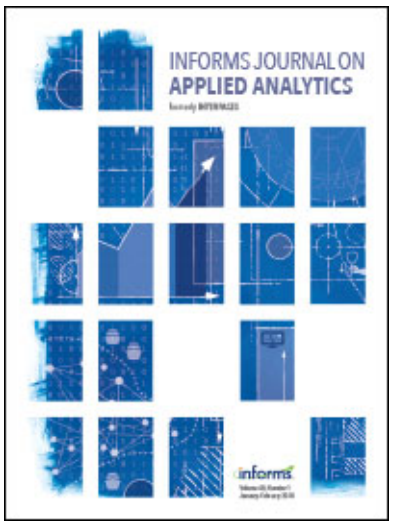


Interfaces

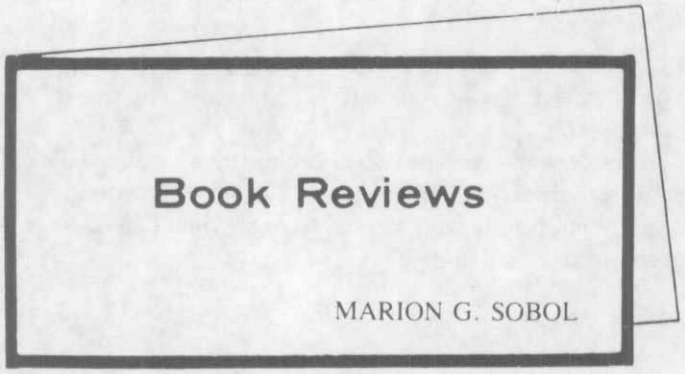
Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Book Reviews

To cite this article:
(1982) Book Reviews. Interfaces 12(2):88-99. https://doi.org/10.1287/inte.12.2.88

INTERFACES
Vol. 12, No. 2, April 1982

0092-2102/82/1202/0088$01.25



HOLZMAN, ALBERT G., *Operations Research Support Methodology,* Marcel Dekker, Inc., New York and Basel, 1979, 646 pp.

This book represents a very different approach to the consolidation of Operations Research literature under a single cover. As its title indicates, the book generally covers those methods and topics which are less main stream in Operations Research, but which support development and application in the field.

The format of the book is that of a collection of articles by distinguished researchers in their fields. Although the level and quality of presentation suffers somewhat from the multiple author format, it still is suprisingly good and consistent.

The text is divided into four areas: Mathematical Foundations (Abstract Algebra, Linear Algebra, Functional Analysis), Mathematical Methods (Classical Optimization, Gradient Methods, Gaussian Methods, Chebyshev Methods, Acceleration Methods, Fibonacci Search, Curve Fitting, Cluster Analysis), Operations Research Related Concepts and Solution Methodologies (Barrier Methods for Nonlinear Programming, Cutting Plane Methods, Bivalent Programming by Implicit Enumeration, Decomposition Methods, Complementarity Problems), Fixed Point Computing Methods, and Linguistics and Behavioral Concepts (Fuzzy Sets, Artifical Intelligence, Adaptive and Learning Systems). The material on Mathematical Foundations should be valuable reading for entry-level PhD students anxious for a review of the mathematical material underlying Operations Reasearch.

In the main, the remaining chapters represent a reasonable compendium of concepts and ideas. As a reader, I very much appreciate the examples and figures used to develop insight and understanding.

I would recommend the book to advanced graduate students, faculty, and researchers in Operations Research who must attempt to keep abreast of developments in the wide variety of areas which constitute Operations Research. As a reference text, the book should be quite useful.

John J. Jarvis
School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332

MAKRIDAKIS, S. and WHEELWRIGHT, S. C., *Studies in Management Sciences: Forecasting*, Vol. 12, North-Holland Publishing Co., New York, 1979, 392 pp.

When I finished reading this book, I wondered how I could write an accurate review; I had read a collection of papers that had been assembled and sandwiched between two covers. Like all reading books, notation and writing style varied from one topic to another, but in general, each article was well written and provided insight into particular aspects of the precasting problem. Many of the articles are tutorials with extensive examples.

The book provides a wealth of knowledge on techniques for data analysis. It shows smoothing, regression, Box-Jenkins, etc., for analyzing data and finding patterns. In fact, the book seems to weigh heavily towards the time-series analysis approach, with some causal modeling and little in the way of judgmental methodology.

The book would be a good reference on developed material in the forecasting area. However, the articles in the book are written for a more sophisticated audience in the forecasting area and not the beginner. If you have some experience with forecasting and a strong analytical base, this book should be in your library.

Vincent A. Mabert
School of Business, Indiana University, Bloomington, Indiana 47405

GOHAGAN, JOHN KENNETH, *Quantitative Analysis for Public Policy*, 1980, McGraw-Hill, Inc., New York, 462 pp.

MCKENNA, CHRISTOPHER K., *Quantitative Methods for Public Decision Making*, McGraw-Hill, New York, 1980, 425 pp.

In recent years there has been an increasing emphasis on quantitative models, analysis, and methods in public policy and public management programs, especially at the graduate level. Such courses have generally been taught using a standard "quantitative methods for business decisions" text supplemented with outside readings in public policy. There has been a striking need for a text which presents a relatively broad coverage of standard OR/MS methodologies, but with a public policy orientation. These two books are intended to satisfy this need. Although both books are aimed at the same *general* audience (public policy students and possibly managers), differences in their philosophy, emphasis, style, and depth of treatment suggest that the suitability of each book for course use will depend upon the background of the students and curriculum structure.

Gohagan's book is most suited for a program in which statistics is integrated into the Quantitative Methods course rather than covered separately. The book is designed for a two-semester course in which the first semester covers mostly Probability and Statistics and the second semester covers Cost-Benefit Analysis, Linear Programming, and Decision Theory. Gohagan's general philosophy is to cover only a few topics, but in great depth. The book has a number of attractive features, specifically: (1) The introductory chapter does an excellent job of putting quantitative analysis in proper perspective as a public policy tool. (2) The coverage of Cost-Benefit Analysis is especially complete, including some of the welfare considerations often addressed only in economics courses. (3) Cases are used well to summarize and unify major topics. (4) The discussion of decision theory is modern and detailed. (5) The discussion of linear programming sensitivity analysis is well done.

The statistical section of this book is sufficiently complete to make a supplementary text unnecessary for the first term of a statistics-oriented course. However, Gohagan's attempt to be complete has led him to introduce advanced concepts for which additional motivation and explanation are required. Consequently an instructor should expect to fill in much of the explanation for these advanced topics, such as Bayesian updating of probabilities. A number of other deficiencies may limit the book's usefulness for the OR part (second term) of the course: (1) the number of Operations Research topics covered is small, (2) the discussion of linear programming formulation is not well structured and is inadequate for helping students develop the logic (and intuition) necessary for problem formulation, and (3) an abundance of health-care-related applications are presented at the sacrifice of other applications, thereby limiting the student's exposure to the full power of the methods. A supplemental text or readings would probably be required to provide adequate coverage of Operations Research. Overall this book is fair to good, with its greatest value being in an integrated Statistics-OR course for public policy students with strong interest in health-care issues.

In contrast to Gohagan's book, McKenna's book is designed for students who have had (or will have) some separate exposure to statistics. The topical structure of the book follows that of standard OR/MS books and includes topics such as Probability (meant mostly as review), Decision Analysis and Utility Theory, Linear Programming, Goal Programming, CPM-PERT, Simulation, and Management Information Systems as well as Cost-Benefit Analysis. There is more than enough material for a one-semester course, thereby allowing the instructor to pick and choose appropriate topics for his or her audience; or, with some supplemental readings and/or a project, it could be used for a two-semester course.

Each topic is effectively motivated and illustrated using numerous examples from public policy. Most examples are real applications from the literature and extensive references are provided. The examples extend over a broad range of disciplines and emphasize the wide applicability of many OR/MS techniques.

Though McKenna provides a broad range of topics, he presents a thorough yet well-controlled coverage of each. This book does not venture into excessively advanced topics, but rather provides a very readable and intuitive introduction to elementary and intermediate topics in OR/MS. Seemingly unrelated topics are continually unified by relating them to public policy decision making. Further, McKenna addresses the realistic problems of applying OR/MS techniques to public policy decisions with multiple objectives. The chapters on Multiple Objective Decision Theory and Goal Programming directly address this theme. In addition, he rightly emphasizes the benefits that other techniques, such as queueing and simulation, can provide for decisions with multiple objectives.

The only two major deficiencies in this book are: (1) McKenna does not thoroughly explain some of the underlying assumptions of the methods he presents (most notably, decision theory), and (2) he does not adequately discuss the importance of criteria in making decisions and how criteria can or might be chosen. Overall, however, this book is very good and would be appropriate in most quantitative methods courses for public policy students.

Joseph S. Martinich
School of Business Administration
8001 Natural Bridge, University of Missouri-St. Louis, St. Louis, Missouri 63121
(Review courtesy of the Newsletter of the TIMS College on Public Programs and Processes.)

JONES, A. J., *Game Theory: Mathematical Models of Conflict*, Ellis Horwood Limited, Halsted Press/J. Wiley & Sons, N.Y., 1980, 309 pp., $45.00

Any reviewer of a new book in a field that already has several in print is forced to make comparisons. In a field that is still developing at a rapid pace, one hopes that new additions incorporate some of these, perhaps clarify those ideas that are presented in a confusing manner in the previous texts, add new examples and applications that enrich the field, and, in short, make a contribution.

The author is correct (in this reviewer's opinion) when he states in his preface that the Von Neumann-Morgenstern book is "difficult to read." Since that was the first book on the subject, this phenomenon is not at all "singular," as claimed by the author. However, this can not be said of the book by Luce and Raiffa nor of the book by Rapapport (especially in relation to nonmathematical but logical discussions of the subtleties).

On the mathematical side — the present book is written in a manner that is indeed easier to read for students who have not had extensive mathematical training. For such an introductory level, the topics selected are indeed appropriate. These topics have also been treated well for this type of audience. The required mathematics has been well explained.

The author has included solutions to all the problems and, indeed, it is his stated view that this should be the case. This reviewer does not quite agree with this approach. The reasons for inclusion and those for exclusion are all quite "clear" and therefore I will not further elaborate on it. Nevertheless, it is a fresh approach in book writing.

Perhaps the most striking feature of this book is the feeling that neither the topics included nor the content in the exposition of these topics is new. A combination of Luce and Raiffa and Owen would perhaps suffice to justify the above statement. Certainly the manner of the mathematical exposition and the presence of a number of examples might ease the pain of the mathematics for the audience for whom this is written. If this was the main purpose of this book, it has achieved moderate success.

But to see none of the newer ideas — which clearly give the reader the sense this is still a developing field in which everyone is groping to solve the more difficult n-person cooperative games along with its applications — in a relatively new book is very disappointing to this reviewer.

R. Chandrasekaran
School of Management and Administration, University of Texas at Dallas, Richardson, Texas 75080

KENNINGTON, JEFF L. and HELGASON, RICHARD V., *Algorithms for Network Programming*, John Wiley & Sons, Inc., New York, 1980, 291 pp.

Network optimization is an important branch of applied mathematics. The emphasis in this book is on employing mathematical programming techniques specialized to develop efficient algorithms for solving network optimization problems. The phrase "Network Programming" in the title recognizes the fruitfulness of this combination.

Upon receiving this book and reading the preface and table of contents, my reaction was extremely enthusiastic. The techniques discussed are certainly current;

much of the research covered has been done during the last ten years. The book unifies this work and provides an extensive list of references. Significant quotes from the preface include:

> . . . our interest . . . has been motivated by applications . . .
>
> We have attempted to collect . . . clear and concise descriptions of the special purpose algorithms for the various network models along with mathematical justification for the algorithms
>
> This book can be used both as a reference book and as a textbook for first-year graduate students . . .
>
> . . . the material requires mathematical maturity, some knowledge of linear programming is the *only* prerequisite.

Sadly, most of my high expectations were ultimately shattered by wading through the book. Any mathematical subject requires slow, careful step-by-step study and requires the reader to work examples. However, this book places an unusually high burden on the reader. It should only be approached under strong lights, with a large supply of paper, pencils, and fortitude.

The complex notational details are handled correctly with apparently very few typographical slips. However, the dispersed definitions and the pedantic approach to detailed proofs obfuscates even the simplest concepts. The promised applications "to illustrate the scope and usefulness" never really materialized. Only four "real" problems are discussed. The first problem is set up as two different but similar models with no hint of solution techniques. The second problem is so trivial that many students would solve it faster without knowledge of network models (and get the correct answer of 12 months rather than the 9 months implied in the text). The model for the third "application" is so poorly explained it can only be called an exercise for the student. For these reasons, plus an incomplete subject index, this book is an unsatisfactory text or a reference book.

On the other hand, the book has several good points. It presents a unified approach to many important network optimization problems. The topics covered in separate chapters (with exercises) are: minimum cost network flow, generalized network flow, multicommodity network flow, network flow with side constraints, and convex cost network flow. I liked the idea of ending each chapter with notes and references to recognize the research contributors to its contents.

The book contains about 200 pages plus over 75 pages of worthwhile material in the appendices. One appendix is devoted to NETFLO, a creative program developed by Professor Klingman and others at the University of Texas to solve minimum cost network flow problems. A table of timing comparisons between NETFLO and RNET is quite interesting. (RNET is a program developed by Professor Grigoriadis and others at Rutgers). After studying the relative times, the reader may wonder why the code for the speedier program RNET was not also included.

In summary, this book has several good points. Some OR professionals will find it worth having because it is current, collects into a unified format many recent developments, and has an extensive list of recent research references. However, any decision to select this as a course textbook should not be taken lightly.

R. E. Thomas
Bell Laboratories, Crawford's Corner Road, Holmdel, New Jersey 07733

KOOPMAN, B. L., *Search and Screening: General Principles with Historical Applications*, Pergamon Press, New York, 1980, x + 369 pp., $45 ($19.50 paperback).

This is a new and expanded edition of *Search and Screening*, Operations Evaluation Group (OEG) Report 56. This is the first hardback edition of this classic work, which retains its interest and importance 34 years after its original publication. I heartily recommend that all practitioners of search theory and operations research buy a copy for their personal library — and read it too.

This new edition is more than a reissue of OEG 56. It contains four new chapters and four new appendices, as well as substantial revisions to some of the original chapters. Most of the material in the original report is contained in the new edition. This includes chapters on target motion and detection, an expanded chapter on optimum distribution of search effort with a discussion of Lagrange multipliers, and chapters dealing with search for targets in transit, sonar screens, and aerial escort. The chapters on visual, radar, and sonar detection in the original report have been rewritten by Koopman's colleagues at Arthur D. Little and appear in the book as appendices.

The new material is interspersed among the old. Chapter 1 contains a general discussion of search problems which is an excellent introduction to the topic and provides the reader with useful philosophical perspectives on these problems. Chapters 4 and 5 concern target localization and models for motion by one or more targets. Chapter 7 takes a sequential look at search problems and discusses some relationships between search and information theory. There are appendices which give background in probability theory, matrices, and arrays of passive sensors. Appendix C discusses some of the detection functions commonly used in search theory.

The original report represented ground-breaking work in search and detection theory. To appreciate the importance of this work, one has only to scan through OEG 56 and note the concepts and methods developed, e.g., lateral range function, sweep width, sweep rate, limiting lines of approach, inverse cube detection function, random search formula, and the basic model for optimal search problems along with the solution for the case of a bivariate normal target location distribution and exponential detection function. These concepts and methods are at the heart of many of today's search and screening problems.

For a number of reasons, the new material in the book is not nearly so satisfactory as the old. For one, the style tends to be overly philosophical and filled with long disgressions on topics such as Heisenberg's uncertainty principle. For another, the new material includes an unsuccessful attempt to bring the reader up to date with advances in search optimization. In particular, there is no discussion of the recent work in optimal search for a moving target which has produced a dramatic increase in our ability to solve these problems. Despite obvious evidence to the contrary, the author still gives the impression that the exponential detection function is the only legitimate detection function. His discussion of target motion models is too glib. For example, he observes that Brownian motion does not have a well-defined velocity and then dismisses this fact as unimportant. However, in practice, one often has information about the target's velocity and it is important to use this information in modeling and constraining the target motion.

It is difficult to summarize my feelings about this book. It is really two books. The first book is the original material from OEG 56. This material retains its importance and usefulness today. The second book consists of the new material which is unsatisfactory and misleading in many respects, particularly in the discussion of optimal search. In spite

of my reservations, I heartily recommend that anyone in Operations Research buy and read this book.

Lawrence D. Stone
Daniel H. Wagner Associates, Paoli, Pennsylvania 19301

(This is a condensed version of a review appearing in SIAM Review, November 1981.)

BOOKSTABER, RICHARD M., *Option Pricing and Strategies in Investing*, Addison-Wesley Publishing Company, 1981, 222 pp., $18.95.

Overall I like Dr. Bookstaber's book, and feel that its strengths outweigh its weaknesses. Although it is not a complete review of the literature, it would be useful to anyone who needs a starting point for studying the option pricing field, whether in a graduate seminar or an independent study. The author is generous with references to the key original sources, and provides lucid explanations of the concepts which lie near the heart of the theory of option pricing.

Those in the decision sciences may wonder why it would be worthwhile to spend much effort on the study of a rather specialized financial instrument. The benefit is that option pricing theory offers a way to analyze the value of choice, in appropriate situations, and one familiar with option theory can not only recognize such situations but also make a proper application. A call option on a stock is a contract which provides the holder the privilege of purchasing the underlying stock at a specified price (called the striking price or exercise price) within a specified period of time. For example, an option to buy Argyle Ltd. at $50 per share would have obvious value if Argyle climbed to $65, for it would allow the holder to purchase the stock at less than its market value and sell it for an immediate profit. If Argyle fell below $50, however, the option would not have to be exercised.

Options offer choice, which makes them very interesting because they give unlimited upside potential, while the potential loss is limited to the price of the option. Those in the decision sciences have obvious interest not only in procedures for making choices when the time comes to do so, but also in dealing with the value of the existence of choice prior to the time of actual decision. There are many instances when managers expend resources in order to provide themselves a choice at some future time. In such situations, option pricing theory may be very helpful in analyzing the value of such contingency preparations, especially when the analysis is qualitative rather than strictly quantitative.

The book begins with two background chapters which patiently introduce the reader to the terminology of options and the organization of the option market. The reader then moves to four chapters on option pricing formulas, focused on the well-known Black-Scholes model. Here the author lays the foundation for understanding option pricing theory by presenting the rational option pricing theorems developed by Robert Merton. These rely on very few assumptions about the stochastic process which generates the price changes of the underlying stock, and are not only especially helpful for dealing with the qualitative aspects of the value of contingent claims for a wide variety of stochastic processes, but also useful for checking the validity of specific models. The author then opens the way to models based on specific assumptions about the stochastic processes by presenting the binomial model of Cox and Ross, in which it is assumed that the price of the underlying stock will

take on either of two values at the next period. This leads naturally to the Black-Scholes model, since in the limit the binomial process becomes a Gauss-Wiener process, which is assumed in the model's derivation.

This is followed by two chapters on applications of option pricing not only within the options market but also to the value of other securities such as stocks, bonds, and convertibles, as well as loan commitments, executive incentives, and exploratory investment (R&D, mineral exploration, test marketing, etc.). This provides only a brief introduction to the applications which have been discussed in the finance literature, but could whet the reader's appetite. The book concludes with four chapters on option strategies within which the author gives a very clear description of the various spreads and straddles, strips and straps, and other portfolio strategies which may have previously been an enigma to many readers.

The strengths of the book begin with its accuracy and faithfulness to the original papers. The clear writing style and often entertaining examples are also pluses, as are the extensive bibliography and generally excellent end-of-chapter references. An additional selling point is the useful Black-Scholes calculator program given as an appendix. It is written for the Texas Instruments TI-59 programmable calculator, and could be quite useful to many readers.

The book also has its weaknesses, however. It is, I feel, insufficiently critical of the Black-Scholes model. This is a rational model of option prices within its assumptions; but the real world, as so often happens, is not as simple as the one in which the model holds. A complete listing of the problems exceeds the scope of a book review, but an important one lies in the assumption that stock price changes follow a stationary stochastic process (a random walk with drift is assumed). Real security prices aren't nearly so well mannered, making application in investment strategies trickier than the author suggests. In line with this lack of critical comment, the author put insufficient emphasis on the empirically revealed shortcomings of the Black-Scholes model. It has been found in several studies that this model consistently undervalues (relative to the market) options with a short time to maturity or which are out-of-the-money (have an exercise price above the current stock price). There is also an apparent tendency to slightly overvalue call options which are in-the-money (have an exercise price below the current market price of the underlying stock). This lack of criticalness has also led to failure to develop a presentation of the models which are based on more complex stochastic processes.

The greatest weakness is the author's focus on using the Black-Scholes model to detect mispriced options. The reader making his or her initial entry into option pricing could easily get the impression that there are bountiful opportunities to make piles of money if one will just take a few days to become proficient with this model. Getting rich quick is a recurrent dream but, alas, if anyone really had a successful formula, it isn't likely that it would be published as long as it was working. Indeed, those who have tested the model have found a paucity of arbitrage opportunities which provide profits after transactions costs.

John Kensinger
Edwin L. Cox School of Business, Southern Methodist University, Dallas Texas 75275

PHILLIPS, DON T. and GARCIA-DIAZ, ALBERTO, *Fundamentals of Network Analysis*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981, 474 pp.

This book addresses a large number of network flow problems. The authors have chosen to limit themselves primarily to problems whose optimal solutions are known to be all integer. This theme is adhered to until the final chapter, where some material on generalized networks and multicommodity networks appears for which solutions may not be integral. It is claimed in the preface that the treatment is self-contained, and that no particular degree of mathematical sophistication is necessary to understand the material developed in this book. We doubt that this will be of much comfort to the pedestrian reader who encounters the material on unimodularity, the "well-known" dual problem formulations, or moment-generating functions. Again, the preface states that the authors have attempted to present the fundamental aspects of network flow analysis in a nontechnical fashion. They have certainly not done so, and we are not sure whether this is desirable or even possible.

Chapter 1 contains a leisurely introduction to network concepts and terminology. The authors here are attempting to reach the nontechnical reader and they do a reasonably good job. Three things serve to slightly mar this effort: a chain is (properly) defined to be a sequence of arcs and nodes, whereas all examples show only a sequence of arcs; the use of a "generalized cost" matrix to define upper bounds on arc flow is confusing; and the possibility of multiple arcs is not mentioned (they eventually show up on p. 239).

At the beginning of Chapter 2, the authors reveal their mode of presentation: "Each topic is introduced, mathematically defined, and then dealt with through an algorithmic framework. One or more examples are then formulated and solved by hand to illustrate the fundamental concepts and computational procedures inherent in the algorithmic process." (Incidentally, the phrase "by hand" is inappropriate in this context.) In Chapter 2, they are largely successful in dealing in this manner with a potpourri of problems: shortest path, minimal spanning tree, traveling salesman, transportation, transshipment, assignment, maximal flow, and some of their variations. Unfortunately, they have missed an opportunity to unify the notation used in presenting the variety of problem classes, opting instead to follow fairly closely the notation and style of the original presentations. As a result the exposition is uneven. However, the examples are good enough to rescue the few weak presentations which occur. The one exception is the K-Shortest-Path problem, whose algorithmic presentation is virtually unintelligible.

Chapter 3 contains a standard presentation of the out-of-kilter algorithm. The algorithm is applied to several problems including the bottleneck assignment problem and some of the problems from Chapter 2. The transportation and assignment problems are presented again with (for no apparent reason) modified formulations.

Chapter 4 has a good presentation of PERT and CPM. It also features several fine sections on resource allocation in project networks by Edward W. Davis and a useful survey of CPM/PERT computer programs by Larry A. Smith and Peter Mahler. The book also has a fine complementary section on stochastic networks (GERT) which is mysteriously sandwiched into Chapter 5.

Chapter 5 contains, in addition to the GERT material, a limited treatment of generalized networks and several sections contributed by James Evans which provide an excellent introduction to his original work on integer multicommodity flows and aggregation in multicommodity networks.

This book has a nice bonus. It contains a FORTRAN code with several subroutines implementing nine of the algorithms appearing in the text, including Dijkstra's shortest-path algorithm, the out-of-kilter algorithm, and a minimal cost generalized network flow algorithm. After discovering that the code listing was out of order (correct order for pages 435 to 439 is 435, 438, 437, 436, 439), the code was installed on our CDC system with only minor changes. We tested several of the algorithm subroutines, each on a single problem from the book, without trouble. We found the code very easy to use and are planning to use it in future undergraduate instruction. It should be noted that the out-of-kilter routine prints a summary of the nonzero flows as a purported sensitivity analysis. On p. 23 the code is falsely claimed to be ANSI; it varies from the standard particularly in its treatment of subscripts and use of string delimiters. The various subroutine descriptions appear abruptly throughout the text after the corresponding algorithms have been described.

The book has several typographical errors, indicating that a poor job of proofreading was done. A few other errors were noted. On p. 137, column 1 was chosen instead of column 2 and a horizontal line was chosen through cell (2, 2) instead of a vertical line. On p. 150, the first summation index should be i instead of j. The reference to Floyd's shortest-path algorithm is missing from the Chapter 2 reference list. Also, Chapter 3 begins with the following enigmatic comment: "Having completed a study of the wide variety of algorithms presented in Chapter 2, the reader might assume that better algorithms cannot be found to solve the problems considered in that chapter. However, as in all areas of systems analysis and optimization, more efficient approaches can be developed if such algorithms are discovered."

Unfortunately, the book is too limited in scope, and state-of-the-art algorithms in many of the areas discussed are ignored. We believe it to be unsuitable for classroom use other than as a supplemental text in courses concerned with graph algorithms or network algorithms. However, this book is recommended for the serious student of network technology, since it may cover some topics not present in the usual graduate courses and it contains some clever problem reformulation techniques.

Richard V. Helgason and Balakrishna Shetty
Department of Operations Research and Engineering Management, Southern Methodist University, Dallas, Texas 75275

RUBINSTEIN, REUVEN Y., *Simulation and the Monte Carlo Method*, John Wiley & Sons, New York, New York 07511, 275 pp., $32.95.

This book views simulation from the statistician's point of view and is concerned principally with using simulation to solve mathematical rather than Management Science problems. The focus is on methods, algorithms, and proofs rather than computation, languages, or case studies of practical problems. Nonetheless, the book should be of interest to readers of *Interfaces* as a supplementary reference because it contains within its 275 pages a wealth of material on problems and issues faced in many Management Science simulations.

Rubenstein begins by talking about random number generators and means for generating numbers from both discrete and continuous distributions. He gives only the standard congruential generator but then proceeds to show a wider variety of statistical tests for determining uniformity than is found in most standard books on

simulation. Similarly, he offers a wide variety of probability distributions and in several cases gives alternate methods of generating them and compares them in terms of required computer time.

Another useful chapter is the one on regenerative methods. These methods have seen extensive development in the last several years and Rubenstein's chapter does a good job of pulling together material which is widely scattered in the literature.

The book has considerable material on variance-reducing techniques, one of the critical tactical issues in simulation. The basic approach is to explain these techniques in terms of using variance reduction in Monte Carlo integration. A large number of methods are shown. A few pages are devoted to applications of variance reduction in networks and queues and the subject is brought up again in considering regenerative methods. To use the various methods described in OR/MS simulations will require some work on the user's part to translate the results into an appropriate frame of reference.

The book also contains the application of simulation to solving linear equations, integral equations, and Markov chains, and in finding the extreme points of complicated nonconvex real-valued functions.

Overall, the book is easy to read and contains a wealth of references including many that have appeared within the last five years. Rubenstein is also to be commended for presenting comparative running times for alternate methods, although the reader would be well advised to check the original source of the data before selecting a method based on the values given.

Paul Gray
Edwin L. Cox School of Business, Southern Methodist University, Dallas, Texas 75275

WATSON, HUGH J., *Computer Simulation in Business*, John Wiley & Sons, New York, 1981, 358 pp.

Simulation is a powerful technique for evaluating complex alternatives unfortunately viewed as a rather simple concept when, in fact, it is far easier to misuse than utilize correctly. This paradox is due in part to the notion that in simulation models the computer does all of the work. This is obviously not true, since in any simulation study, the computer code must be verified, the model must be validated, appropriate experiments must be designed, and output data must be analyzed. There are many textbooks in the area of simulation but only a small number of these are really successful in providing insight into the nature and complexity of simulation modeling. That is, whereas some texts are extremely good at describing a host of applications in the various functional areas of business and others are strong in addressing random number generation, variance reduction techniques, and statistical analysis of output, few are proficient in both dimensions.

Computer Simulation in Business, designed for use in an elementary simulation course at a college of business administration, tries to cover a wide spectrum of applications and at the same time introduce some of the theoretical issues. In many ways, the book accomplishes its goal. However, it also falls short with respect to the second dimension just mentioned.

Text prerequisites include calculus and a first course in probability and statistics. Ideally, the book is suited for undergraduate general business majors. Prior

knowledge of FORTRAN, while not strictly required, would certainly be helpful.

The text is well written and nicely organized. Each chapter is carefully structured and, in most cases, motivates subsequent chapters. The book has a nice flow to it and a large number of topics are at least mentioned. The reference list is current, well chosen, and reasonably complete, taking into account the intended audience.

The book can roughly be divided into three sections. The *first section* focuses on applications and includes Chapters 1-4 and 11. After introducing the concept of simulation in Chapter 1, applications from production, marketing, finance, inventory control, and real estate are discussed in Chapters 2 through 4. Chapter 11 describes corporate simulation models. The *second section* consists of Chapters 5-7 and 12 and concerns itself with theory. In Chapters 5 through 7, the statistical theory of simulation (including sampling from probability distributions, goodness-of-fit tests, random number generation, etc.) is developed and then applied to queueing systems. Chapter 12 belatedly and superficially, in my opinion, treats issues of experimental design, variance reduction, transient vs steady-state conditions, and autocorrelation in the output of the simulation. The *third section*, Chapters 9, 10, and 13, is more philosophical in nature and covers selected simulation-like models such as human decision making and management games as well as an overview of the entire modeling process.

In order to emphasize chapter interconnections and promote continuity, I would have offered the first section chapters together, the second section chapters together, and so on. Chapter 8, which looks at special-purpose simulation languages, in particular GPSS, is rather cumbersome and could have been eliminated.

Without doubt, the book's greatest strength lies in its handling of applications (Section 1) and simulation-like methods (Section 3). The portion of the book devoted to theory (Section 2) is informative but cursory.

In summary, the book provides a nice introduction to the field of simulation. It would probably be most successful in an undergraduate course for nonquantitative business majors. For a more sophisticated audience, the instructor would need to supplement Section 2 quite substantially. The book is clearly written, with only a few typographical errors, and is interspersed with humorous illustrations from sources such as Doonesbury, Peanuts, and, last but not least, *Interfaces*.

Bruce L. Golden
College of Business and Management, University of Maryland, College Park, Maryland 20742