

**LARGE
SCALE**

DIGITAL COMPUTERS

An Annotated Bibliography

PUBLISHED AS A SERVICE TO THE COMPUTER ART BY...

Remington Rand Univac

DIVISION OF SPERRY RAND CORPORATION

INTRODUCTION

This bibliography is intended for those who wish to inquire into aspects of the computer field which are unfamiliar. To accomplish this it has been made relatively comprehensive in the listing of books and articles which give serious but not highly technical treatment of subjects such as general theory of digital computer design and operation, and the business and scientific applications of these machines. Special subjects, particularly those involving extremely technical treatment, are given but brief mention herein.

Readers are invited to submit new titles for inclusions in successive editions of this bibliography. In particular, it is hoped that suggestions from readers will permit expansion of the section on digital computer applications to provide a comprehensive bibliography of this segment of the field.

LARGE SCALE DIGITAL COMPUTERS

A General Bibliography

TABLE OF CONTENTS

- I Theory and Operation of Computers
 - A. Books
 - 1) For the layman
 - 2) Relatively technical
 - B. Articles
 - 1) For the layman
 - 2) Relatively technical
- II Applications: What Large Scale Digital Computers Can Do
 - A. Books
 - B. Articles
 - 1) Automation
 - 2) Business Management
 - 3) Engineering
 - a) General
 - b) Aeronautical
 - c) Chemical and Petroleum
 - d) Electrical Power
 - e) Mechanical
 - f) Other
 - 4) Other
- III Some Special Subjects
 - A. Mathematics and Statistics
 - B. Analog Computers and Converters
 - C. Operations Research
 - D. Automation
 - E. Missiles and Missile Guidance
 - F. Nuclear Energy
 - G. Chemical Processing
 - H. Specific Computers
 - J. Other Subjects
 - 1) Glossaries of computer terms
 - 2) Punched Cards
 - 3) Language Translation
 - 4) Miscellaneous
- IV A List of Periodicals
 - A. Devoted Mainly or Entirely to Computers
 - B. Devoted to Mathematics or Statistics
 - C. Devoted to Other Subjects of Interest to Users of Computers
- V Indexes to Publications About Computers
- VI Bibliographies in the Computer Field

I Theory and Operation of Computers: A: Books

1) For the Layman

Berkeley, Edmund C., Giant Brains, or Machines That Think, New York, Wiley, 1949, 277 pages, \$5.00.

In spite of its unfortunate title, this excellent book is still a classic popularization. But it has been superseded; see the entry immediately below.

Berkeley, Edmund C., and Wainwright, Lawrence, Computers -- Their Operation and Applications, New York, Reinhold, 1956, 296 pages, \$8.00.

A good survey for the newcomer to this field. It describes small machines as well as large, has a chapter on both IBM and Univac computers, another on applications in general, and a glossary and a bibliography.

Bowden, Bertram V., Faster Than Thought -- A Symposium on Digital Computing Machines, London, Pitman, 1953, 416 pages, 35s (about \$5.00).

Canning, Richard G., Electronic Data Processing for Business and Industry, New York, Wiley, 1956, 332 pages, \$7.00.

Lucid explanations of basic processes, carefully but vividly illustrated with a number of good diagrams and many references to specific installations. This is probably the best book on this subject for the businessman.

Chapin, Ned, An Introduction to Automatic Computers: A Systems Approach for Business, Chicago, The Technology Center, 1955, 245 pages, \$9.00.

This book can be ordered from Publications Sales, 407-C Gunsaulus Hall, 3140 South Michigan Avenue, Chicago 16.

Data Processing by Electronics, New York, Haskins and Sells, 1955, 113 pages, paper bound, no charge; apply to the publisher.

A relatively simple general introduction that includes such matters as binary arithmetic, theory of operation, and the operating costs and characteristics of a dozen different computers.

Eckert, W. J., and Jones, Rebecca, Faster, Faster: A Simple Description of a Giant Electronic Calculator and the Problems It Solves, New York, McGraw-Hill, 1956, 160 pages, \$3.75.

The example described here is the IBM NORC (Naval Ordnance Research Calculator).

Wilkes, M. V., Automatic Digital Computers, London, Methuen Co., 1956, 305 pages, 42s. (about \$6.00); also, New York, Wiley, \$7.00.

The author is Director of the Cambridge University Mathematical Laboratory. According to a detailed review in Control Engineering for September, 1956 (pp. 336-341) by Thomas J. Higgins, professor of electrical engineering at the University of Wisconsin, this book is not only, "an excellent general introduction to the major principles which underlie the design and use of digital computers," but also "one of the best-integrated and most intelligible books (on this subject) which has appeared to date." According to the same review, Professor Wilkes' book (which was published too late to be examined for this bibliography) has the following chapters:

1. The Development of Automatic Digital Computers (39 pages)
 2. The Principles of Logical Design (47 pages)
 3. The Principles of Programme Construction (47 pages)
 4. Relay Computers (20 pages)
 5. Storage (58 pages)
 6. Electronic Switching & Computing Circuits (47 pages)
 7. The Design & Operation of Digital Computers
- An appendix: Machinery & Intelligence (5 pages)
An annotated bibliography (108 items)

2) Relatively Technical Books

AIEE (American Institute of Electrical Engineers) Review of Electronic Digital Computers, New York, The AIEE, 1952, 114 pages.

Papers presented at the Joint AIEE - IRE Computer Conference held in Philadelphia in December, 1951.

ASME (American Society of Mechanical Engineers), Digital and Analog Computers and Computing Methods, New York, the Applied Mechanics Division of the ASME, 1953, 64 pages.

Transcripts of a symposium of the 18th Applied Mechanics Division Conference of the ASME held at the University of Minnesota in June, 1953.

Association for Computing Machinery, Eleventh Annual Meeting, Los Angeles, The Association, 1956, about 180 (unnumbered) pages, price not given.

Proceedings of the meeting held in Los Angeles, August 27 - 29, 1956. Most of the papers are very technical, but there are some notable exceptions, e.g.: Buchman, Aaron L., "Computer Programming & Coding at the High School Level," and Mayer, Rollin P., "A Proposal for Training Youngsters in Digital Computing Techniques." The Mayer article describes a proposed training computer which would include "a 32-register, 8-bit, 4- instruction, display-screen-output basic computer; a 1,024-register, 8-bit storage; a 32-instruction control; an 8-bit multiply-divide arithmetic element; analog and digital inputs; analog and digital outputs, and two storage and arithmetic sections ... to provide a full 16-bit machine ... a typical full scale model with eight sections . . . (costing) ... about the same as a bicycle. The speed of such a machine might easily be faster than ten instructions per second." Mr. Mayer is a staff member of the MIT Lincoln Laboratory, Lexington, Massachusetts.

Automatic Digital Computation, London, 1954; See the entry under Teddington National Physical Laboratory, below.

Blachman, N. M., Kruskal, J. B., Wolf, J. J., and Hogan, D. L., A Survey of Automatic Digital Computers, Washington, U. S. Office of Naval Research, Office of Technical Services, 1955, 109 pages, \$2.00.

Characteristics of about a hundred computers, small, medium, and large. Most of the information was obtained by questionnaire, in February, 1953.

Booth, Andrew D., and Booth, K. H. V., Automatic Digital Calculators, London, Butterworth Scientific Publications, 1953, 230 pages, 32s (about \$4.50); also, New York, the Academic Press, \$6.00

Carr, John W. III, and Scott, Norman R., (editors), Notes on Computers and Data Processors: Frontier Applications, Ann Arbor, The University of Michigan College of Engineering, 1956, about 600 pages, price not given.

Stenographic transcripts of a symposium held at Ann Arbor in the summer of 1955. (The cover title lists the date 1956 prominently, but this is the date of the subsequent symposium, at which copies of this book were distributed). There are many discussions of specific computers by the mathematicians and engineers who are using them.

ERA (Engineering Research Associates) Staff, High Speed Computing Devices, New York, McGraw-Hill, 1950, 451 pages, \$7.00.

Most of the material in this book was first issued to the Office of Naval Research as "an investigation and report on the status of development of computing machine components;" much of it is now largely of historical interest. However, it was written by members of the engineering staff which developed the Univac Scientific series of computers, it covers most of the large scale computers in existence at the time, it gives a thorough account of the structures and functions of the major computer components, both electrical and physical, and it has a number of bibliographies, the aggregate totaling several hundred items.

IRE (Institute of Radio Engineers) Transactions on Instrumentation, for June, 1956, New York, the IRE, 1956, 224 pages.

Report of the IRE Instrumentation Conference and Exhibit of November, 1955. Prepared by the PGI (Professional Group on Instrumentation), this is PGI-5. Some of the section headings are as follows: "24-Channel Cathode-Ray Oscilloscope for Monitoring Magnetic Tape Records," "Simplified Automatic Data Plotter," "Now Airborne Recorder of Small Weight and Size," "High Speed Reader of Perforated Tape," "Survey of Navigational Measurements Methods for Missile Guidance Systems," "Central Facility for Processing Engineering Test Data," "Digital Solutions to Instrumentation and Automatic Control."

IRE (Institute of Radio Engineers), 1956 Convention Record, Part 4: Computers, Information Theory, Automatic Control, Sessions 7, 10, 32, 39, 42, 46, 53. \$10.50 to non-members.

Order from IRE Headquarters, 1 East 79th Street,
New York 21.

Proceedings of the Eastern Joint Computer Conference, (of November, 1955?). Published by the AIEE, New York, 1956. 92 pages.

More information requested.

Proceedings of the Western Joint Computer Conference (of March, 1955), published by the IRE. 132 pages, paper bound, price not given.

26 technical papers

Teddington, (England) National Physical Laboratory, Automatic Digital Computation, London, H. M. Stationery Office, 1954, 296 pages, 21s7d. (about \$3.05).

Proceedings of a symposium held at the Laboratory in March, 1953. Descriptions of some British machines, with designs and photographs; discussions of certain mathematical and statistical applications. Emphasis is on medium-sized digital computers. Bibliographies.

Weik, Martin H., A Survey of Domestic Electronic Digital Computing Systems, Washington, U. S. Department of Commerce, Office of Technical Services, 1955, 272 pages, price not given.

This is Aberdeen Proving Ground Ballistic Research Laboratories Report No. 971, issued in December, 1955. Offset reproduced from typescript, but with many photographs. Information in tabular form, most of it obtained from questionnaires submitted to manufacturers or from publications issued by manufacturers. The abstract printed at the head of the volume reads as follows: "The engineering characteristics, operating experiences, cost factors and personnel requirements of eighty-four different domestic digital electronic computing systems are described. An analysis of the computer field, a discussion of trends, and a complete glossary of computer engineering and programming terminology are included." The glossary referred to is based primarily on the one fostered by The Association for Computing Machinery and published in Computers and Automation for January, 1956.

Theory and Operation of Computers: B: Articles

1) Articles for the Layman

Baker, W. W., "The Use of Computers in Handling Statistical Data," Journal of Engineering Education, Vol. 46, No. 2 (October, 1955), pages 163-167.

A paper presented at the annual meeting of the Chemical Division of the Association for Engineering Education in 1955, this is short, basic and substantial; it begins with an explanation of the differences between digital and analog machines.

Charnes, Abraham, & Cooper, William, "Linear Programming," Scientific American, (August, 1954) pages 21-23.

A short, lucid explanation of what linear programming is and how it is used to "calculate the best possible solution to a problem that involves a number of variables."

Clippinger, Richard F., "Economics of the Digital Computer," Harvard Business Review, Vol. 33, No. 1 (January-February 1955), page 77.

About the costs of owning, renting, operating.

"Glossary of Terms in the Computer Field," Computers & Automation, Vol. 5, No. 1 (January, 1956) pages 15-31.

See also III J 1) below.

King, Gilbert W., "Information," Scientific American, (September, 1952), pages 132-142.

Basic treatment of binary and other coding systems, including machine cards, graphs, and tapes, and their relationship to automatic control.

Klein, Martin L., "Digital Technique and Binary Numbers," Instruments & Automation, Vol. 27, No. 12 (December, 1954) pages 1944-1947.

A description of the binary system.

Lerner, I. S., and others, "Basic Digital Series," Control Engineering, Vol. 2 & 3 (issues for October, November, December, 1955, and for 1956).

A series of substantial but not extremely technical articles intended to introduce the elements of digital computers to the layman as well as the engineer.

Ridenour, Louis N., "Computer Memories," Scientific American, Vol. 192, No. 6 (June, 1955).

From the abstract at the head of the article; "Computing machines must be fast, and they must also have access to a vast store of information. How to increase this store and the speed with which it can be searched are problems now taxing computer designers."

"Roster of Organizations in the Computer Field," Computers & Automation, Vol. 5, No. 6 (June, 1956), Special Issue, \$6.00.

A 90-page list, with annotation. Various supplements have been issued in subsequent numbers of the journal.

Troll, John H., "The Thinking of Men & Machines," Atlantic, Vol. 194, No. 1 (July, 1954) pages 62-65.

"Who's Who in the Computer Field," Computers & Automation, Vol. 4, No. 6 (June, 1955) Special Issue, \$4.00.

A 94-page list, with annotation. Various supplements have been issued in subsequent numbers of the journal.

I Theory and Operation of Computers: B: Articles

2) Relatively Technical

Nye, G., "Basic Digital Computer Principles," Electrical Manufacturing, Vol. 56, No. 6 (December, 1955), pages 134-42.

"Primer in electronic digital computers containing elements of binary number system, decimal to binary conversion and fundamental computer definitions and symbols; information is important in development of control systems employing computer techniques and components; reference chart for decimal to binary conversion...and basic descriptive terms, symbols, and circuits...included." Abstract from Engineering Index.

Thomas, B. W., "High Speed Computers," ISA (Instrument Society of America) Journal, Vol. 2, No. 3 (March, 1955), pages 73-76.

"Highlights of computer design and component structures; analog vs. digital processes; binary and decimal counting systems; methods for handling and storage of information; construction and automation of circuit components; examples of computer applications in oil production, chemical analysis, inventory control,..." Abstract from Engineering Index.

Wilkinson, J. H., "Electronic Computing Machines and Their Uses," Journal of Scientific Instruments, November, 1955, pages 409-415.

An introduction to the characteristics and programming methods of various machines used for engineering and physical problems.

II Applications

A. Books

Anthony, Robert N., (ed.), Proceedings of the Automatic Data Processing Conference, September 8 & 9, 1955, Boston, The Harvard Business School, Division of Social Research, 1956. \$3.50.

Brown, R. Hunt, Office Automation -- Integrated & Electronic Data Processing, Automation Consultants, Inc., 1450 Broadway, New York, 1955, 283 pages, \$12.50.

Written for the businessman, technical jargon kept to the minimum.

Electronic Data Processing in Industry -- A Case Book of Management Experience, New York, American Management Association, Inc. 330 West 42nd St., New York 36, 1955, 257 pages, \$7.75.

Kozmetsky, George, & Kircher, Paul, Electronic Computers and Management Control, New York, McGraw-Hill, 1956, 275 pages, \$5.00.

According to the publisher, this is "A comprehensive survey of the problems of management planning and control... shows how they operate, many ways in which they can be used, and when and how business executives should plan to use them."

Locke, William N., & Booth, Donald A., Machine Translation of Languages, Boston, The Technology Press of the Massachusetts Institute of Technology, and New York, Wiley, 1956, 243 pages, \$6.00.

An exhaustive survey of the use of digital computers to translate languages, with an annotated bibliography.

Proceedings of the Second Annual Computer Applications Symposium, October 24-25, 1955, Chicago, Armour Research Foundation, 1956, 108 pages, \$3.00.

For a good general introduction to the whole subject of computer applications, see Berkeley & Wainwright, Computers ..., Section VII, pages 243-301, (Listed in I A above).

II Applications B: Articles

1) Automation

Gordon, B. M., "Adapting Digital Techniques for Automatic Controls," Electrical Manufacturing, Vol. 54, No. 5 & 6 (November, 1954, pages 136-143; 332; December, 1954; pages 120-125; 298-300).

Klein, Martin L., Williams, Frank K., & Morgan, Harry C., "Digital Automation," Instruments & Automation, Vols. 28 & 29 (October, 1955 through July, 1956)

October: Definitions & Elements; November: Code Arithmetic; December: Logical Network; January: Linear Programming; February: Basic Circuits; March: Multiplexing; April: Digital to Analog Conversion; May; Analog to Digital Conversion; June: Practical Analog-Digital Converters; July: High Speed Digital Conversion.

Macmillan, R. H., "Control Systems Simplified," Automation, Vol. 3, No. 7 (July, 1956) pages 55-60.

An excellent explanation, for the intelligent but ignorant layman, of just what automation is, written by a professor of engineering at Cambridge University.

Middleton, M., "Digital Computers in Design," Machine Design, Vol. 28, No. 4 (February 23, 1956) pages 88-92.

High speed design in complex situations.

Ridenour, Louis N., "The Role of the Computer," Scientific American, Vol. 187, No. 3 (September, 1952) pages 116-130.

This discussion, by a distinguished authority, is in an issue of the Scientific American devoted entirely to automatic control.

Stone, J. J., "Introducing Computers for Machine Tool Control," Tool Engineering, Vol. 36, No. 4 (April, 1956) pages 87-91.

A fairly technical discussion of the use of both digital and analog equipment in this work. Description of open-end and closed-loop systems of control.

Wadel, L. B., and many others, "Computers, Information Theory, Automatic Control," IRE Convention Record Part 4: Automatic Control 1955, pages 2-36 and 52-63.

"What Computers Can Do For You," Factory Management & Maintenance, Vol. 114, No. 2, (February, 1956), pages 98-105.

2) Business Management

Carroll, J. M., "Electronic Computers for Businessmen," Electronics, Vol. 28, No. 6 (June, 1955), pages 122-131.

"Possibilities of digital computers as valuable aids in business; summarized information furnished by 24 computer manufacturers, describing 38 models; data on price, number of installations, operations performed, speeds, storage devices, and other pertinent characteristics. Bibliography." ...Abstract from Engineering Index.

Clippinger, Richard F., and others, "Automatic Digital Computers in Industrial Research," Journal of Machine Accounting Systems and Management, Vol. 6, No. 2 (February, 1955), page 7; Vol. 6, No. 3 (March, 1955) page 9.

These two articles discuss computer costs.

Cony, Ed, "Canny Computers: Machines Write Music, Play Checkers, Tackle New Tasks in Industry, But Some Executives Still Shy From Computers; Manpower Remains Scarce," The Wall Street Journal, Vol. 36, No. 237 (September 19, 1956) page 1, Col. 1; page 15, Col. 1.

A review of the present state of business acceptance of computers, the writer's point is that "the business world has only begun to tap the computer's potentialities." He quotes N. J. Ream, director of systems planning at Lockheed, as saying, "...90% of the firms using computers aren't getting the most out of them, because they insist on using them for bookkeeping and accounting operations."

Gibbons, James, "Let's Look at the Available Business-Data Processors," Control Engineering, Vol. 3, No. 6 (July, 1956) pages 101-111.

Digital Applications Series, No. 7. The author, director of the electronics division of Price Waterhouse & Co., compares about twenty different computers.

Lessing, Lawrence P., "Computers in Business," Scientific American, Vol. 190, No. 1 (January, 1954) pages 21-25.

Although now somewhat dated, this is an excellent and readable report on the "problems, progress, potentials and present state of development," of large scale computers in business.

"What Computers Can Do For You," Factory Management, Vol. 114, No. (February, 1956) pages 98-105.

See also: The bibliography on computers in business by Ned Chapin, in Section VI, below. See also Canning, in I A 1) above; Brown, in II A, and Kozmetsky in II A. See also the article by C. R. DeCarlo, under II, B, 3) a), below.

II Applications B. Articles 3) Engineering Applications

a) General

Baker, W. W., "Use of Computers in Handling Statistical Data," Journal of Engineering Education, Vol. 146 (October, 1955), pages 163-167.

A brief introductory article emphasizing the relationship between speed of operation and economy, in the big computers.

DeCarlo, C. R., "Computers & Production Engineering," ASME (American Society of Mechanical Engineers) Paper N. A-161, for meeting of November 14, 1955, 10 pages. For copies write ASME, 29 W. 39th St., New York 18.

"Possibilities in use of electronic automatic digital computer as instrument in production management for solving problems affecting real production...what computer can do in handling large volumes of information, handling many variables and simultaneously...applicability to production scheduling and control of shop orders." Abstract from the Engineering Index.

Grabbe, E. M., and others, "Digital Applications Series," Control Engineering, Vol. 2, No. 12 (December, 1955) and subsequent issues for 1956.

A series of substantial but generally not extremely technical articles intended to introduce the applications and functions of digital computers to the businessman as well as the engineer.

Hurd, C. C., "Automatic Digital Computing in Engineering," Applied Mechanics Reviews, Vol. 8, No. 7 (July, 1955) pages 269-272.

A brief review of the history of computers, and an outline of the problems involved in programming and in education for the use of computers.

Keller, Allen, "Extending Engineering Skills With Large Scale Digital Computers," Mechanical Engineering, November, 1953, pages 891-

"Typical problems: potentialities, and applications."
Abstract from Aeronautical Engineering Index.

Klass, P. J., "New Convair Facility Given Task of Speeding Aircraft Design Flow: Data Reduction Processing Center," Aviation Week, Vol. 63, (November 14, 1955), pages 95-

Liggett, I. C., "Examples of Engineering Applications of IBM Digital Computers," Electrical Engineering, March, 1955, pages 233-235.

Roggenbuck, R. A., & Jeska, R. D., "Computer Gadgetry Helps Solve Special Problems," SAE (Society of Automotive Engineers) Journal, Vol. 64 (January, 1956) page 6.

This is an abridgment of a paper called, "Analog and Digital Computer Methods for Engineering Problems," which can be obtained from SAE Special Publications for 60¢. The authors are Ford Motor Company engineers.

b) Aeronautical Engineering

Grabbe, E. M., "The Use of Digital Computers in Air Navigation," Journal of the Institute of Navigation, June, 1954, page 67.

"Development appraisal of reliability, relative merits, and requirements for airborne applications." Abstract from the Aeronautical Engineering Index, 1954.

Granholm, Jackson W., "Magnetic Tape is Key to Flight Test System," Aviation Age Research & Development Handbook. (This is the June, 1956, special issue of Aviation Age; (Vol. 25, No. 6) Section G. pages 5-8.)

The author, an engineer at the Boeing Airplane Company, describes the use of airborne magnetic tape recorder for the collection of flight test data which is then fed through Uniservos to an 1103A computer. Schematic diagrams, photos.

Hunt, P. M., "Electronic Digital Computer in Aircraft Structural Analysis," Aircraft Engineering, Vol. 28, Nos. 325, 326, 327, (March, 1956), pages 70-76; April, pages 111-118; May, pages 155-165).

"Programming of Argyris matrix formulation of structural theory for electronic digital computer. March: Matrix interpretive scheme and its general application. April: Use of preset and program parameters with matrix interpretive scheme and application to general purpose programs for force methods of analysis. May: General purpose programs for force and displacement methods in large structures." Abstract from Engineering Index.

Ryskamp, John H., "Systems for Multiple Instrumentation Outputs," Automatic Control, August, 1956, pages 16-19.

An illustrated description of the use of an 1103 computer and a number of other devices in the central automatic digital data control system of the Lewis Flight Propulsion Laboratory of the NACA at Cleveland.

See also Section H, "Computers," a 22-page chapter of the Research and Development Technical Handbook issued as the June 1956 number of Aviation Age. Titles in the section include: "Research and Development Trends," "Analog Computers in Modern Aircraft Design," and the tables: "How Aircraft Industry Uses Computers," and "Computers for the Aircraft Industry."

For missile applications, see III E below.

II Applications: B. Books 3) Engineering

c) Chemical & Petroleum Engineering

DeCarlo, C. R., "Future of Automatic Information Handling in Chemical Engineering," Chemical Engineering Progress, Vol. 51, (November, 1955) pages 487-491.

Deutsch, M. L., & Hicks, J. S., "Simulation of a Refinery by a Digital Computer," World Petroleum, Vol. 26 (July 15, 1955) pages 69-71.

Describes the use of an ElectroData computer by Socony-Mobil Oil engineers.

Ebdon, J. F., "Digital Computers," Gas, Vol. 31 Nos. 1, 3, 5, 7, 9; (January, March, May, July and September, 1955).

"Symposium on the use of digital computers in gas industry with reference to management and employment of supervising personnel; storage system developments; place of computers in gas piping network analysis." Abstract from the Engineering Index.

Ebdon, F. J., "Electric Computers in Gas Industry Technology," Gas, Vol. 31, No. 11 (November, 1955) pages 51-57.

"Problems created by computers while solving distribution network analysis problems; transmission computer applications; future of computers in gas industry." Abstract from Engineering Index.

King, C. G., & Dunbar, G. D., "Computer Applications in Petroleum Refining," Canadian Chemical Processing, Vol. 40, No. 4 (April, 1956) page 92.

Two engineers discuss the use of an IBM CPC (Card Programmed Calculator) by Imperial Oil, Ltd., at Sarnia, Ontario. The article contains some excellent flow diagrams for readers not familiar with computers. The journal is published by the MacLean Publishing Company in Toronto.

Levine, C. A., & Opler, A., "Computer Solves Heat Flow Problems," Chemical Engineering, Vol. 63 (January, 1956) page 203.

Opler, Albert, "Application of Computing Machines to Ion Exchange Column Calculations," Industrial & Engineering Chemistry, Vol. 45 (December, 1953) pages 2628-2629.

For other chemical and petroleum applications, see the bibliographical article by Rose and others listed under Section VI below.

II.

d) Electrical Power

Henderson, J. M., "Automatic Digital Computer Solution of Load Flow Studies," Transactions of the American Institute of Electrical Engineers (AIEE) Part III, Vol. 73 (1954): also printed in: Power Apparatus Systems No. 16 (February, 1955) pages 1696-1702.

Load flow and voltage distribution for a given set of impressed power and reactive loads.

Little, John D. C., "The Use of Storage Water in a Hydroelectric System," Operations Research (formerly, Journal of the Operations Research Society of America) Vol. 3, No. 2 (May, 1955) pages 187-197.

A summary of the author's MIT PhD thesis. It describes the use of a high-speed digital computer to obtain a solution to the problem indicated by the title.

Robinson, C., & Tompsett, D. H., "Power System Engineering Problems With Reference to the Use of Digital Computers, abstract," The Engineer, (London) Vol. 201 (April 20, 1956) page 372.

II.

e) Mechanical Engineering

Kuhnel, A. H., "Computer Control of a Rolling Mill Schedule," Instruments and Automation, Vol. 29, No. 7 (July, 1956) pages 1303-1305.

Middleton, Marshall, Jr., "Digital Computers in Design," Machine Design, (February 23, 1956) pages 88-92.

"Appraisal of basic operational principles, programming requirements, relative merits of various types, applications, and potentialities." Abstract from the Aeronautical Engineering Review.

II.

f) Other Engineering

"In Ten Minutes Electronic Machine Performs 55 Man-Weeks of Bridge Calculations," Roads & Engineering Construction, Vol. 93 (November, 1955) pages 66-

Milliken, J. W., "Computers Control Operations," Railway Age, January 10, 1955, page 138.

II.

4) Other

Brooker, R. A., "Application of Digital Computing Techniques to Physics," British Journal of Applied Physics, (November, 1953) Page 321.

Has a 21-item bibliography.

Carr, John W., "Solving Scientific Problems," Control Engineering, Vol. 3, No. 1 (January, 1956) pages 63-70.

Locke, William N., "Translation by Machine," Scientific American, Vol. 194, No. 1 (January, 1956) pages 29-33.

The author, head of the Department of Modern Languages at MIT, describes the use of digital computers for this purpose and gives a sober appraisal of some of the intrinsic difficulties to be encountered.

Reynolds, A. C., Jr., "The Conference on Mechanical Translation," Mechanical Translation, Vol. 1, No. 3 (December, 1954) pages 47-55.

An engineer gives his view of the First Conference on Mechanical Translation which was held at MIT in May, 1952. The journal is published at MIT. For more information, see also the book by W. N. Locke listed under II A above.

Moore, W. J. M., "The Applications of Computers to Industry," Engineering Journal, (September, 1954) page 1068.

Discusses the use of computers in air traffic control, pilot training, and other fields; 24 references. The journal is published in Montreal.

Tocher, H. D., "Application of Automatic Computing Machines to Statistics," a chapter in, Automatic Digital Computation (London, 1954) pages 166-178. For a complete bibliographic description of the book see I A 2) above.

III. Some Special Subjects of Interest to Users of Computers

The books and articles listed here, with the exception of those under subheadings B (analog computers) and H (specific computers) do not necessarily discuss or even mention computers or computation but they are devoted to subjects which have become more and more closely associated with these machines, and they are included here in response to many requests by programmers, engineers, and laymen.

III. A. Mathematics & Statistics

Boole, George, An Investigation of the Laws of Thought on Which are Founded the Mathematical Theories of Logic and Probabilities, New York, Dover Publications, Inc., 1955, 424 pages, \$1.95.

A reprint of the 1854 classic written by the founder of Boolean Algebra.

Booth, Andrew D., Numerical Methods, New York, The Academic Press, 1955, 195 pages, \$6.00 (?)

The author is lecturer in mathematics at the University of London and head of the Electronic Computation Laboratory there.

Dantzig, Tobias, Number, the Language of Science, 4th Edition, Garden City, New York, Doubleday & Co., 1956, 345 pages, paper bound (Doubleday Anchor edition) 95¢

The author said in his preface to the first edition (1930): "...our school curricula, by stripping mathematics of its cultural content and leaving a bare skeleton of technicalities, have repelled many a fine mind. It is the aim of this book to restore this cultural content and present the evolution of number as the profoundly human story which it is.... Can the fundamental issues of the science of number be presented without bringing in the whole intricate apparatus of science? This book is the author's declaration of faith that it can be done."

Dwyer, Paul Sumner, Linear Computations, New York, John Wiley, 1951, 344 pages, \$6.50. Also London, Chapman & Hall, 52s.

"Elements of Boolean Algebra," Proceedings of the IRE (Institute of Radio Engineers) Vol. 41, No. 10 (October, 1953) pages 1366-1379.

An outline of the subject, written for mathematicians or for engineers with strong mathematical backgrounds.

Hald, A., Statistical Theory with Engineering Applications. Translated from the Danish by G. Seidelin, New York, Wiley, 1952, 760 pages, \$9.00.

Hartree, Douglas Rayner, Numerical Analysis, Oxford University Press, 1953, 287 pages, \$6.00.

The author is an authority on machine computation.

Hastings, Cecil, Approximations for Digital Computers, Princeton University Press, 1955, 201 pages, \$4.00.

"...Although the book may be considered to be of special value to users of high speed digital computers, it will also be of great value to others carrying out other digital computations where approximations are used. The style of presentation, less formal than a text, is fresh and interesting. While the applied mathematicians will want the text for Part II, those...who are less aware of the terms and methods of numerical analysis will find Part I most interesting." From the review in the Review of Scientific Instruments, October, 1955, pages 979-980. A review in Econometrica, April 1956, page 213, objected that the book gave little "historical perspective to the problem," and "only a sketchy set of references to current literature..."

Hildebrand, F. B., Introduction to Numerical Analysis, New York, McGraw-Hill, 1956, 511 pages, \$8.50.

"...intended to provide an introduction to methods useful with both desk calculators and high speed computing machines..." from the review in the Journal of Applied Physics, April, 1956.

Householder, Alston S., "The Generator of Error in Digital Computation," Oak Ridge National Laboratory Report ORNL 1893 (1955) 79 pages.

The computer used in the examples is the ORACLE.

Householder, Alston S., Principles of Numerical Analysis, New York, McGraw-Hill, 1953, 274 pages, \$6.00.

The author is head of the computing laboratory at Oak Ridge and president of the (American) Association for Computing Machinery. See also his bibliography on numerical analysis in Section VI, below.

Kendall, M. G., & Buckland, W. R., Dictionary of Statistical Terms, London, Oliver & Boyd, 1956, 576 pages, "about 25s," (about \$3.60)

According to the publisher's announcement, this book is to include, "in addition to terms that are wholly statistical, ... some terms of a semi-mathematical character ... together with terms of a statistical character used in other sciences, as well as terms originating in other sciences of special interest to statisticians....The book falls into two parts -- the Dictionary of terms and definitions, in English, and glossaries of equivalent terms (without definitions) arranged in an alphabetical order for each of the four languages: French, German, Italian, and Spanish."

Langer, Susanne K., An Introduction to Symbolic Logic, New York, Dover Publications, (920 Broadway, N. Y. 10) 2nd edition, 1953, 367 pages, paper bound, \$1.70.

Mrs. Langer's book is not casual reading, but it is intended for the layman whose background in mathematics and logic is slight. It places Boolean algebra in its logical context. No discussion of computers. There is a good index, a table of contents, and a short but annotated bibliography.

Lotkin, Mark, "Some Problems Solvable on Computing Machines," Communications on Pure & Applied Mathematics, February, 1954, page 149.

The references are to ENIAC, EDVAC, ORDVAC, BELL, and various other machines.

Milne, William Edmund, Numerical Calculus, Princeton University Press, 1949, 393 pages, \$3.75.

Approximations, interpolations, finite differences, numerical integration, curve fitting.

Milne, William Edmund, Numerical Solution of Differential Equations, New York, John Wiley, 1953, 275 pages, \$6.50

Nielsen, Kaj L., Methods in Numerical Analysis, New York, Macmillan, 1956, 382 pages, \$6.90.

The author, head of the mathematics division of the U. S. Naval Ordnance Plant at Indianapolis, says in his preface that he wrote this book to meet the need for an elementary textbook on this subject.

Richards, R. K., Arithmetic Operations In Digital Computers, New York, Van Norstrand, 1955, 397 pages, \$8.00.

The author is a member of the IBM Engineering Laboratory at Poughkeepsie. This is the standard text on this subject; however, the ten-page bibliography appended to it lists only one or two items as recent as 1954.

Petrucelly, Vincent, "Boolean Algebra: New Tool for Circuit Designers," Electrical Manufacturing, Vol. 54, No. 2 (August, 1954) pages 97-101.

Scarborough, James N., Numerical Mathematical Analysis, Johns Hopkins University Press, 1955 (3rd edition) 554 pages, \$6.00.

Uspensky, James V., & Heaslet, M. A., Elementary Number Theory, New York, McGraw-Hill, 1939, 484 pages, \$4.00.

Whittaker, Sir Edmond Taylor, & Robinson, George, Calculus of Observations, A Treatise on Numerical Mathematics, London, Blackie & Son, (66 Chandos Place, London WC2) 4th edition, 398 pages, 25s, (about \$3.60).

Whittaker, Sir Edmond Taylor, & Watson, G. M., Course of Modern Analysis, New York, Macmillan, 1952, 608 pages, \$11.55; also, Cambridge University Press, 42s (about \$6.00).

Not a book for amateurs, this is an introduction to the general theory of infinite processes and analytic functions.

Willers, Friedrich Adolf, Practical Analysis -- Graphical and Numerical Methods, Translated by Robert T. Beyer, New York, Dover Publications, 1949, 422 pages, \$6.00. Also available from George J. McLeod, Ltd., 73 Bathurst St., Toronto 2-B, at \$2.50. Disparity in prices not clear to bibliographer; correction wanted.

III. Some Special Subjects

B. Analog Computers and Converters

Bower, G. G., "Analog to Digital Converters," ISA (Instrument Society of America) Journal, Vol. 1, No. 12 (December, 1954) pages 15-19.

A substantial discussion, with examples and a bibliography.

Fletcher, Taylor C., & Walker, Norman C., "Analog Measurement and Conversion to Digits," ISA (Instrument Society of America) Journal, September, 1955, pages 341-345.

"Basic principles, design, and potentialities of voltage converter systems, with a comprehensive bibliography; applications." Abstract from the Aeronautical Engineering Review.

Johnson, Clarence L., Capt. USAF, Analog Computer Techniques, New York, McGraw-Hill, announced for 1 October 1956, 280 pages, about \$7.00.

Jones, C. E., "Factors in Evaluating Analog Computers," Machine Design, Vol. 27, No. 2 (February, 1955) pages 218-220.

Korn, Granino, & Korn, T. M., Electric Analog Computers, New York, McGraw-Hill, announced for October 1956, 425 pages, \$9.00.

This will be the second edition of this standard work.

McDonnell, J. A., "Fundamentals of Analog Computers," Instruments & Automation, Vol. 27, No. 11 (November, 1954) pages 1797-1803.

Nicola, R. M., "Operational Techniques for Special Purpose Computers," Aeronautical Engineering Review, Vol. 15, No. 3 (March, 1956) pages 78-82.

"Compromise approach to question of analog vs. digital methods of computation; successful applications of techniques and components in airborne equipment, and in high temperature test facilities." Abstract from the Engineering Index.

Vance, A. W., Hutter, E. C., Lehman, J. & Wadlin, M. L., "Analog Computers," in: Marton, L., (editor) Advances in Electronics & Electron Physics, Volume VII, New York, the Academic Press, 1955; pages 363-398.

An excellent review of this subject, by members of the David Sarnoff Research Center at Princeton University, with some 60 references to articles in technical journals.

Wass, C. A. A., Introduction to Electronic Analog Computers, New York, McGraw-Hill, 1955, 237 pages, \$6.50.

This book uses a minimum of technical jargon, but it assumes that the reader is familiar with the essentials of electronics and feedback theory.

Wood, Thomas, "How an Analog Computer Works," SAE (Society of Automotive Engineers) Journal, Vol. 63 (August, 1955) pages 45-46.

See also an extensive discussion intended expressly for the layman: "Analog & Digital Computers Compared;" "Examples of Analog Computer Units;" and, "Examples of Analog Computers," in Berkeley & Wainwright, Computers, listed under I A 1) above.

III.

C. Operations Research

McCloskey, Joseph F., & Trefethen, Florence N., (editors) Operations Research for Management, Baltimore, The Johns Hopkins University Press, 1954, 409 pages, \$7.50.

An excellent introduction to this subject.

Proceedings of the Conference on Operations Research, January 28 and 29, 1954, published by the Society for Advancement of Management, New York, The Society, (74 Fifth Ave., New York 11) 328 pages, \$15.00.

Includes, among others, the following papers: Hurd, Cuthbert, "Information Handling;" Mitchell, H. F., "Electronic Computers in Inventory Control."

III.

D. Automation

Automatic Control, by the editors of Scientific American, New York, Scientific American and Simon and Schuster, 1955, 148 pages, paper bound, \$1.00.

Probably the best extended discussion of the technical aspects of this subject now available to the layman.

The Automatic Factory: What Does It Mean?, published by The Institution of Production Engineers, London, The Institution, (10 Chesterfield St., London W1) 1955, 228 pages, \$3.50.

A group of papers on the automatic factory and its many implications, technical and social.

Diebold, John D., Automation, New York, Van Norstrand, 1952, 181 pages, \$3.50.

Einzig, Paul, The Economic Consequences of Automation, London, Secker & Warburg, 1956, 226 pages, 21s (about \$3.00)

The author, "who possesses a remarkable flair for clear economic exposition, has essayed in his latest book ... (a survey of) automation -- what it is, its practicable limits, the economics of it, and its implications in the fields of industrial relations, company finance, macro-economics, the trade cycle, balances of payments, taxes ... (Although) he may seem to experts too optimistic or too pessimistic here and there, his book in the hands of those who want to learn the meaning of the new age can do nothing but good." From the review in the Times (London) Literary Supplement, August 17, 1956.

Levin, Howard S., Office Work in Automation, New York, Wiley, 1956. More information wanted.

Macmillan, R. H., Automation: Friend or Foe? Cambridge University Press, 1956, 100 pages 8s 6d. (about \$1.25).

The author, a Cambridge mathematician and engineer, explains the principles of automation for the layman. He also describes the use of computers, from the same point of view, and adds a discussion of the social consequences of automation. Some of the reviewers have criticized these last two aspects of the book as superficial.

Soule, George, What Automation Does to Human Beings, London, Sidgwick & Jackson, 1956, 184 pages, 15s. (about \$2.25).

A substantial, and, in spite of its title, optimistic examination of the social and economic consequences of automation by a prominent American economist.

"Automation," Supplement to The Economist, (London) Vol. 180, No. 5892 (July 28, 1956) 24 pages.

A survey of the present state of this subject by the editors of London equivalent of The Wall Street Journal.

III.

E. Missiles and Missile Guidance

Donan, J. F., "Missile Design: Role of the Electronic Computer," Aero Digest, Vol. 69 (July, 1954) pages 76 -

Fisher, Louis L., "Recording Data on Magnetic Tape," Radio-Electronic Engineering, March, 1955, pages 18-20; 37-38.

"Evaluation of multiplexing digital and analog recording techniques, design and operational principles, and procedures for systematizing telemetered data for input to high-speed computers, with schematic diagrams of an analog-to-digital converter." Abstract from the Aeronautical Engineering Review.

Gibson, Richard C., Colonel, USAF, "Some Principles of Missile Guidance," Aeronautical Engineering Review, Vol. 15, No. 5 (May, 1956), pages 70-75.

A paper presented by the author, chief of the Guidance Branch of the Air Research & Development Command, USAF, at the 24th annual meeting of the Institute of the Aeronautical Sciences in January, 1956. The abstract at the head of the paper: "A description of surface-to-air, air-to-air, and long range surface-to-surface missile guidance systems and their applications, with mention of difficulties to be overcome in making such systems effective." This article does not discuss computers, but it gives explanation of what is involved in the problem itself.

Litman, Bernard, "Computers -- Brains of the Inertial System," Aviation Age, November, 1954, page 24.

Locke, Arthur S., Guidance -- Principles of Guided Missiles Design, New York, Van Norstrand, 1955, 729 pages, \$12.50.

Newell, Homer E. Jr., High Altitude Rocket Research, New York, The Academic Press, 1953, 298 pages, \$7.50.

Parson, Nels A. Jr., Guided Missiles in War & Peace, Harvard University Press, 1956, 161 pages, \$3.50 (?)

An intelligent popular survey outlining some of the guidance problems briefly; does not discuss computer control.

National Telemetering Conference 1954, New York, The Institute of Aeronautical Sciences, (2 East 64th St., N. Y. 21) 1955, 179 pages, \$2.00.

Papers given at Chicago, May 24 and 26, 1954. This publication is sponsored by the IRE, the ISA, the IAS, and the AIEE, and may be obtained from any one of them as well as the Institute of Aeronautical Sciences. The papers discuss a wide variety of applications, from missile guidance to pipeline control. Some of the titles are: "Telemetering Systems;" "Telemetering Pickups and Components," "Classification of Telemetering Systems" (i.e: Remote Control Digital, and Remote Control Analog); "All-Weather Flight Control;" "Information Handling -- Data Reduction."

"Progress of Missile Science," Special issue of Aero Digest, for July 1954, 148 pages.

Includes: "Missile Directory," "Design Analysis," "Aerodynamic Principles," "Role of the Electronic Computer," "Guidance Problems," other subjects.

"Guided Missiles 1956", Interavia, Vol. XI, No. 6 (June, 1956) (the entire issue).

A remarkably lucid and well-illustrated survey of the guided missile program from an international point of view. Written for the layman rather than the engineer, but several cuts above the usual. Does not discuss the use of computers.

III.

F Nuclear Energy

Bonnaure, P., and others, "Automatic Control of a Nuclear Reactor," Journal of Nuclear Energy, August, 1954, Part I, pages 24-38.

In French.

Schultz, Mortimer A., Control of Nuclear Reactors and Power Plants, New York, McGraw-Hill, 1955, 313 pages, \$7.50.

Written for the reader familiar with servo engineering. Most of the discussion is based on the operation of the solid fuel heterogeneous reactor. A few pages in Chapter II are about analog computing techniques. Each chapter has a bibliography.

Stone, J. J., & Mann, E. R., Oak Ridge National Laboratory Reactor Controls Computer, U. S. Atomic Energy Commission, ORNL Report No. 1632 (1954), 44 pages.

"The computer simulates reactor operation and enables the proper design and evaluation of necessary controls. Construction details of the various components and their application to the linear and non-linear problems handled are discussed extensively." Abstract from Chemical Abstracts.

III.

G. Chemical Processing

This is an extremely large field. The literature has been quite well reviewed and listed by Arthur Rose, and others, in two issues of Industrial and Engineering Chemistry -- March, 1955, and March, 1956. Their discussion lists some 330 articles devoted to computation in chemical processing. See the full bibliographic description of these two discussions under VI below.

III.

H. Specific Computers

Allen, W., & Smith, G. E., "Univac & Univac Scientific," Instruments & Automation, Vol. 28, No. 6 (June, 1955) pages 960-969.

Components, command structures, other characteristics, and applications.

Alrich, J. C., "Engineering Description of ElectroData Digital Computer," Institute of Radio Engineers -- Transactions on Electric Computers (IRE - EC) Vol. 4, No. 1 (March, 1955) pages 1-10.

Bauer, Walter F., "An Integrated Computation System for the ERA 1103," Journal of the Association for Computing Machinery, Vol. 3, No. 3 (July, 1956) pages 181-185.

For the reader who understands programming but is not familiar with the 1103.

Berkeley, Edmund C., "Simple Simon," Scientific American, Vol. 138, No. 5 (November, 1950) pages 40-43.

A brief description of a now famous miniature digital machine built primarily for training purposes; the author was one of its designers. For a much more extensive account of this machine, see Part V of his book, Computers ..., listed in Section I above.

Bryzgalin, F., "USSR Struggles With Electronic Computers," Petroleum Engineer, Vol. 27 (August, 1955) page A58.

Carr, John W., "Comparison of Large Scale Calculators," Control Engineering, Vol. 3 No. 2 (February, 1956) pages 84-92.

Carr, John W., & Scott, Norman, (editors) Notes on Digital Computers and Data Processors. j See under I A 2) above.

Carr, John W., "Small Scale Computers," Control Engineering, Vol. 3 No. 3 (March, 1956) pages 99-104.

Carr, John, W., "Solving Scientific Problems," Control Engineering, Vol. 3 No. 1 (January, 1956) pages 63-70.

Brief comparisons of several machines built for scientific work.

Carroll, J. M., "Electronic Computers for the Businessman," Electronics, Vol. 28 No. 6 (June, 1955) pages 122-131.

Surveys the characteristics of 38 digital computers.

"Electronic Calculator," Electrical Manufacturing, December, 1953, page 108.

The IBM 607.

"Electronic Digital Computers," The Engineer (London) issues for February and March, 1955:

The Elliott 402: February 18, page 232.

The "Deuce," February 25, page 266.

The Ferranti Mark I, and the "Pegasus," March 4, page 303.

Gibbons, J., "Available Business Data Processors," Control Engineering, Vol. 3 No. 7 (July, 1956) pages 101-111.

"Inexpensive Digital Computers for Engineering Calculations," British Communications & Electronics, Vol. 3 No. 8 (August, 1956) page 430.

Primarily a description of the "Deciplex," made by Southern Instruments, Ltd., and intended to sell for about \$20,000.

Lebedev, S. A., "The High Speed Electronic Calculating Machine of the Academy of Sciences of the USSR," Journal of the Association for Computing Machinery, Vol. 3 No. 3 (July, 1956) pages 129-133.

A translation (by C. D. Benster of the ElectroData Corporation) of a paper originally presented at the international conference on digital computers held at Darmstadt in October, 1955. The author is presumably a member of the Academy in question.

Lonsdale, K., "The Design & Construction of the Manchester University Digital Computer," Electronic Engineering, September, 1954, page 376.

Osborn, Roddy F., "G. E. & Univac: Harnessing the High Speed Computer," Harvard Business Review, July-August, 1949, page 99.

Perkins, Robert, "EASIAC, A Pseudo-Computer," Journal of the Association for Computing Machinery, Vol. 3 No. 2 (April, 1956) pages 65-72.

Rutishauser, H., "Some Programming Techniques for ERMETH," Journal of the Association for Computing Machinery, Vol. 2 No. 1 (January, 1955) pages 1-4.

The computer in question, built at the E. T. H. (Federal Institute of Technology) in Zurich, is a decimal machine with floating point arithmetic and a 10,000 word magnetic drum storage.

Smith, Charles V. L., "Electronic Digital Computers," a chapter in: Advances in Electronics, Vol. IV, edited by L. Marton; New York, the Academic Press, 1952. The chapter cited discusses "Whirlwind," and SEAC, and was apparently written in 1950.

For many different computers see the books by Berkeley-Wainwright, Blachman, Booth, Bowden, Carr, Canning, and Weik, all listed under I A above. For a 1955 survey of 38 different computers, see the article by J. M. Carroll under II B 2) above; for a 1956 survey of about 20 different computers used mainly for business purposes, see the article by James Gibbons under II B 2) above. For the IBM models 701, 702, 705, and 704, see Berkeley-Wainwright, under I A 1) above; for the IBM "NORC," see Eckert & Jones, also under I A 1); for the "ERA 1103," (Univac Scientific) see Berkeley-Wainwright.

Practically all of the computer journals regularly publish more or less detailed reviews and notes on new computers, and these reports have become too numerous to list here. See, for example, any issue of Computers and Automation, or of the Journal of the Association for Computing Machinery. The Digital Computer Newsletter, (which see under IV A below) regularly publishes articles about specific computers under two headings: "Computers, U S A," and, "Computers, Overseas."

III

J. Other Subjects of Interest to Users of Computers

1) Glossaries

"Glossary of Terms in the Field of Computers and Automation," Computers & Automation, Vol. 5 No. 1 (January, 1956) pages 15-31.

This is a compilation of several glossaries issued earlier by the same journal; it is based ultimately on the work of Grace M. Hopper of the Programming Research Center of Remington Rand Univac and a committee of the Association for Computing Machinery; the emphasis is on digital computer programming and applications rather than engineering terms. It has been reprinted, with minor changes, in Berkeley & Wainwright, which see under I A 1) above.

Glossary of Terms Relating to Automatic Digital Computers, British Standard n2641, 1955, published by the British Standards Institution, 15 pages. More information wanted.

"IRE Standards on Electronic Computers: Definitions of Terms, 1956," (Standard 56 IRE 8.S1), in : Proceedings of the IRE (Institute of Radio Engineers) Vol. 49 No. 9 (September, 1956), pages 1166-1173.

A valuable counterpart, especially for engineers, to the glossary listed at the head of this section. According to a notice on the title page, it "may be purchased while available from the IRE, 1 East 79th St., New York, at 60¢ per copy. A 20 percent discount will be allowed for 100 or more copies mailed to one address."

III.

J. Other Subjects of Interest to Users of Computers

2) Punched Cards

The Punched Card Annual, published by the Punched Card Publishing Co., 502 Maccabees Building, Detroit 2. Price not given.

Volume 3, for 1954-55, consisted of 232 pages, contained about 50 articles, mainly about applications, and had an index to the first three volumes. More information wanted.

Casey, Robert S., & Perry, James W., Punched Cards: Their Application to Science and Industry, New York, Reinhold, 1951, 516 pages, \$10.00.

Gruenberger, Fred, Diagrams in Punched Card Computing, Madison, The University of Wisconsin Press, 1954, 139 pages, \$3.75.

"The diagrams in this book show some of the things that can be done with basic equipment. Some of the panels and principles apply directly to routine work; others illustrate what might well be done...." Abstract from the Aeronautical Engineering Review.

III.

J. Other Subjects ...

3) Language Translation

Locke, W. M., "Speech Typewriters and Translating Machines," PMLA (Publications of the Modern Language Association) Vol. 70 No. 2 (April, 1955) pages 23-32.

This is a revision, intended primarily for linguists, of a paper originally presented before the Division of a Chemical Literature at the American Chemical Society meeting in New York in September, 1954. It gives a history of the subject and an outline of the work being done at MIT. For the most complete and authoritative discussion of this subject, see the book by Professors Locke and Booth listed under II A above.

"Multi-Million Bit Storage System," Digital Computer Newsletter, Vol. 8, No. 3 (July, 1956); also in: Journal of the Association for Computing Machinery, July, 1956, page 260.

This unsigned article describes a 6-million-bit-per-square-inch digital memory system developed by the International Telemeter Corporation for the U. S. Air Force as part of a mechanical language translation program. The reader familiar with foreign languages will recognize that the linguistic assumptions of this article are naive.

See also the periodical, Mechanical Translation, listed under IV C below.

See also the June, 1955 issue of the Journal of Symbolic Logic, (listed under IV B below) which is devoted entirely to the use of digital computers for machine translation.

III.

J. Other Subjects

4) Miscellaneous

Doss, M. P. (editor), Information Processing Equipment, New York, Reinhold, 1955, 276 pages, \$8.75.

Not a book on computers, this covers all kinds of office equipment including spirit duplicators, punched cards, large and small calculators.

Hollitch, Robert S., & Hawkes, Albert K., Automatic Data Reduction WADC Technical Report No. 54-519 Part II, November, 1954, 73 pages; published by the Armour Research Foundation of the Illinois Institute of Technology.

Subtitle: "A Catalogue of Devices Useful in Automatic Data Reduction." Analog voltage to digital converters, shaft position digitizers, digital plotters, digital to analog converters, digital voltmeters, special tape recorders.

Householder, Alston S., "The Position of the University in the Field of High Speed Computation and Data Handling," Computers & Automation, Vol. 5 No. 5 (May, 1956) pages 6-10.

Setterwell, M., "A Mechanical Binary-Decimal Converter," Journal of Scientific Instruments, Vol. 33 (January, 1956) pages 18-19.

IV. A List of Periodicals

A. Devoted Mainly or Entirely to Computers

Computers & Automation, published monthly by Berkeley Enterprises, Inc., 815 Washington Street, Newtonville, 60, Massachusetts; \$5.50 a year; \$6.00 in Canada; \$6.50 elsewhere, Offset printed from typescript.

Both technical and general articles. A Directory Issue is published in June (June, 1955: "Who's Who in the Computer Field," June, 1956: "Roster of Organizations in the Computer Field.") These special issues are available at \$4.00 and \$6.00 respectively; supplements are issued in subsequent issues. This journal also publishes book reviews, abstracts of papers given at meetings, various other kinds of reference lists, and even a special breed of science fiction. It published a "Glossary of Terms in the Computer Field," in its January, 1956 issue. (See III J 1 above). The editor is Edmund C. Berkeley; contributing editors whose names will be familiar to readers of this bibliography are Andrew D. Booth, John W. Carr, Alston S. Householder. The editorial offices are at 36 West 11th Street, New York 11.

Computing News, published twice a month by Fred Gruenberger, Richland, Washington; \$6.00 a year. Subtitle: "A semi-monthly newsletter of information on punched card machines and calculators."

About 6 or 8 pages an issue. One or two short technical articles, much gossip.

Data Processing Digest, published monthly by Canning, Sisson & Associates, 914 South Robertson Boulevard, Los Angeles 35; \$24.00 a year. Offset printed.

Publishes book reviews and reviews of abstracts of articles on data processing from about 80 different periodicals including Computers & Automation, Electrical Engineering, Business Week, The Wall Street Journal. It is devoted primarily, although not entirely, to the business rather than scientific applications of computers and data handling systems. About 18 pages; no ads. Some of the subheadings are: General Information, Equipment, Programming, Management Decision-Making Techniques, Comment, Training, Meetings, References.

Digital Computing Newsletter, published quarterly by the office of Naval Research, Physical Sciences Division, Washington 25; Offset printed, apparently from typescript.

Sixteen or twenty pages an issue. Notice on the masthead; "The purpose of this newsletter is to provide a medium for the interchange among interested persons of information concerning recent developments in various digital computer projects. Distribution is limited to government agencies, contractors, and contributors." Headings in the table of contents are: Computers, U.S.A.; Components, Computers, Overseas; Miscellaneous. The editor is Albrecht J. Neumann. This quarterly is also published regularly as a supplement to the Journal of the Association for Computing Machinery, which see below.

IRE (Institute of Radio Engineers) Transactions on Electronic Computers, published quarterly by the PGEC (Professional Group on Electronic Computers) of the IRE at 1 East 79th Street, New York 21; \$17.00 a year to non-members; single copies, \$3.60 to non-members. Letterpress printed.

In addition to full-length, signed, technical articles, there are regular features such as "Reviews of Current Literature," which consists of several pages of abstracts and book reviews; there are also long technical articles on special subjects, e.g.: "Review of Electronic Computer Progress During 1955," with a 125-item bibliography. The March issue has an index which lists, by both author and subject, all the transactions which have appeared in the journal during the previous year.

Journal of the Association for Computing Machinery, published quarterly by the Association at 2 East 63rd Street, New York 21; \$10.00 a year to non-members; however, the \$6.00 annual membership fee includes a subscription to the Journal. Letterpress printed.

From 100 to 200 or more pages an issue; no ads; the whole presentation is that of the classical "learned journal." From the Association's announcement inside the back cover; "The purpose of the Association is to advance the science, design, development, construction, and application of modern machinery for performing operations in mathematics, logic, statistics, and kindred fields, and to promote the free interchange of information about such machinery in the best scientific tradition." From the masthead of the Journal: "By arrangement with the Office of Naval Research, U. S. Navy Department, the Digital Computer Newsletter issued quarterly by that organization is reprinted in its entirety as a supplement to the Journal." In addition to its signed articles, the Journal also publishes book reviews, notes on coming conventions and conferences, and Association news.

Modern Machine Calculation

More information requested.

IV.

B. Journals Devoted to Mathematics or Statistics

American Statistician, published five times a year by the American Statistical Association, 1108 16th Street, N. W., Washington 6; \$1.50 a year.

Applied Statistics, published quarterly for the Royal Statistical Society by Oliver & Boyd, London; 21s (about \$3.00) a year.

Econometrica, published quarterly by the Econometric Society at Yale University; \$12.00 a year.

The Econometric Society is "an international society for the advancement of economic theory in relation to mathematics and statistics."

Journal of Mathematics & Physics, published quarterly at the Massachusetts Institute of Technology, Cambridge 39, Mass.; \$6.00 a year.

From the masthead: "The Journal publishes papers of an advanced mathematical nature from the fields of Engineering and Applied Physics and papers dealing with mathematical methods of interest for the applications."

Journal of the Royal Statistical Society, Series B, Methodological, published twice a year by the Society at 21 Bentinck Street, London W. 1; the cost is about \$7.00 a year, but it varies.

Journal of the Society for Industrial and Applied Mathematics, published quarterly by the Society, Box 7541, Philadelphia 1; \$8.00 a year.

Journal of Symbolic Logic, published quarterly by the Association for Symbolic Logic, Rutgers University, New Brunswick, New Jersey; \$5.00 a year.

Bibliographies, book reviews; issues an index to its own articles.

Mathematical Tables & Other Aids to Computation, published quarterly by the National Academy of Sciences -- National Research Council, Publications Office, 2101 Constitution Avenue, Washington, D. C.; \$5.00 a year.

Quarterly of Applied Mathematics, published quarterly by Brown University, Providence 12, Rhode Island; \$6.00 a year.

From the masthead: "The Quarterly prints original papers in applied mathematics which have an intimate connection with application in industry or practical science...."

See also Mathematical Reviews, listed under V (Indexes) below.

IV.

C. A List of Periodicals Devoted to Other Subjects of Interest to Users of Computers.

Aeronautical Engineering Review, published monthly by the Institute of the Aeronautical Sciences, 2 East 64th Street, New York 21; \$3.00 a year.

Prints abstracts in an "Aeronautical Reviews" section each month; one of the subheadings in this section is "Computers." Publishes its own index in the December issue each year.

Aircraft Engineering, published monthly by Burnhill Publications, Ltd., 12 Bloomsbury Square, London W. C. 1; 30s (about \$4.20) a year. Subtitle: The Scientific and Technical Organ of the Aeronautical Engineering Profession.

Has abstracts, bibliographies, book reviews, its own indexes.

Automatic Control, published monthly by Reinhold, 430 Park Avenue, New York 22; free to engineers and "management men;" \$10.00 to others. Subtitle: "The Applications Magazine of Systems Engineering."

Automation, published monthly by the Penton Publishing Co., Cleveland 13; \$10.00 a year.

The articles run from fairly technical to fairly popular; many ads.

Aviation Age, published monthly by Conover-Mast Publications, 205 East 42nd Street, New York 17; \$10.00 a year.

Technical news; many short articles. The June, 1956 issue was an out-sized "Research and Development Technical Handbook." See the last entry under II B 3) b) above.

British Communications on Electronics, published monthly by Heywood & Co., Ltd., Drury House, Russell Street, Drury Lane, London W. C. 2; \$6.00 a year.

According to the publisher, this is "the only British journal devoted specifically to the applications of communications and electronics."

Communications & Electronics, published every two months by the American Institute of Electrical Engineers, 33 West 39th Street, New York 18; \$5.00 a year to non-members.

Control Engineering, published monthly by McGraw-Hill Publishing Company, 330 West 42nd Street, New York 36; \$3.00 a year.

This magazine has published a long series of excellent articles on computers. See Lerner, I. S. and others, under I B 1) above; also Grabbe, E. B., and others, under III B 3) above.

Electrical Manufacturing, published monthly by the Gage Publishing Company, 1250 Sixth Avenue, New York 20; \$10.00 a year. Subtitle: "Design Engineering of Electrically Energized Machines, Appliances, and Equipment."

Electronic Engineering, published monthly at 28 Essex Street, Strand, London W. C. 2; \$4.00 a year.

Electronics, published monthly by McGraw-Hill Publishing Co., 330 West 42nd Street, New York 36; \$6.00 a year.

Signed technical and technical news articles; regularly publishes articles about developments in computers. A list, "Meetings Ahead," includes many of the computer conferences.

Industrial and Engineering Chemistry, published monthly by the American Chemical Society, 1155 16th Street N. W., Washington 6; \$5.00 a year.

Signed technical articles; bibliographies; its own index. It is also indexed or abstracted in a dozen indexes of the type listed under V below. Published the extraordinary review of computer applications in the chemical industries which is described in II B 3) c) above.

Instruments & Automation, published monthly by the Instruments Publishing Co., 845 Ridge Avenue, Pittsburgh 12; \$4.00 a year.

I.S.A. Journal, published monthly by the Instrument Society of America, at 313 Sixth Avenue, Pittsburgh 22.

Interavia, published monthly by the Interavia Company, Geneva, in four different editions, including one in English. The American agent is Interavia U.S.A., 185 Madison Ave., New York 16; \$7.00 a year.

Beautifully written and illustrated articles on world aviation; on a level, technically, with Fortune or Scientific American.

IRE Transactions on Information Theory, published irregularly by the PGIT (Professional Group on Information Theory) of the Institute of Radio Engineers, 1 East 79th Street, New York 21.

IRE Transactions on Automatic Control, published by the PGAC (Professional Group on Automatic Control) of the IRE, as above. The first issue appeared in May, 1956. Apparently \$5.85 accopy to non-members.

Wide range of articles, written by and for engineers and research men. The first article in the first issue (lithographed from typescript) was about the integration of a digital computer into a feedback control system.

Jet Propulsion, published monthly by the American Rocket Society, 20th and Northampton Streets, Easton, Pennsylvania; \$12.50 a year; back numbers \$2.00 each.

Illustrated technical articles on all phases of the field, particularly guided missiles and space flight. Has its own annual index, by author only, unfortunately, in the December issue.

Journal of the Aeronautical Sciences, published monthly by the Institute of the Aeronautical Sciences, Inc., 2 East 64th Street, New York 21; \$12.00 a year.

Has abstracts, bibliographies, its own index, in addition to its technical articles.

Journal of the British Interplanetary Society, published every two months by the Society, 12 Bessborough Gardens, London S.W.1; \$7.50 a year to engineers or scientists, who are received as fellows of the Society, but \$4.50 a year for ordinary subscribers, who are received as members of the Society; in either case, there is a \$1.50 entrance fee with initial membership.

This journal publishes, in addition to technical articles and reviews in the field of space travel and rocketry in general, valuable bibliographies of current literature; one of the subdivisions of the latter is "Projectiles."

Journal of Machine Accounting Systems and Management

More information requested.

Journal of Scientific Instruments, published monthly by the Institute of Physics, 47 Belgrave Square, London S. W. 1; \$14.00 a year.

Management Science, published quarterly by the Institute of Management Sciences, 250 North Street, White Plains, New York; \$10.00 a year.

This is a "learned journal" of the classical type. It has published a number of articles on optimization theory and techniques.

Mechanical Translation, published irregularly at the Massachusetts Institute of Technology; \$1.00 a year; back issues 50¢ each. Checks should be made out to W. A. Hokanson, Bursar, MIT, and sent to Mechanical Translation, Room 14N-307, MIT, Cambridge 39, Mass.

Missiles & Rockets, to be published monthly, from October, 1956, by American Aviation Publications, 1001 Vermont Avenue N. W., Washington 5; \$8.00 a year. Subtitle: "Magazine of World Astronautics."

According to the publisher's announcement: "Missiles & Rockets will deal with all the important problems and developments involved in and taking place in the industry. These include: ... guidance and control systems ... basic and applied astronautical research and development."

Office Management, published monthly by Geyer-McAllister Publications, 212 Fifth Avenue, New York 10; \$3.00 a year.

Has a feature called "Automation in the Office."

Operations Research, published every two months by the Operations Research Society of America at Mount Royal and Guilford Avenues, Baltimore 2; \$7.50 a year. Subtitle: "The Journal of the Operations Research Society of America."

Devoted to both military and industrial theory and practice; has its own index in the last volume of each year.

Proceedings of the IRE (Institute of Radio Engineers), published monthly by the Institute at 1 East 79th St., New York 21; \$18.00 a year to non-members.

Unusually well edited. Each issue has a detailed table of contents followed by abstracts of all the articles in that issue. Ads separated from the text and paginated separately. In addition to the regular articles, written largely by and for electronics engineers, each issue has an Abstract and References section covering other journals and publications, and this has an "Automatic Computers" subsection.

The Punched Card Annual

See III J 2) above.

The Review of Scientific Instruments, published monthly by the American Institute of Physics, 57 East 55th Street, New York 22; \$9.00 a year to non-members.

A "learned journal" of the classical type. Detailed table of contents on front cover; signed articles intended for specialists in this field. Book reviews.

Scientific American, published monthly at 415 Madison Avenue, New York 17; \$5.00 a year.

Articles on all fields of science, both pure and applied, written usually by the scientists who have themselves done pioneer research on the subject at hand. Much more readable than most scientific journals, it is so well written and edited that it is widely used in American Universities as a model of good scientific writing. Its articles are intended for the educated layman, or for the student, graduate student, engineer, or scientist who wants reliable information about fields other than his own. A section in each issue gives the biographical backgrounds of the contributors; there is a short bibliography for each article, and a book review section. In recent years, this magazine has published a number of articles on computers (see I B 10 above); it was founded over a hundred years ago.

See also the "Roster of Magazines" in the December, 1955, issue of Computers & Automation.

V. Indexes

Aeronautical Engineering Index, published annually by the Institute of the Aeronautical Sciences, Inc., 2 East 64th Street, New York 21; \$5.00 to non-members.

Issued annually, about June, it has both subject and author indexes, and its list of periodicals covered includes "More than 500 periodicals and report series dealing with aeronautical engineering and closely allied fields."

Air University Periodical Index, published quarterly (?) by the Air University Library, Maxwell Air Force Base, Alabama; price not given.

The January-March, 1956 issue lists a dozen articles on aeronautical applications of computers.

Chemical Abstracts, published twice a month by the American Chemical Society, Easton, Pennsylvania; \$60.00 a year.

This gigantic index now publishes, in a single year, about two million abstracts from several thousand different journals. Abstracts of articles about computers in chemistry are listed under the "Computers" subheading of the "Calculations" section of the annual index. The monthly numbers list the abstracts alphabetically by author only. The annual and the ten-year cumulative indexes list them by both author and subject.

Electrical Engineering Abstracts, (Science Abstracts: Section B), published monthly by the Institution of Electrical Engineers, Savoy Place, London, W. C. 2, in association with the American Physical Society, the American Institute of Electrical Engineers, and others; 70s (about \$9.00) a year.

When indexes or abstract journals of this kind list the number of journals they "cover," "review," or "index", they seldom claim to index or abstract every single article appearing in those journals; the process is necessarily selective, and sometimes arbitrarily so, but Electrical Engineering Abstracts abstracts completely the contents of some 60 journals; among these are: The Bell System Technical Journal, Electronics, Proceedings of the IRE, Proceedings of the IEE, Review of Scientific Instruments, and Transactions of the AIEE. The arrangement is by both subject and author, and there is an annual index number. This is an excellent abstract journal, but readers complain that it is too slow.

The Engineering Index, published annually by the American Society of Mechanical Engineers, 29 West 39th Street, New York 18; \$60.00 a year.

This index lists, by both author and subject, articles from some two thousand American and foreign engineering and scientific journals and magazines, and gives a short abstract with each entry. It is the standard first reference work for literature searching in all engineering fields. This bibliography could not have been compiled without it. See, for examples, the abstracts under I B 2) Nye, G., and Thomas, B. W., and under II B 3) a) Hunt, P. M.

Engineering Index Service, published continuously (sections issued at daily or weekly intervals) by the ASME (see the entry immediately above); about \$1500.00 a year (if the entire service is required; however, separate sections or even subsections may be subscribed to at small fractions of this rate).

This is a continuous up-dating supplement to the Engineering Index. It is issued on 3" x 5" cards, for insertion in standard library card catalog drawers. Each card contains a subject heading, a subject subheading, the article (or book) title, the author's name, the journal (or book publisher), the date, and a short abstract (10 to 60 or 70 words). Libraries using this service usually discard it when the annual index appears in the spring; then a new series begins, printed on a different colored stock.

Gas Abstracts, published monthly by the Institute of Gas Technology, Chicago 16 (which is affiliated with the Illinois Institute of Technology); \$18.00 a year to non-members.

This journal has a subheading, "Computers," under the section "Process Equipment and Instrumentation;" sometimes under other sections.

Industrial Arts Index, published annually, with monthly supplements, by the H. W. Wilson Co., New York 52. Price can be given only upon inquiry to the publisher, as it varies with the size of the library subscribing.

This index differs from the Engineering Index in that it covers about one tenth as many journals, emphasizes business and applied science far more than engineering and engineering research and development, covers very few foreign journals, and is arranged alphabetically by subject only, not by author. The following list of journals indexed is not a representative cross section but a selection of some of those which may interest readers of this bibliography: Journal of the American Chemical Society, Proceedings of the American Petroleum Institute, Chemical Engineering, Aviation Week, Electrical Engineering, Bell System Technical Journal, Instruments & Automation, Harvard Business Review, Advanced Management, Review of Economics and Statistics.

Mathematical Reviews, published monthly by the American Mathematical Society, 80 Waterman Street, Providence 6, Rhode Island; \$20.00 a year.

This review, which has extensive international coverage and support, publishes abstracts from about 450 journals. It has a thorough classification and sub-classification system, with cross-referencing.

Nuclear Science Abstracts, published twice monthly by the Atomic Energy Commission, Technical Information Service, P. O. 62, Oak Ridge, Tennessee; \$6.00 a year, by subscription through the Superintendent of Documents, U. S. Government Printing Office, Washington 25.

Presumably because of security regulations, very little has been published about the use or proposed use of large scale computers in this field; when they do appear, such articles will be abstracted here. There is also an annual index. (60¢).

U. S. Government Research Reports -- A Monthly Listing of Government Research Reports Available to Industry, Washington, The Superintendent of Documents, U. S. Government Printing Office; \$6.00 a year.

Contains index, complete bibliographical description of each item, and abstracts. Lists reports on computers under "Instruments."

VI. Bibliographies

Beach, Ann F., and others, Bibliography on the Use of IBM Machines in Science, Statistics, and Education, "Compiled at the Watson Scientific Laboratory" and issued by the IBM Corporation, 1954, 60 pages, price not given.

Confined to IBM equipment, this is apparently a revised edition of a list first issued in 1952.

Berkeley, Edmund C., and Wainwright, Lawrence, "References: Books and Other Sources of Information," in: Computers -- Their Operation and Applications, pages 305-316, which see under I A 1) above.

Brombacher, W. G., Smith, J. F., and Van der Pyl, L. M., Guide to Instrumentation Literature --n National Bureau of Standards Circular 567 issued 14 December 1955, 156 pages, \$1.00.

A bibliography and reference index.

Chapin, Ned, "Publications for Business on Automatic Computers," Computers & Automation, Vol. 4, No. 9 (September, 1955) pages 13-16; 38; also: Vol. 5, No. 2 (February, 1956) pages 16-20, and Vol. 5, No. 4 (April, 1956) pages 28-29.

"Publications about computers and computer applications which are written in a language which can be understood by the businessman are listed in this bibliography." From the review in the IRE Transactions on Electronic Computers for March, 1956. Chapin is an authority on this subject. See his book under I A 1) above.

Hollander, G. L. Bibliography on Data Storage and Recording, M.I.T. Servomechanisms Laboratory Technical Memorandum No. 8, February 24, 1953, 36 pages.

"... contains 249 titles and abstracts of unclassified publications which appeared between 1937 and 1952 and which are applicable to the fields of data storage, recording, analog-to-digital conversion, data presentation, and telemetering. The publications are arranged alphabetically by author and chronologically for each author." From the abstract in Nuclear Science Abstracts.

Householder, Alston S., "Bibliography on Numerical Analysis," Journal of the Association for Computing Machinery, Vol. 3, No. 2 (April, 1956) pages 85-100.

Four-page introduction, followed by a 321-item list intended to supplement the bibliography appended to the same author's Principles of Numerical Analysis (which see under III A above).

Kemler, Emory N., Automatic Control Bibliography; see Wade, Warren F., and Kemler, below.

Klingman, Herbert F., Electronics in Business -- A Descriptive Reference Guide, The Controllership Foundation, New York 16, 1955, 176 pages, \$2.00.

Pages 3 through 87 are bibliography; pages 91 through 105 are a listing of conferences, seminars, and training programs in the computer field. Pages 109-110 list films about computers; pages 113 through 153, taken largely (and admittedly) from Haskins & Sells, Data Processing by Electronics (which see under I A 1) above) describe briefly 15 or 16 different computers. Pages 157 through 160 list fifteen of the firms which had installed for use one or more of these computers by 1955. Pages 163 and 164 list commercial computing centers. All this is useful information, but the logic of the arrangement is not apparent, particularly in the bibliography, which is very hard to use.

Nash, J. P., "Review of Electronic Computer Progress During 1955," IRE Transactions on Electronic Computers, March, 1956.

A short essay followed by a 124-item bibliography. The author is a member of the Digital Computer Laboratory at the University of Illinois.

Riley, Vera, and Allen, Robert L., Industry Economic Studies, published by the Operations Research Office, Johns Hopkins University, at the Johns Hopkins University Press, Baltimore, 1955, 280 pages, \$2.50.

This is a bibliography containing a chapter called, "Mathematical and Computational Techniques." See the review in Operations Research, Vol. 4, No. 2 (April, 1956) pages 252-254.

Rose, Arthur; Johnson, R. Curtis; Heiny, Richard L., "Computers, Statistics, and Mathematics," Industrial and Engineering Chemistry, Vol. 47 (March, 1955) pages 626-632, and Vol. 48 (March, 1956) pages 622-632.

These two articles review the entire field indicated by the title, with special emphasis on chemical engineering. The 1955 article has 130 references; the 1956 article about 200. An excellent review and bibliography.

Wade, Warren F., and Kemler, Emory N., Automatic Control Bibliography, published by Summary Reports, P. O. Box 176, Spring Park, Minnesota, 1955, 331 pages, price not given.

This is a list of 120 books and 1,376 articles, most of the entries annotated.

Computers and Automation also frequently publishes short, well-annotated lists of new books in the computer field. List No. 19 appeared in Vol. 5, No. 8 (August, 1956) page 134.

See also the bibliography appended to Wilkes, M. V., Automatic Digital Computers (London, 1956), which see under I A 1) above. It is annotated, contains over a hundred items, and is understood to include British sources which deserve to be better known in this country.