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The Analyst's Bookshelf

Joseph F. McCloskey, Editor

BOOKS

Reviews

MARITIME CARGO TRANSPORTATION CONFERENCE, *Maritime Transportation of Unitized Cargo*, NRC Publication 745, National Academy of Sciences, National Research Council, 2101 Constitution Avenue, Washington, D.C., 1959, 102 pages, \$2.00

THE SUBJECT of unitization of cargo is of considerable interest to operators in the marine field. Upwards of a half dozen U.S. flag lines have embarked upon substantial unitization programs. In all cases the operators have faced the problem of determining the best system to fit the unique environment of their own trade route. This has involved selecting the type of unitization (primarily pallets versus containers), size of unit (especially in the case of containers), vessel characteristics (with consideration of new construction as well as conversion), method of handling (roll on-off versus lift on-off), and numerous other characteristics to obtain the happiest compromise for the cargo that they move or hope to capture. It is safe to say that all operators have given thought to this subject. Hence analysis by an objective and impartial organization is particularly welcome.

The report is intended to serve as a management tool; to be used "by the individual ship operator, in conjunction with his own experience and research, to determine the probable economic effects of unitization upon his operations. With this in mind, the method developed for the cost calculations has been designed for flexibility, so that the ship operator can apply it to his specific operation by substituting his own data." It is far more successful in achieving this objective than it is in fulfilling its second function where an attempt is made to "develop results applicable to general operating conditions, based upon the best available operating data and professionally determined ship construction costs."

As a management tool it contains a useful check list (Chapter I, General Methodology), and places cost factors in proper perspective (Chapter II, Operating Expenses). These chapters should be revealing to interested parties not in the steamship business and give some insight into the complexities of the field. Those in the field will benefit from the objective review and may well come across fresh ideas on cost breakdowns and operational relations.

Some of the simplifying assumptions need challenge. For example, data are presented for the ratio of total wages to straight-time wages for a variety of conventional vessels. (Total wages are composed of straight-time wages, overtime wages, and fringe benefits—vacations, social security, retirement, etc.) The

standard deviation is then computed (erroneously as 0.60 per cent—the data shown have a standard deviation of 1.32 per cent) and found to be small. This, coupled with the questionable assumption that overtime wages at sea and overtime wages in port are about equal, leads to the conclusion that the mean value of the sample may be applied to all vessels without regard to turnaround time (or degree of containerization). In the reviewer's experience, the ratio of total wages to straight-time wages may vary substantially between rapid-turning mechanized vessels and slow-turning break-bulk vessels.

The average net loading rate of 18.75 long tons per gang hour that is used as the basic rate for a break-bulk system is so much greater than the average West Coast general cargo stevedoring rate (about double) that readers should be cautious in drawing conclusions from computational results. Readers may be assured that longshoremen are not unduly overworked.

Both of the foregoing assumptions introduce a bias in favor of break-bulk and palletized operations.

Generalization is always a popular endeavor, as measured by the frequency with which it occurs. In this study evaluation of the relative cargo handling rates of mechanized and break-bulk handling systems is bypassed by carrying it along as a parameter with a range of values. As one might expect, the resulting conclusions are far from specific when comparing the relative merits of break-bulk, palletized, and containerized operations. As an illustration, the first conclusion is: "Unitization, in either pallet loads or containers, decreases the cost of maritime cargo operations in most situations examined in this report, but increases the cost in others."

The general conclusions of the study are based on a set of over 1900 calculations where ranges of values are assigned to some half dozen parameters and system costs computed. They add bulk to the report but not weight to the conclusions. Such voluminous computations should not have been required where the basic results change monotonically and in most cases linearly as the parameters are varied. Local anomalies produced by certain discretely valued elements in the analytic model are of little significance in the real world.

LLOYD D. YATES

Matson Navigation Company

**WILLIAM J. BAUMOL, *Economic Theory and Operations Analysis*,
Prentice-Hall, Englewood Cliffs, New Jersey, 1961, 438 pages,
Trade Edition: \$9.00, Text Edition: \$6.75**

THE TERM 'operations analysis' is used interchangeably with 'operations research' in this book, without a definition of either. A number of *techniques*, like mathematical programming, game theory, and decision theory, are touched upon by the author, to whom these "*constitute the equipment of operations research*" (italics supplied). But "the subject of this book is economic theory, *not* operations research." To the author, the economist is to the operations researcher what the physicist is to the engineer. Even if this were granted (which is far from established), bold indeed would be the promise to provide engineering skills in a single science book. Yet the promise is made: "With the reader acquiring both a syste-

matic exposition of received micro-economic analysis, and an intuitive grasp of recent developments in mathematical analysis, he is able to apply theoretical analysis toward the solution of a specific business problem via operations research."

To this reviewer, operations research is the heuristic art of prescriptive application of the scientific method to executive-type problems, whose solutions are not immediately obvious, and which arise in behavioural aspects of entities, more or less with respect to decision-making, in industrial, commercial, military, or institutional environments.

Thus, the operations researcher is like the medical doctor, who constructs hypotheses about disease(s) out of symptoms, without stopping the patient's heart, and prescribes specific remedies. Principles and practice of internal medicine can hardly be construed to be constituted by chapters on aspirin, antacids, and some wonder-drugs "which have too long remained a mystery in the private possession of the specialists," according to the author.

Turning to the subject matter of the book, economic theory, the treatment is generally in the textbook tradition. Unlike the undergraduate studying economics, the operations-research professional is a practitioner. Therefore, if the chapter on "Theory of Demand" is intended for the operations-research professional, he should be told certain facts of life, like fundamental questions raised by MORGENTHAU and others about the nature of demand, and not merely be provided the simplified algebraic and geometric exercises, as in this book. The edifice of demand analysis is built, other things being equal, on assumptions seldom realized in real life. Not only does the author underplay this basic assumption, but he *omits* it in the proffered reason for the operations researcher to read this chapter: "It [demand curve] can tell management what may be expected to happen to the demand for one of its outputs if the price of that item is changed." Omitted also is the spirit of Hicksian observation that if total utility is arbitrary, so is marginal utility. The well-known studies in the theory of demand by SHULTZ are not mentioned either. It is one thing to ignore road signs when your aim, as an undergraduate, is an aerial view of economics; but it is quite another to be an operations researcher invited "to apply theoretical analysis toward the sources of a specific business problem"—which is like driving at 75 miles an hour along a route from which signs reading "absolutely unsafe for automobiles," "shifting sands," "watch for volcanic eruptions," have been removed.

"The Firm and Its Objectives" states that it is important to determine the nature of the firm's objectives, but little aid is provided to the operations researcher who must address himself to this problem. The chapter on "General Equilibrium and Welfare Economics," dealing with "policy recommendations that the economist is entitled to make," states that "the discussion of welfare criteria was relatively sterile and largely doomed to failure." However, the author concludes that welfare economics is "training material for operations researchers who can learn from the special concepts of welfare economics to avoid some frequently encountered analytic booby traps." The author reveals "many recent developments in mathematical economics which have too long remained a mystery in the private possession of the specialists," which turn out to be input-output analysis, activity

analysis, game theory, and decision theory, not entirely foreign to the operations-research literature.

Exactly 19 out of 438 pages are devoted to "Marketing and Operations Research," covering pricing problems, selling effort, queuing analysis, transportation-storage models, etc. These few pages do not justify the title of the book; neither does the generous sprinkling of the term "management" into what are otherwise pages from an undergraduate book on economics.

The graphs and tables in the book are satisfactorily produced. There are a few typographical errors in the text, and instances of inelegant expression. In the Index, the first name of Morgenstern is misspelled; Jacob Viner is erroneously credited with a reference on page 190. The Index is incomplete with respect to words like operations research.

The three chapters on programming are probably the best in the book, but they are not the subject matter of the book.

GEORGE K. CHACKO

**JACK BONNELL DENNIS, *Mathematical Programming and Electrical Networks*, John Wiley & Sons, New York, 1959,
186 pages, \$4.50**

THE DIFFERENCE between mathematical programming problems and variational problems of a more classical kind lies in the fact that the constraints are in the form of inequalities rather than equations. This book deals with the representation of mathematical programming problems by means of direct-current networks which, in addition to the usual voltage and current sources, ideal transformers, and resistors, also contain ideal diodes. The reason for considering this idealized physical model of the mathematical programming problem is to study this problem from a new point of view that offers elegant interpretations and proofs of known results and also suggests the formulation of new algorithms and theorems. The first two chapters and several of the appendices give an introduction to the theory of mathematical programming. After a chapter on diode networks, linear and quadratic programming problems are presented in the network formulation. Network-flow problems that include many allocation, distribution, and assignment problems are considered. A procedure for solving the general programming problem by a gradient method is given; it requires the solution of a quadratic programming problem to determine the direction of steepest descent. This book offers both insight and techniques to those working on programming problems.

C. SALTZER

University of Cincinnati and
Mathematics Research Center

**ROBERT B. FETTER and WINSTON C. DALLECK, *Decision Models for Inventory Management*, Richard D. Irwin, Inc.,
Homewood, Illinois, 1961, 123 pages, \$5.75**

FETTER and Dalleck have done a surprisingly complete job in a very restricted number of pages. The practicing analyst can find an excellent review of the essential elements of inventory theory in the first chapter on inventory decision

models. The neophyte analyst can obtain an appreciation of the data problems from the second chapter. Purchasing agents and production planners with any appreciation of mathematics can work their way through these two chapters and get a good idea of how the theory is applied in the numerical examples of the third chapter. Finally, the appendices contain an assortment of nomographs, distribution tables, random numbers, etc., sufficient for on-the-job training of clerical personnel involved in system implementation.

At no time do the authors propose this as a do-it-yourself kit for operating personnel—if only because of the necessity for preliminary analysis to make sure that potential savings will offset the cost of analysis and implementation. But they do demonstrate that we are not far from the point in the development of inventory theory that flexible and practical ‘cookbooks’ should be forthcoming that will be very useful in all but the more complex inventory situations.

J.F.M.

THOMAS C. SCHELLING and MORTON H. HALPERIN, *Strategy and Arms Control*, The Twentieth Century Fund, 41 East 70th Street, New York 21, N. Y., 1961, 148 pages, \$2.50 (\$1.25 paper bound)

DAVID H. FRISCH, Ed., *Arms Reduction: Program & Issues*, The Twentieth Century Fund, New York, N. Y., 1961, 162 pages, \$1.25

THE Twentieth Century Fund has performed a great service, both to the nation and to operations analysts concerned with problems at the national level, in publishing these two volumes. They are digests of the deliberations of the participants in the Summer Study on Arms Control at M.I.T. in 1960, under the auspices of the American Academy of Arts and Sciences.

The two books discuss the approaches to and mechanics of arms control. In sum, they aim toward creation of invulnerable retaliatory capability. Under the resulting conditions of stabilized deterrence, negotiations for general arms reduction could proceed. Mutual inspection is recognized as a problem but is de-emphasized by putting it in perspective as part of the larger problem of making arms control work.

This reviewer has the uneasy feeling that these books describe an attempt to solve a dynamic problem by reducing it to relatively static conditions. It is doubtful if the *status quo* thus achieved would be satisfactory to the U.S.S.R., Red China—or even the U.S.

J.F.M.

Books Received

EDWARD H. BOWMAN AND ROBERT B. FETTER, *Analysis for Production Management*, Revised Edition, Richard D. Irwin, Inc., Homewood, Illinois, 1961, 562 pages, \$11.65

HAROLD BIERMAN, JR., LAWRENCE E. FOURAKER, AND ROBERT K. JAEDICKE,

- Quantitative Analysis for Business Decisions*, Richard D. Irwin, Inc., Homewood, Illinois, 1961, 358 pages, \$10.60
- Simulation and Gaming: A Symposium*, AMA Management Report Number 55, American Management Association, New York 36, N. Y., 1961, 135 pages, \$3.75 (AMA Members \$2.50)
- THOMAS C. SCHELLING AND MORTON H. HALPERIN, *Strategy and Arms Control*, The Twentieth Century Fund, 41 East 70th Street, New York 21, N. Y., 1961, 148 pages, \$2.50 (\$1.25 paper bound)
- DAVID H. FRISCH, Ed., *Arms Reduction: Program & Issues*, The Twentieth Century Fund, New York, 1961, 162 pages, \$1.25
- WILLIAM H. NEWMAN AND CHARLES E. SUMMER, JR., *The Process of Management: Concepts, Behavior, and Practice*, Prentice-Hall, Englewood Cliffs, New Jersey, 1961, 675 pages, \$10.60
- NORBERT WIENER, *Cybernetics, or Control and Communication in the Animal and the Machine*, 2nd Ed., Technology Press and John Wiley & Sons, New York, 1961, 212 pages, \$6.50
- JOHN C. HANCOCK, *An Introduction to the Principles of Communication Theory*, McGraw-Hill Book Company, New York, 1961, 253 pages, \$9.50
- HOWARD W. ALEXANDER, *Elements of Mathematical Statistics*, John Wiley & Sons, New York, 1961, 367 pages, \$7.95
- RENÉ CAVÉ, *Le Contrôle Statistique des Fabrications*, Éditions Eyrolles, 61 Boulevard Saint-Germain, Paris 5^e, France, 1961, 528 pages, 72.85 NF
- P. ARMITAGE, *Sequential Medical Trials*, Charles C. Thomas, 301-327 East Lawrence Avenue, Springfield, Illinois, 1961, 105 pages, \$4.75
- HERBERT D. LEEDS AND GERALD M. WEINBERG, *Computer Programming Fundamentals*, McGraw-Hill Book Company, New York, 1961, 368 pages, \$8.50
- FREDERICK C. HENNIE III, *Iterative Arrays of Logical Circuits*, Technology Press and John Wiley & Sons, New York, 1961, 242 pages, \$4.95
- RICHARD B. HURLEY, *Transistor Logic Circuits*, John Wiley & Sons, New York, 1961, 363 pages, \$10.00
- W. W. PETERSON, *Error-Correcting Codes*, Technology Press and John Wiley & Sons, New York, 1961, 285 pages, \$7.75
- ARNOLD J. ROSENTHAL, Ed., *Quality Control and Applied Statistics, Including Operations Research, Yearbook 1960*, Interscience Publishers, Inc., New York, 1961, 1369 pages, \$60.00
- WERNER SOMMER AND HANNS-MARTIN SCHÖNFELD, *Management Dictionary* (German-English), Walter de Gruyter & Co., Berlin W35, Germany, 1961, 198 pages, no price.
- WILLIAM LILLER, Ed., *Space Astrophysics*, McGraw-Hill Book Company, New York, 1961, 272 pages, \$10.00
- LEOPOLDO B. VALDES, *The Physical Theory of Transistors*, McGraw-Hill Book Co., New York, 1961, 370 pages, \$10.50
- GILBERT B. MELESE, *Nuclear Engineering*, Allyn and Bacon, Inc., 150 Tremont Street, Boston 11, Mass., 1961, \$8.50
- WILLARD BASCOM, *A Hole in the Bottom of the Sea, The Story of the Mohole Project*, Doubleday & Company, New York, 1961, 352 pages, \$4.95

Comments

IN THEIR basic text on management, NEWMAN AND SUMMER have devoted about three pages to operations research (315-318). They make two statements in this brief treatment that should give operations-research workers pause: "... operations research techniques are too elaborate to apply to most managerial problems," and "No one claims that it diagnoses problems, conceives of alternatives, identifies critical factors and determines their relationships, appraises the reliability of evidence, or sets values. It is no substitute for these basic steps in planning." Either these authors are very wrong or we have succeeded in building what Madison Avenue would call a very poor 'image'!

THE second edition of WIENER's *Cybernetics* has "been completely re-edited and contains two new chapters and a new introduction by Dr. Wiener. DR. GORDON RAISBECK of the Bell Telephone Laboratories is technical editor of this new edition."

HANCOCK's *Communication Theory* is essentially an advanced undergraduate textbook on the subject.

ALEXANDER's *Mathematical Statistics* is for the student who has completed the first course in calculus.

AS ITS title states, *Le Controle Statistique des Fabrications* is concerned with statistical control of manufacturing operations and is essentially a textbook treatment of the subject.

ARMITAGE's *Sequential Medical Trials* examines sequential sampling and its use in the test of new medicines, etc.

Computer Programming Fundamentals is, according to the jacket, "the truly simple, introductory book on digital computers, written especially for the layman" (italics supplied).

Iterative Arrays of Logical Circuits is the latest of the M.I.T. Press Research Monographs. It "examines the behavior of one- and two-dimensional iterative networks. It is written for persons working in the communications sciences, and is especially pertinent to the areas of information processing, switching theory, and computer design."

HURLEY's *Transistor Logic Circuits* is an advanced undergraduate text.

Error-Correcting Codes is "devoted exclusively to error-detecting and error-correcting codes for information transmission and storage systems."

THE *Quality Control and Applied Statistics Yearbook for 1960* is a vast improvement over the 1959 edition—of which your editor was quite critical (Vol. 8, No. 4, p. 581). A logical and usable classification system has been developed and, more

important, the volume is arranged in classification order. Only six articles are classified as operations research, but this paucity is compensated for by a good index that makes possible easy reference to articles legitimately classified elsewhere.

THE *Management Dictionary* announced above is the German-to-English complement of the English-to-German *Dictionary* announced in the September-October 1960 issue of *Operations Research*.

Self-Organizing Systems, edited by MARSHALL C. YOVITS and SCOTT CAMERON, is a series of talks presented before an interdisciplinary conference co-sponsored by the Office of Naval Research and the Armour Research Foundation. The date of the conference was May 5-6, 1959. The subject matter of this conference deals with the problems of information processing, equipments and techniques, and their capabilities, particularly in relation to certain types of problems, mostly those involving inherently nonnumerical types of information that may be solved efficiently only with the use of machines exhibiting a high degree of learning or self-organizing capability. Examples of problems of this type include automatic print reading, speech recognition, pattern recognition, automatic language translation, information retrieval, and control of large and complex systems. The papers fall naturally into four different interdisciplinary groups: (1) perception of the environment, (2) effects of environmental feedback, (3) learning in finite automata, and (4) structuring of self-organizing systems. Pergamon Press is the publisher. (Submitted by N. A. ABLAHAT.)

THE *Decennial Report* (1950-60) of the Indian Institute of Technology, Kharagpur, India, is perhaps most useful in dramatically exemplifying India's mood and enthusiasm in her development in the field of higher technical education. Started in August 1951 as the first of four higher Technical Institutions sponsored by the Central Government, with a student body of about 200, the growth of the Institute has been impressive. The present size of the student body is 1796 and, since inception, there has been an out-turn of 1605 graduates, 510 M.S.'s, and 56 Ph.D.'s. The school now offers Master's courses in 35 different areas of specialization. The International character of the school is also remarkable. It now has a teaching and research staff of 300, including teachers from several foreign countries such as the U.S.A., Germany, U.S.S.R., Poland, Sweden, Norway, France, U.K., and Austria. The student body is also drawn not only from all over India but also from the neighboring Southeast Asiatic countries. (Submitted by RUSSELL L. ACKOFF.)

PERIODICALS

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ANATOL RAPOPORT, *Three Modes of Conflict*

ANATOL RAPOPORT, *Remarks on Marshall Wood's Paper*

- MARSHALL K. WOOD, *Remarks on Anatol Rapoport's Paper*
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Journal of Industrial Engineering, May-June, 1961

- R. W. LLEWELLYN, *A Game-Information Theoretic Decision Model*
 HAROLD E. SMALLEY AND THOMAS L. NEWBERRY, *Profit Maximization and Industrial Engineering*
 GERALD NADLER, *Will a Change in Name Change Industrial Engineering?*

IRE Transactions on Engineering Management, March 1961

- PETER V. NORDEN, *The Study Committee for Research, Development, and Engineering (SCARDE): A Progress Report and an Invitation to Participate*
 HERBERT A. SHEPARD, *Social Change in Science and Engineering*
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And Some Notes

PROFESSOR J. A. NORDIN develops an economic equipment replacement model for a sequence of planned equipment purchases in "A Method of Replacement Analysis" (*The Engineering Economist*, Vol. 6, No. 2 Winter 1961, pp. 1-19). Specific acquisition, salvage, and operating cost functions are assumed to be known in advance of the decision point. A measure of performance is used that relates replacement timing policies to total discounted expenditures. Computation methods are used to derive solutions. A comparison is made with the MAPI method.

The method developed may be applied to the problem of selecting an item to purchase from a set of potential choices. Extension of the methods to cases not covered by the assumptions is indicated. The essential usefulness of the method described in this article is to the case where varying replacement internals are considered. (See BURTON V. DEAN, "Replacement Theory," in RUSSELL L. ACKOFF, Ed., *Progress in Operations Research*, John Wiley & Sons, 1961.) Recent developments in sequential decision theory, applicable to replacement theory, have indicated a considerable reduction in forecasting requirements for future costs accompanied by cost savings. (See Y. H. RUTENBERG, "Sequential Decision Models," Ph.D. Thesis, Case Institute of Technology, Cleveland, Ohio, 1961.) (Submitted by BURTON V. DEAN, Case Institute of Technology.)

Mathematik, Technik, Wirtschaft, Vol. 8, No. 1 (1961), has three articles of possible interest to operations research workers (in German):

W. HAACK, *Automation of Flight Control by Digital Computers*

R. TABORY, *Automatic Translation of Languages*

W. CZAPLA, *Digital Computers in the Soviet Union*

There are also some notes on OR seminars in Germany and on plans to found a German OR Society that will be a member of IFORS (pp. 25 and 28). (Submitted by FRED HANSSMANN.)

SHERMAN K. STEIN has written a delightful article on "The Mathematician as an Explorer" in the May 1961 issue of *Scientific American*. Its interest to operations-research workers lies in its relation to the traveling salesman problem.

Operations Research Techniques [in this case, simulation] as a Basis for System Design is the subject of an article by NICHOLAS J. RADELL in the March-April 1961 issue of *Systems & Procedures*. There is also an Editorial on "Decision Making," the first half of which is quite provocative.

THE *SRI Journal* for the second quarter of 1961 is devoted to "Light on Growth for Free Peoples."

Business Week for April 15, 1961 describes AVRAM KISSELGOFF's approach—and contributions—to business forecasting.