Proceedings of the Third International Measurement Conference. vols. 1–3. Ing. S. Kovács and J. Solt, Eds. Hungarian Scientific Society for Measurement and Automation, Budapest, 1964. vol. 1, 498 pp.; vol. 2, 475 pp.; vol. 3, 530 pp. Illus. $30. Contain the full text of 105 papers in their original languages followed by abstracts in three languages—German, English, and Russian

Analysis. vol. 1. Einar Hille. Blaisdell (Ginn), New York, 1964. 640 pp. Illus. $10.

Atlas of Electron Spin Resonance Spectra. vol. 2, *Theoretically Calculated, Multicomponent, Symmetrical Spectra.* Ya. S. Lebedev, V. V. Voevodskii, and N. N. Tikhomirova. Translation from the Russian. Consultants Bureau, New York, 1964. 201 pp. Illus. $15.

Atomic Migration in Crystals. L. A. Girifalco. Blaisdell (Ginn), New York, 1964. 174 pp. Illus. $3.75.

Azeotropic and Extractive Distillation. E. J. Hoffman. Interscience (Wiley), New York, 1964. 336 pp. Illus. $14.

Bailey's Industrial Oil and Fat Products. Karl F. Mattil, Frank A. Norris, Alexander J. Stirton, and Daniel Swern. Daniel Swern, Ed. Interscience (Wiley), New York, ed. 3, 1964. 1117 pp. Illus. $25.

The Binary Stars. Robert Grant Aitken. Dover, New York, 1964 (corrected reprint of 1935 edition). 319 pp. Illus. Paper, $2.

Chemical Engineering. Paul P. De Rienzo. Macmillan, New York, 1964. 253 pp. Illus. $7.

A Collection of Problems on Mathematical Physics. B. M. Budak, A. A. Samarskii, and A. N. Tikhonov. Translated from the Russian edition by A. R. M. Robson. D. M. Brink, Translation Ed. Pergamon, London; Macmillan, New York, 1964. 782 pp. Illus. $11.50.

The Constitution of Glasses: A Dynamic Interpretation. vol. 2, pt. 1, *Constitution and Properties of Some Representative Glasses.* Woldemar A. Weyl and Evelyn Chostner Marboe. Interscience (Wiley), New York, 1964. 486 pp. Illus. $15.

A Course of Higher Mathematics. vols. 1–5. vol. 1, *Elementary Calculus* (557 pp., $12.50); vol. 2, *Advanced Calculus* (634 pp., $12.50); vol. 3, pt. 1, *Linear Algebra* (334 pp., $9); vol. 3, pt. 2, *Complex Variables-Special Functions* (710 pp., $15); vol. 4, *Integral Equations and Partial Differential Equations* (825 pp., $17.50); vol. 5, *Integration and Functional Analysis* (649 pp., $17.50). V. I. Smirnov. Translated from the Russian editions (Moscow, vols. 1 and 2, ed. 16, 1958; vol. 3, pts. 1 and 2, 1957; vol. 4, 1959; vol. 5, 1960) by D. E. Brown. I. N. Sneddon, Translation Ed. Pergamon, London; Addison-Wesley, Reading, Mass., 1964. Illus.

Electromagnetic Fields and Interactions. vols. 1 and 2. Richard Becker. Fritz Sauter, Ed. vol. 1, *Electromagnetic Theory and Relativity* (453 pp., translated from the

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