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Book Reviews

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BOOK REVIEWS

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In response to the interest expressed by many members of TIMS, we propose to begin listing working papers by title and author at the end of the Book Reviews Sections. Any interested author of a working paper should send a copy of it to the Book Reviews editor. Any working paper which is received by the editor will be listed without comment. It is hoped that this will provide better communication of the kind of work which is in progress and will permit direct contact among various persons who may be pursuing similar directions in their research.

SHOOMAN, MARTIN L., *Probabilistic Reliability: an Engineering Approach*. New York: McGraw-Hill Book Co., 1968, 524 pp., \$16.50.

Reliability theory is an attractive subject. It is more nearly an application of probability theory than any other single thing. Many of its results are unexpected and interesting and much of the theory requires only modest mathematics. It is surprising, then, that this seems to be the first textbook devoted to reliability theory. But, on the other hand, this fact makes this good book all the more welcome. Clearly, reliability theory is an engineer's subject and Professor Shooman has addressed this book to the needs of engineers. Still, most quantitative analysts will be able to negotiate the majority of the book.

After a brief introductory chapter, there is a lengthy chapter (100 pages) on the necessary mathematical background: probability theory, estimation theory, and differential equations. Chapter 3 is devoted to "Combinatorial Reliability." This is the approach which is used in accomplishing the reliability analysis of a complex system: the system is broken down into functional entities, each assumed to have two states, good and bad. This generates a block-diagram description of the complex system and the system reliability is related to the component reliabilities by combinatorial procedures. The discussion includes critical-failure models, multi-state models, and standby-system models. Chapter 4 treats "Catastrophic Failure Models." This is the theory of the reliability of the system elements introduced in the analysis of complex systems. These failure models are related directly to life-test and failure-rate data. The standard analysis in terms of hazard rates is discussed at length.

Chapter 5 treats "System Reliability." This chapter puts the procedures of the two

preceding chapter together in order to determine the actual reliability of the system. Since it is quite generally the case that system elements are dependent much of this chapter is devoted to the development of Markovian and other state-transition models which are appropriate for this case. Some simulation procedures are also discussed. Chapter 6 deals with "Reliability Improvement", with some attention to simplicity of design and emphasis on the possibilities of redundancy.

All the preceding chapters dealt with catastrophic failures. Chapter 9 deals with other modes of failure: "Drift Failures, Component Tolerances, and Parameter Variations". The central theme here is system accuracy and a description of how system accuracy varies with changes in relevant parameters is called accuracy analysis. Clearly, if a system drifts until it becomes sufficiently inaccurate it has failed, although not by a catastrophic either-or process. The last chapter is devoted to "Reliability Physics Models and Statistical Parameter Estimation". Can the physics of failure be used to predict hazard parameters? This would be highly desirable but it can only rarely be accomplished and only a few components can be treated in this manner. In all other cases the parameters must be estimated from experimental data. This chapter deals with these two themes and includes a discussion of accelerated testing.

The exposition is clear throughout. There are good examples, quite a few problems, and a good bibliography. The book is quite comprehensive and deserves a strong recommendation. Anyone interested in this subject will be able to learn a great deal about it from this book.

EVANS, C. R. AND A. B. J. ROBERTSON, eds., *Cybernetics*. Baltimore, Md.: University Park Press, 1968, 289 pp., \$7.95.

By any standards, this is an unusually interesting selection of papers. It is also an unusual book. The editors state in their introduction that they have aimed this book at two broad classes of readers: the "beginners," defined as "undergraduates in all scientific disciplines", and "experts," defined as "postgraduate students, research workers, and university staff." Most of us would assume that there was an inherent incompatibility about these two classes of readers but it seems to me that this book may in fact be of use to both classes. The editors further state: "As with our previous anthology, (but unlike most other collections of readings), this book could quite sensibly be read from cover to cover. Treated in this fashion it will serve as a somewhat outre and challenging introductory textbook."

The 16 selections are apt and interesting and many of them were unfamiliar to me. Thus, I had never previously encountered Menabrea's "On the Mathematical Principles of the Analytical Engine," a study of Babbage's calculating machine written in 1842 and I concur with the editors' comment: "At the same time there is something extremely coherent and explicit about Menabrea's style of presentation which suggests unhappy comparisons with the general level of scientific writing today." Nor was I familiar with an interesting, although a little dated, paper by Thompson and Sluckin, "Machines, Robots and Minds"; nor with two fascinating papers by Kenneth Craik on "Theory of the Human Operator in Control Systems"; nor with an excellent paper by Horace Barlow on "Sensory Mechanisms, The Reduction of Redundancy, and Intelligence." Add to these some excellent papers by Turing; Gelernter and Rochester; McCulloch; Cowan; Elias; and Cherry and one has an outstanding collection of readings. I conclude that the editors have accomplished their purposes and that this is an exceptionally good collection of readings. It can be strongly recommended to anyone who is interested in cybernetics.

RIVETT, PATRICK, *An Introduction to Operations Research*. New York: Basic Books, Inc.; 1968, 206 pp., \$5.95.

Several good introductions to operations research have recently appeared for persons without significant amounts of mathematics. Since this category includes a high proportion of executives who are potential users of OR analyses it is particularly desirable that there should be an assortment of such introductions so that one can be found which is most likely to be suitable for a specific individual. This introduction, by Professor Rivett, is a welcome addition to the literature.

The author proceeds by giving some history of the development of the OR approach, discussing the methodology of model building, and considering how problems are formulated. Then he has chapters illustrating the OR approach in queuing problems, allocation problems, human problems, competitive problems, and simulation. He concludes with chapters which discuss "How to Fail and How to Succeed" in OR analyses, "The Problem of Education and Training," and a synthesis of his statement.

The exposition is cogent and fluent. By making excellent use of graphs Professor Rivett succeeds in presenting technical results without any mathematics beyond the use of an occasional symbol or two. He gives lots of instructive examples. Many of the examples are drawn from experience in England and, hence, are not likely to be familiar in the United States. This book is highly recommended as an introduction to operations research for a nonmathematical audience.

MEIER, ROBERT C., WILLIAM T. NEWELL, AND HAROLD L. PAZER, *Simulation in Business and Economics*. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1969, 369 pp., \$9.

This is a very good introduction to simulation techniques in business and economics. After an introductory chapter devoted to basic concepts there is a chapter on "Simulation in Business" with discussions of simulations of inventory systems, job-shop scheduling, PERT networks, waiting lines, forecasting, Markov processes, and three attempts at total firm simulation. Chapter 3 deals with "Industrial Dynamics and Large Systems Simulation." Chapter 4 is devoted to "Simulation in Economic Analysis" and discusses econometric models; the microanalytic simulation of socioeconomic systems due to Orcutt et al; Cohen's model of the shoe, leather, hide sequence and Balderston and Hoggatt's simulation of market processes in the lumber industry; and the use of simulation models to study parameter estimation in econometric models. Chapter 5 is an excellent discussion of "Heuristic Methods" which includes sections on artificial intelligence and on the simulation of human thought. Chapter 6 covers "Games and Gaming" and includes a discussion of the construction of a management game by one of the authors. Chapter 7 discusses "Computer Programs and Language Simulation." Chapter 8 deals with some "Concepts in Model Construction": random number generation, the use of tracking devices, simulation of continuous processes, and so forth. The final Chapter 9 is devoted to "Operation of a Simulation Model" and includes discussions of the problem of validating a model, the elimination of transients, optimization and simulation studies, and sampling from, and experimentation with, simulation models.

There are lots of good examples and the presentation is cogent and clear. Numerous problems and good bibliographies make the book an excellent possibility for a text for a course in simulation. But almost anyone who wants to learn something about simulation will surely find this a highly informative book and I strongly recommend it for self-study.

BESHES, JAMES M., ed., *Computer Methods in the Analysis of Large-Scale Social Systems*. Cambridge, Mass.: The M.I.T. Press, 1968, 266 pp., \$12.50.

This is the second edition of a book first published in 1965 which presented the papers given at a conference held in 1964 at the Joint Center for Urban Studies of M.I.T. and Harvard University. The editor tells us that three papers are almost entirely new. These are Greenberger's paper on "Simulation Methodology"; Keyfitz's paper on "Machine Computation and the Working Demographer"; and Beshes' paper on "The Social Theorist: On-Line Theory Construction and Concept Validation." There is a paper by Herniter on "Mathematical Design of Marketing Systems" which will be of interest to readers of this journal and some of the other papers dealing with the problem of coping with huge amounts of data will also be of interest.

Two Books On Games

SPENCER, DONALD D., *Game Playing With Computers*. New York: Spartan Books, 1968, 464 pp., \$12.95.

This is an off-beat book of considerable appeal. Mr. Spencer presents more than 70 games, puzzles, and mathematical recreations that may be programmed for a digital computer. He includes more than 25 complete programs, either in FORTRAN or BASIC. There is a chapter on magic-square programs and one on prime numbers, which includes a program for the sieve of Eratosthenes and another for Wilson's prime-number generator. There are two programs for binary games and some miscellaneous game programs, including one for blackjack against the computer. In Part II, the author gives 50 "games proposed for computer solution" but he surely must have had tongue in cheek when he included checkers, chess, and Go in this category. Clearly, this is an interesting book which can considerably heighten the interest of some students in learning how to program—if one must have a utilitarian motive. But the book's appeal is more direct than that and many of us who already know how to program will find this book hard to resist.

LUKACS, CLARA AND EMMA TARJAN, *Mathematical Games*. New York: Walker and Co., 1968, 200 pp., \$4.95.

There are more than 100 "somethings" in this book. The "somethings" range from number puzzles to codes to games like tick-tack-toe and battleship and include simple tricks with string, rubberbands, and so forth. Why the book is called "Mathematical Games" escapes me, unless it is that most of the problems involve numbers or some kind of geometric representation—but what doesn't? Indeed, I do not understand why it was translated from the Hungarian in the first place. I note the book nonetheless because it describes a simple card game, "The Secret Rules," which I have never encountered before and which strikes me as having some sophisticated implications in terms of the logic of hypothesis testing.

DRUCKER, PETER F., *The Age of Discontinuity; Guidelines to Our Changing Society*. New York: Harper & Row, 1969, 394 pp., \$7.95.

In this stimulating book, Professor Drucker offers some "Guidelines to Our Changing Society." He maintains that ours is an age of discontinuities, in the sense that past

trends are no longer continuing. He undertakes the analysis of four major discontinuities in our social life: genuinely new technologies, major changes in the world's economies, the pluralistic society and the disenchantment with it, and knowledge as the crucial resource of the economy. The four parts of this book are devoted to these four "discontinuities."

Professor Drucker argues that the past 50 years has been a period of "almost unparalleled continuity" in the economy. Economic expansion has been largely in terms of industries that were already "big" in 1913. But he sees four major new industries on the horizon: the information industry, exploitation of the ocean, new materials, and technologies and industries based on the megalopolis. In the coming era the most important business role will once again be that of the entrepreneur and the author argues that marketing will be one of the most important functions the entrepreneur will need to understand. New economic policies will be required in order to maximize the mobility of men and capital. But, "as a result of fifty years of economic continuity, however, the developed countries today are organized to prevent mobility of people as well as to penalize mobility of capital." And "the greatest obstacle to economic growth in the United States and Great Britain is the craft organization of work and especially the craft union." The key requirement to achieve capital mobility is "to remove the inducement to retain earnings and to restore the normal desire of a shareholder to receive dividends."

The second discontinuity results from the fact that there is a "world economy in its demands" but not yet any world economic institutions. Of critical importance is the fact that "no country has developed and become an advanced industrial country since World War I." A chapter, "Beyond the 'New Economics'," is devoted to the urgent need for the development of the economic theory necessary to support the required policies.

"The New Pluralism" results from the fact that "all our major social functions are today being discharged in and through these large, organized institutions." Professor Drucker urges the imperative need for a political and social theory of this pluralist structure of society. In this regard he suggests that performance is the only acceptable foundation for the authority which the organization has. "We need to insist that institutions and their managements confine themselves to the specific tasks whose performance justifies their existence and their power. Everything beyond is usurpation." In short: "By their fruits ye shall know them—." There is an excellent chapter on "The Sickness of Government" and another entitled "How Can the Individual Survive?"

Part IV is devoted to "The Knowledge Society." The remarkable growth in the "knowledge industries"—the author states that in 1965 the knowledge sector accounted for one-third of GNP—has resulted in a situation in which " 'Knowledge' rather than 'science' has become the foundation of the modern economy." Professor Drucker sees a major problem in "the hidden conflict between the knowledge worker's view of himself as a 'professional' and the social reality in which he is the upgraded and well-paid successor to the skilled worker of yesterday." The author explains the shift to the knowledge economy, not as the result of increasing complexity of jobs, but rather as the result of the great increase in the working life of man. There are two excellent chapters on schools and teaching in the context of the modern knowledge society.

This is a very interesting book and there are lots of insights to help us find our way in these parlous times. What better recommendation can a book have?

Some Brief Notices

ANDREWS, FRANK; JAMES MORGAN; AND JOHN SONQUIST, *Multiple Classification Analysis*. Ann Arbor, Mich.: Institute for Social Research, 1967, 211 pp., paperbound \$3.

MCA is a technique for analyzing the interrelationships between several predictor variables and a dependent variable. It assumes an additive model. Predictors need no more than nominal measurement but the dependent variable must be measured on an interval or ratio scale or else be a dichotomy. The interrelationships can be of any form. The output shows how each predictor relates to the dependent variable, both before and after adjusting for the effects of the other predictors, and provides a multiple correlation coefficient. The program handles missing data or weighted data. This book is a description of MCA.

FARINA, MARIO V., *Programming in Basic*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968, 164 pp., paperbound \$4.75.

This is a good presentation of Basic in 25 lessons. Problems are given and some answers. It can be used for self study.

GREENLAW, PAUL S. AND M. WILLIAM FREY, *FINANSIM*. Scranton, Pa.: International Textbook Co., 1967, 200 pp., paperbound \$3.75.

FINANSIM is a computerized financial management simulation. This book describes the simulation and discusses how it can be used as a "learning experience."

IANNONE, ANTHONY L., *Management Program Planning and Control with PERT, MOST, and LOB*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967, 202 pp., \$17.95,

This book gives a simple exposition of PERT; MOST (Management Operation System Technique), "a graphical illustration of performance time and cost on an easily read network"; and LOB (Line of Balance), "developed by the Navy as a graphic method of industrial programming using the contractual requirements against achievements." The price is exorbitant.

MILLER, ERNEST C., *Objectives and Standards of Performance in Production Management*. New York: American Management Association, 1967, 112 pp., \$10.50.

This book is exactly what the title suggests: an extremely thorough listing of a very large number of production objectives and standards.

MILLER, JAMES M., *Automati on Conversion of a Trust Department*. Boston: Bankers Publishing Co., 1967, 177 pp., paperbound \$15.

This is an attempt to provide guidelines and procedures for the conversion of the accounting functions of a trust department from ordinary bookkeeping methods to EDP. It is based on the experience of The First National Bank of Montgomery.

STANKOVICH, ARTHUR, *An Experimental Methodology to Plan the Organization and Delivery of Comprehensive Personal Health Services*. Philadelphia: Lankenau Hospital, 1968, plastic binder \$4.50.

This is an interesting attempt to develop a methodology for the cost-effectiveness analysis of alternative changes in health-care systems.

NOVICK, DAVID, ed., *Program Budgeting*, New York: Holt, Rinehart and Winston, Inc., 1969, 382 pp., paperback \$3.95.

This is the paperback of the second edition of *Program Budgeting: Program Analysis and the Federal Budget*, which was published in hardcover by Harvard University Press. The editor has written a 10-page introduction, "Origin and History of Program Budgeting," which did not appear in the original edition. Otherwise, it is the same. There are 12 chapters in 3 parts. Part 1 presents some of the underlying theory of program budgeting in 3 chapters. Part 2 has 6 chapters which illustrate the applications of program budgets to various areas of federal activity. Part 3 has 3 chapters on implementation and operation. This book is still an excellent introduction to program budgeting and can be recommended to anyone who wants to know something about this important subject.

All unsigned reviews are written by the Book Reviews editor.