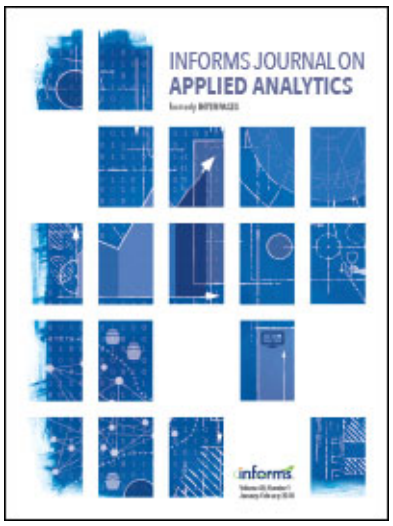

Interfaces

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

Book Reviews

To cite this article:
(1979) Book Reviews. Interfaces 9(2-part-1):99-115. https://doi.org/10.1287/inte.9.2pt1.99

INTERFACES
Vol. 9, No. 2, Pt. 1, February 1979

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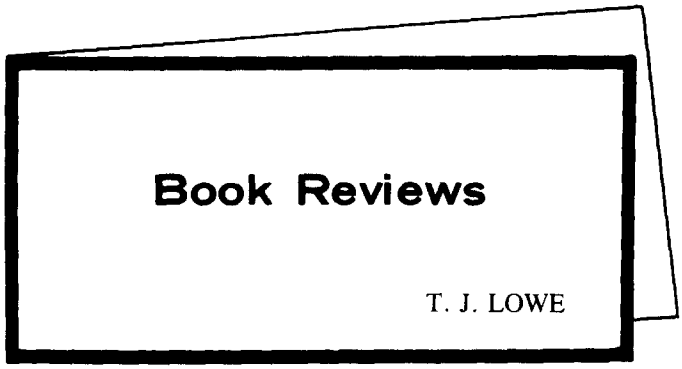

BAZAARA, M. S. and JOHN J. JARVIS, *Linear Programming and Network Flows*, John Wiley & Sons, 1977, 565 pages.

Bazaara and Jarvis have recently submitted their version of a course in linear programming and network flows. In spite of several similar books available, this one does have something special to offer. In particular, its great readability assures that it will be well received by students.

The order of presentation follows the pattern developed by Hadley [1], and is by now well honed and pedagogically effective. What is especially commendable about this text, however, is the appealing style of presentation. New ideas are introduced by a three stage process; they are naturally suggested, illustrated by a small example, and then rigorously developed. Besides making the book more accessible to students, this allows the instructor to teach selected portions on a more casual level if desired.

Also, a much appreciated courtesy to the reader is that the book is graphically well laid-out. The clean format and generous use of white space attracts the eye, and hence the mind.

If the book has any weaknesses, these are primarily in the neglect of algorithm analysis. Little is said of the efficiencies (guaranteed or empirical) of the algorithms; nothing is mentioned of appropriate data structures for efficient implementation of the network algorithms.

Finally, I feel the book does not adequately address the problem of *modeling*, i.e. it provides little insight in how to recognize when linear or network models may be appropriate.

Despite these few weaknesses, I feel that the book is rather good. It clearly deserves consideration as a text for any quantitatively-oriented course in linear programming/ network flows.

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BECK, JAMES V. and KENNETH J. ARNOLD, *Parameter Estimation in Engineering*, John Wiley & Sons, 1977, 501 pp., $24.95.

"Parameter Estimation in Engineering and Science" is apparently the collaborative result of an engineer and a statistician. To them "parameter estimation is a modern and exciting discipline ..." and "other names for parameter estimation are nonlinear estimation, nonlinear regression, optimization of parameters, calibration, model building, identification, and identification of systems." The book is on least squares estimation. Coefficient estimation rather than prediction is emphasized throughout.

The introduction and survey of parameter estimation given in the first chapter provides little motivation for the material which follows. The next two chapters on probability and statistics are shallow. Fundamental statistical concepts are discussed and explained poorly. Elements of randomness are contrasted to elements of stability. F(y) is termed the distribution function rather than the more commonly used cumulative distribution function. The explanation and interpretation of confidence intervals given on page 102 could be misleading to the novice statistician. We are then told, without further explanation, that "one-sided confidence intervals should be used more often than they are. Still, two-sided intervals are usually wanted and we seldom, if ever, refer to one-sided confidence intervals." In an introduction to linear estimation, the reader is told, "When models are linear in the parameters, regression analysis and analysis of variance are sometimes used interchangeably." The explanation of analysis of covariance is that it "uses a combination of techniques which are specially adapted to 0 or 1 independent variables and techniques needed in more general cases." In example 5.2.3, four data values are given for each of Re and Nu. We are then told that "the suggested model is $Nu = a_0 Re^{a_1}$" and to get the solution "take the logarithm to the base 10 to get $\log N_u = \log a_0 + a_1 \log Re$." No motivation or explanation for model linearization is provided the reader. Throughout the text it is not apparent to the reader that the authors are always clear in the distinction between accuracy and precision.

Following the introduction to linear estimation is a 120 page chapter on least squares in matrix notation. Least squares, maximum likelihood, and maximum a posteriori estimation is presented throughout the development. The book ends with a chapter on the design of optimal experiments in which criteria in terms of XTX are covered.

Each of the eight chapters is followed with an extensive list of references and a large number of exercises. Solutions are given for many of the exercises. The text is replete throughout with worked numerical examples, mostly from the physical sciences. Only two typographical errors were found, "ture" for "true" on page 128 and the publication date "1968" for the first reference on page 204 should be "1966."

For the reader wishing a comprehension of regression, Draper and Smith (1966) or Graybill (1961) is recommended over "Parameter Estimation in Engineering and Science." For the engineer wishing a reference on model building, Hahn and Shapiro (1967) is recommended. In spite of the above criticism, the book is interesting reading.

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BRADLEY, STEPHEN P., ARNOLDO C. HAX and THOMAS L. MAGNANTI, *Applied Mathematical Programming*, Addison-Wesley Publishing Co., 1977, 716 pp.

At last — a book which focuses on realistic applications of mathematical programming, and does a good job of it. Most OR students and (even worse) hordes of MBA's have been bombarded with the mathematics of optimization, spiced with a few toy examples, and that's all. This misinforms the OR students as to the nature of mathematical programming applications and really turns off the MBA's. I believe this text goes a long way toward remedying this situation.

The strong points of the book are an excellent set of problems, four detailed and realistic case studies, and a clear and intuitive development of algorithms. The exercises are on a par with those in Wagner's books, and have some unique features. Some exercises, as well as three of the case studies, present a problem statement and formulation, then show computer solution output and ask the student to analyze that output. This is a central activity in practice, yet few books deal with it. In some examples MPS input and output formats are used; in others, the output is from a time sharing program.

The case studies, plus a chapter on "mathematical programming in practice" are highlights of the book. The problem descriptions are extensive. A hierarchical solution approach is used, which in one case leads to a strategic and a tactical model, while in another the division is into aggregate and detailed. The role of the mathematical programming models within the overall planning system is discussed and, in three of the cases, extensive input and solution data are provided. Much of the output presented is for the purpose of sensitivity analysis. This topic receives an excellent treatment, both in the chapters on methods and in the case studies.

I believe that the level of mathematics is such that much of the book can be used in an MBA course in management science. In the chapters on LP, networks, and integer and dynamic programming, no matrices, vectors, or calculus derivations are used. The overall approach is to develop algorithms from simple geometric examples. However, there are three mathematical appendices, using matrix-vector notation, which permit a more sophisticated treatment of linear programming. This, plus the coverage of topics such as the bounded variable simplex method, duality, and ranging and parametrics, make the book suitable for students with a good mathematical background as well. There are chapters on integer programming, nonlinear programming (using calculus), and on large scale systems (decomposition and column generation), all of which are well done.

I do have a few criticisms. The LP chapters do not make the correspondence between a basic feasible solution and an extreme point until after all discussion of the simplex method is complete, and then in an offhand way. I feel that noting this correspondence (by simple geometric example) at the start would add motivation and understanding. In some of the instances where computer output is shown, an example of a well structured report based on the output would have been helpful. This would have reinforced the brief discussion of matrix generators and report writers in Chapter 5. Similarly, more discussion and examples of matrix generation would have furthered the applications orientation of the book.

These, however, are minor quibblings with what is essentially an excellent text. I congratulate the authors on helping to fill a gaping hole in management science education, and give the book my enthusiastic endorsement. I plan to use sections of it in courses on LP for OR students and case studies course for MBA and OR students.

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GOODMAN, S. E. and S. T. HEDETRIEMI, *Introduction to the Design and Analysis of Algorithms*. McGraw-Hill, 1977, 371 pp.

The authors have provided an introductory level of algorithm design and analysis. Properly supplemented it would be a good text for a course of the same title in an operations research curriculum; the only background needed is introductory finite mathematics with exposure to logic plus a basic FORTRAN course.

Despite excursions into some of the mathematics, the book mostly stays with its central topic. The authors use Knuth's notation to present algorithms, and students should have no difficulty picking out the relevant material in each chapter.

There are two criticisms I have. First, although data structures are covered, the reader is misled at first. That is, since the authors adhere to the poor principle of dimensioning for the maximum, the reader believes the adjacency matrix requires different storage than the incidence matrix. It would have been desirable to point out that, despite their different column dimensions, a proper data structure would require the same storage for both plus the degree of each vertex. This provides, incidently, a cute proof of the lemma: the sum of the degrees equals twice the number of edges. More importantly, it can capture a central point with little difficulty.

Overall, the book is written well, and the exercises are adequate. There is at least mention of every important topic (i.e. structured programming, parallel algorithms, list structures, recursion, ...). The particular algorithms presented are simple enough that even a mini-computer is adequate to support a course based on the book.

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HASEMAN, WILLIAM D. and ANDREW B. WHINSTON, *Introduction to Data Management*, Richard D. Irwin, Inc., 1977, 432 pages.

Let me admit at the outset that I am not an expert on data management. I assume that most readers of *Interfaces*, like myself, would approach this book as a student rather than as a teacher, so my review will concentrate on the clarity of the presentation.

The authors state that "The only prerequisite assumed for this book is that the reader has had an introductory course dealing with some higher level programming language, such as FORTRAN," and that is accurate insofar as it applies to the technical material. Some exposure to the jargon used by professional computer users would be helpful because the book rapidly introduces such jargon. This is not an altogether bad feature of the book because learning the jargon is one of the most important steps one has to take when learning a new subject.

The book is divided into three parts. The first is an introduction to data management; it comprises four chapters and covers 108 pages. This should be the heart of the book. The second is about the CODASYL approach to data management; in particular it describes a specific data management system called GPLAN. Seven chapters totaling 150 pages are devoted to this. The last part is about advanced issues, such as systems design and optimal structures; it comprises five chapters covering 104 pages. My review will concentrate on part one.

The authors do a decent job in the first two chapters, which give a general overview and describe file structures and have very little technical content. Things take a turn for the worse in chapter three, which is about data structures and has a substantial amount of technical material. No general definition of data structure is given; we are confronted with descriptions of some particular data structures but we have no context in which to place them. The discussion of stacks is very confusing and analogies to noncomputer phenomena are forced and inappropriate. A program for managing a data base of inventory transactions that would strike an operations researcher as quite inadequate is given as an example. Linked lists are described in terms of nodes, which are never defined. On p. 71 we learn that "The concept of a set structure corresponds to that of doubly linked lists *being able to own* other doubly linked lists." (emphasis added), but we are never told what "own" means. I regard these as serious faults.

Chapter four is entitled "History of Data Management" but is more than just that because several of the data management systems that are currently used are described here. One of these is called IMS and I have read some lucid descriptions of it elsewhere. The best I can say for the description given here is that it is murky. It is interesting to notice that many of the figures are reprinted from IBM Corporation publications. Throughout chapters three and four I felt as if I were reading one of those infernal manuals inflicted upon users by software vendors. Another negative feature of this book is poor use of examples. Frequently, the simplest concepts are illustrated by examples but there are no, or inadequate, examples for the deeper concepts, and that is when examples are most valuable.

The poor presentation of the ideas in part one leaves the reader ill prepared to tackle the specifics in part two and the more difficult material of part three. In summary, this book is not written in such a way as to make it suitable as an introduction to the subject for workers in other fields.

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KAPUR, K. C. and L. R. LAMBERSON, *Reliability in Engineering Design*, John Wiley & Sons, 1977, 586 pp.

The book provides an introduction to engineering design reliability for the student with an engineering background, and minimal exposure to the concepts of probability and statistics. As such, the emphasis is on usable answers (versus derivations) and numerical results. The book delivers remarkably well on its purpose.

Extensive and effective use is made of tables for probability distributions, abbreviations, units of measure, and the like. Graphs, examples and problems are plentifully used. In general, the introductory derivations are complete and mathematically sound. Beyond the introductions, results are often quoted without accompanying motivation. Bibliographic entries are, however, sufficient to provide entry into more detailed literature, if desired. A great number of different reliability design models are drawn together. These include static and dynamic models, exponential and Weilbull estimation, some Bayesian topics, and sequential analysis. In the last case, for example, models for test truncation and batch testing, often omitted in texts, are included here.

The limits of usefulness of the text are strict. It provides the student with little indication or understanding of more advanced reliability models, or with the mathematical tools and understanding to derive variations of the presented models. As a reference text, it lacks the clear structure, and careful delineation between different types of models, to provide a ready reference. Careful study could remedy this deficiency.

The book suffers from the authors' association with strength, stress and other mechanical engineering topics. The non-engineer would have considerable distress following all the examples, and making sense out of a whole chapter devoted to stress-strength models. (On the other hand, of course, the student with appropriate background would find this same emphasis useful.) The authors also failed to make any mention that reliability (and associated safety) concerns carry on throughout the entire life of the equipment or system; they do not stop at the completion of the design, or the fabrication of the system.

In conclusion, I like the book within the limits for which it was intended.

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LADANY, SHAUL P. and ROBERT E. MACHOL, *Optimal Strategies in Sports*, North Holland Publishing Co., 1977, 231 pp., $20.00.

This book is a very interesting collection of articles on the application of Management Science to sports. As such, it is the first publication of its kind and should be commended for being a pioneering work in a new area. Although isolated articles have been published on the subject, this book represents the first attempt to bring together under one cover the different articles related to sports. The book can thus be considered an extension of the application of Management Science. It can now be said that to the many areas that Management Science has tackled, a new one has been added, namely sports. For this reason, the book is recommended to any Management Science practitioner who wants to be in on the "ground floor" of a new application.

The editors should be commended for assembling a very comprehensive and exhaustive collection of articles on the subject. The book contains virtually everything written on this subject.

Another quality of the book is its informative value. Examples are the articles on the effectiveness of different batting orders. These are backed by such extensive evidence that the conclusions should be accepted by the baseball fan. The sports fan can learn a lot from this book.

The book is very interesting and will stimulate discussion. Athletic sports are widely discussed, and anything connected with them usually provokes comments, discussions and sometimes heated arguments. This holds true for players' and coaches' comments, articles written on the subject, and newspaper reports. As this writer found out in the recent weeks that this book has been in his possession, a scientific treatment of sports is no exception to the above rule. Friends who had a chance to go over some of the articles came back with comments and counterarguments. This book, therefore, is received in somewhat different manner than Management Science publications in general. Because of the subject matter, this book stimulates extensive reaction. It can safely be said that the book is a "conversation piece."

The book has one limitation. The audience it addresses is somewhat limited, because only a person with a solid mathematical background can follow it. Most articles are at a level which goes beyond the layman's mathematics. The book is not intended for the layman, but certainly a person with Management Science background should have no difficulty.

A warning is in order about what one may not find in the book. The book title and some of the articles suggest that what is being presented is optimal strategy, which leads to winning. This is somewhat misleading. Sports situations that seem similar, in fact differ so vastly depending on the circumstances, that no strategy exists that applies under all conditions. An analytical approach, and conclusions reached by such approach may provide the manager or coach some information on what past experience indicates but cannot provide him with an optimal strategy. He must assess the particular situation and make decisions which the team can carry out. This book can provide some input to the manager or coach, but it cannot determine the best course of action for him to take. This is in fact very properly stated in some of the articles.

It was stated above that the book is not for the mathematical layman. Also it is not for the manager or coach. The book is intended for the sports fan, the person who follows sports and likes to discuss it.

The book is recommended for anyone with a mathematical background and an interest in sports. It is a very informative and interesting work.

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COURTOIS, P. J., *Decomposability: Queueing and Computer System Applications*, Academic Press, 1977 (201 pages, incl. 4 appendices, bibliography, and index). Price $17.50, IBSN #0-12-193750-X.

Decomposability as used in this book is principally in the sense of Simon and Ando's nearly completely decomposable matrices. A finite, stochastic matrix $\mathbf{Q}$ is nearly completely decomposable if $\mathbf{Q} = \mathbf{Q}^* + \epsilon\,\mathbf{C}$, where $\mathbf{Q}^*$ is a finite, block diagonal stochastic matrix, $\mathbf{C}$ is a matrix with elements in $[-1, 1]$ whose row sums are zero, and ϵ is a scalar, small compared to the nonzero elements of $\mathbf{Q}^*$. Matrices $\mathbf{Q}$ with this property can have some nice properties for computing approximate values for the time dependent state probabilities. Chapters I-III of the book discuss properties of such $\mathbf{Q}$ matrices and approximations.

Jackson queueing networks have proven useful for modeling computer systems. If one treats such networks in discrete time (instead of the more usual continuous time), the queue length process is a vector-valued Markov chain which in many practical applications can be taken to have a finite number of states. Thus, the application of nearly completely decomposable matrix theory to finite, discrete time Jackson networks allows one to study the time path of the state probability vector, approximately. That is a valuable contribution of the book to the study of such systems. Chapters IV-VI of the book develop some of the background necessary to understand Jackson queueing networks.

Chapter VII is concerned with memory hierarchies. Chapter VIII discusses near-complete decomposability in program behavior. Chapter IX is titled "Instabilities and Saturation in Multiprogramming Systems." Chapter X discusses hierarchical systems design. The book ends with a short Conclusion.

There are four appendices. The first two provide extended proofs of results given in the main body of the book. The third gives a numerical example of several results found in the first two chapters. The final appendix computes the eigenvalues of a one-step transition probability matrix for a random walk with reflecting barriers. Therefore, what the book attempts to do is important. Unfortunately, it is written with such imprecision that it does not do what is claimed. Three examples illustrate the point.

Pages 50-51 give a "sufficient" condition for a matrix to be nearly completely decomposable (equation 3.5). The arguments used to get the result contain a logical error. One of our colleagues has produced a proof of a modification of that result. Whether this version is applicable in the many places equation (3.5) is used throughout the book needs to be shown. Without such verification one must question the correctness of many assertions throughout the book.

Page 78-82 attempt to generalize the service time distributions that occur in Jackson queueing networks to networks with general service time distributions (G servers). Such a generalization would be of enormous benefit to the use of the theory of networks of queues, since it is the service time assumptions that often turn one away from Jackson network models for many real applications. The motivation for Courtois' generalization appears to be a theorem by Palm and Khinchin for superposing independent renewal processes. Unfortunately, although the processes that are being superposed may be independent, as the author asserts, the problem as stated does not guarantee that they are renewal processes. The discrepancy is apparent in the proof of theorem 6.1. The Khinchin theorem concerns stationary processes so that, while the discussion preceding theorem 6.1 is misleading, it may be correct for stationary processes. In that case the proof of theorem 6.1 might be corrected by removing the renewal assumption. Therefore, careful arguments may be able to extend the results, but as things stand, one cannot assume that the book is useful for networks more general than finite dimensional, discrete time Jackson networks.

Finally, one must assume that all of the matrices involved have only one eigenvalue of modulus 1, or else the results of Chapter 1 do not go through as given. This condition must be tested for not only in $\mathbf{Q}$ but every block of $\mathbf{Q}^*$.

In summary, the author's work might turn out to be a major contribution to the study of finite discrete time queueing networks, but a reader of this book must be prepared to spend time trying to patch up some of the assertions. The applier of these results might find them to be quite useful but he is advised to search for hidden assumptions.

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ROTHBERG, ROBERT R., *Corporate Strategy and Product Innovation*, The Free Press/A Division of Macmillan, 1976, 518 pages.

MIDGLEY, DAVID F., *Innovation and New Product Marketing*, Halsted Press, 1977, 296 pages, $15.95.

PESSEMIER, EDGAR A., *Product Management: Strategy and Organization*, John Wiley & Sons, 1977, 478 pages.

These three books are very different in their orientations and objectives. Rothberg's book is a collection of old but good readings, Midgley's monograph represents an academic comparison of behavioral and quantitative models of diffusion of innovation, and Pessemier's textbook is a personalistic exposition of the managerial issues underlying the process of new product development.

Rothberg attempts to "integrate strategic planning with new product development" (p. xi) with a set of selected readings. This book is a good summary of classical managerial thought on new product development and includes some good readings on R&D management and marketing. However, the readings are rather old. The most recent ones were published in 1973 and two-thirds of the readings were published before 1970. The newer areas of management science models and behavioral science are not well represented. There is little or no presentation of perceptual mapping, segmentation or

conjoint measurement. The one quantitative model paper describes DEMON, which is hardly representative of the state of the art of management science research or practice. Due to the lack of description of recent research, this book can not be termed a comprehensive integration of strategy and new product planning. Those looking for a readings book could also consider the collection published in 1977 by Edward Spitz [4]. It is similar to Rothberg's book in that it is a classical description of new product development.

While Rothberg neglects behavioral and management science, Midgley devotes his entire monograph to a rigorous consideration of these issues. He attempts to integrate what is known about diffusion of innovation with the practice of managing new products. He should be commended for his efforts to integrate behavioral and management science since this can yield substantial benefits in developing and testing new products.

After a critical review of the relevant strands of academic research on the diffusion of innovation, Midgley proposes a general model based on consumer flows through the states of unawareness, awareness, and acceptance ("favorable" or "passive") or rejection. He creates a specific special case of this model for frequently purchased consumer products and empirically tests it on six new products. With this background, strategic, organizational, and managerial process aspects of development are considered. Although these are useful discussions, Midgley's contribution lies in comparing predictive management science models to the theoretical innovation concepts. This comparison is useful at the product testing phase and the models are appropriate as test market analysis and forecasting tools. He considers most of the major models (Parfitt and Collins, DEMON, NEWS, SPRINTER, N.W. Ayer, NEWPROD) and is one of the few authors to correctly position DEMON versus NEWS. He concludes that SPRINTER was "the only model mentioned which was explicitly based on a theory of innovative behavior" (p. 274). However, he criticizes SPRINTER for its high level of complexity, apparently due to not being aware of the evolutionary nature of this model and its use earlier in the development process [5].

While overall Midgley's book is accurate, two other points deserve comment. First, he feels that test market models should be capable of application to pre-test market evaluation. This is desirable, but recent experience with pre-test market models [1, 3] indicates that different and more aggregate models parameterized by laboratory measures are the best approach to forecasting test market sales performance. Secondly, Midgley argues that concept and product evaluation should be based on responses from "innovators" rather than a cross section of consumers. This is true for major innovations in durable consumer or industrial markets, but in the frequently purchased consumer product markets he considers, the pre-test market models indicated above have been successful with a random sample of the target group. These two comments should not be considered as criticisms of the author, since they are based on models that were not published when Midgley wrote his book, but rather as observations on recent experience.

Overall, Midgley has written a good book. It should be read by market researchers, brand managers, and marketing model builders. It provides an in-depth understanding of behavioral and management science concepts that can be utilized to test new products and predict their adoption patterns.

While Midgley's effort is concentrated on testing frequently purchased new products, Pessemier has created a textbook that spans the entire new product process. Midgley's monograph is academically oriented while Pessemier's test is managerially focused and grounded in a comprehensive discussion of strategy, analysis, and organization. The strong points of the book are the inclusion of substantive material on R&D management and its relationship to marketing and the recommendations on organizational policies. Another good aspect of the book is its coverage of product markets. Consumer durables (e.g. cameras, calculators, tires) and industrial examples (e.g., computers, plastics, motor speed drives) are presented, in addition to frequently purchased consumer products. The text gives a reasonable treatment of technical methods and through the use of technical appendices strikes a good balance between technical complexity and managerial understanding.

While the book has many excellent features, some issues deserve comment. The technical models presented are very personalistic. Pessemier developed them and they reflect his recommendations to the field. By the author's design "competing approaches are not described in detail" (p. v). Although other models are referenced, they are not compared to Pessemier's models. There could be considerable debate over whether the models he proposes are best. For example, is the proposed discriminant analysis approach the best method for perceptual mapping? Is PREFMAP the best way of estimating importances? Is Pessemier's use of the cumulative Weibull distribution a good way to represent the response to marketing expenditure for an innovation? Many would say no. Another problem with the technical exposition is that is neglects some analysis techniques, such as conjoint analysis, which are widely accepted, and LOGIT modeling, which has been effectively used to represent probability of purchase. While Pessemier's models may not be the most technically powerful, they are reasonable and effectively demonstrate the value of perceptual mapping, estimating and importance of attributes, modeling the adoption process, venture simulation, and mature product planning. For analytically inclined readers, in-depth technical issues and comparisons could be obtained by a study of the references.

Another comment on the book is that although the coverage of consumer and industrial markets is good, services are not considered. Services are the biggest part of the GNP and are receiving increasing attention. A recent text by Richard Hise [2] uses a classical approach to consider service innovation.

All the three books reviewed here are worthwhile. If you must pick one — choose Pessemier. It is the most managerially comprehensive and technically up to date text available. It can be complemented by the other two books. Rothberg will give the reader a classical perspective and Midgley will add behavioral and management science depth to the area of diffusion of innovation modeling. These three books contribute to the advancement of new product development theory and practice. We can expect continued advancement in this area since there are at least two textbooks in process which aim to provide a comparison of the most recent technical procedures within a practical management structure to improve the process of innovation in product and service organizations [6, 7].

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ROY, ROBERT H., *The Cultures of Management*, The Johns Hopkins University Press, 1977, 431 pp., $19.95.

The title of the book clearly describes the objective of the author to present the different cultures that affect the decisions of managers of organizations. These cultures are described and discussed along the dimensions of general management relevance: organizations, technology, quantitative methods, and behavior.

Organizational relevance is devoted to the development, structure and mores of formal organizations, with the main emphasis intitally upon the large public corporation and then a discussion of the differences in culture of other types of prominent organizations in our society such as labor unions, government agencies, academic organizations and voluntary organizations. Of particular interest is the emphasis on how the mores of these organizations have changed over time and how the existing mores may affect the range of feasibility of management decisions.

Technology is presented in terms of the technology of "operations" and the "technologies of systems." The first emphasizes the work place and the second the interface between the operations. Again the perspectives are developed in a historical context, which enables the reader to readily understand the effects of these two technologies on managerial decisions and to gain insight concerning their future impacts.

The section on quantitative methods has two main objectives. The first is to present in a simplistic but readily understandable manner the more common quantitative methods that are widely used in the organizations. The second is to present the role of number in organizations. Since the role differs in subparts of an organization, the topic is presented in a number of chapters including Accounting, Cost Accounting, Financial Accounting, Work Measurement, Ability and aptitude Measurement, Probability and Statistics, Operations Research and Computes. The necessity for the manager and decision maker to thoroughly understand the limitations of number systems in terms of the validity and accuracy of the numbers is particularly stressed.

The chapters in the behavior section include chapters on Autocracy and Autonomy, Precepts, and Interdependence. Each of the chapters contain numerous observations which are quite interesting, but are not as well developed with a central underlying theme as the earlier chapters. Nevertheless, these topics are not normally covered in management books or by authors of organizations theory and therefore present a dimension which is generally not available.

The book is a major contribution to the management literature. The author uses numerous examples to make his points and is especially skillful in using technical jargon in a readily comprehensible manner. The book should be required reading by students in the management process, the technical change process, and those interested in the roles of information systems in organizations. The book will be especially of value to mid-career managers because of the perspective it will help to provide them on the effect of different cultures on the decision process.

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RUSTAGI, JAGDISH S., *Variational Methods in Statistics*, Academic Press, Inc., 1976, 236 pp., $19.50.

This is a welcome introduction and exposition of the applications of the calculus of variations to statistical and related problems. The unique feature of this book is that it is the first of its kind which attempts to integrate and to synthesize an application of such techniques to some diverse areas of statistical theory and methodology.

In the opinion of this reviewer, the statistical prerequisites for a good appreciation of this book would be familiarity with the concepts of hypostheses testing, regression with an emphasis on experimental design, sequential analysis, and stopping rule theory. The mathematical requirements would be a modest maturity in the language of hard analysis.

The book starts off with a discussion and an overview of classical and modern variational methods. The material here is well written, though there appears to be a mild tendency to get bogged with the details. The bulk of the book deals with an application of the variational methods to the problem of moments, the optimal design of experiments, and the statistical theory of optimal control. The last chapter discusses miscellaneous applications to areas as diverse as reliability theory and stochastic programming, and should prove to be interesting both from the point of view of information and ideas for future research.

In summary, I recommend this book for a graduate level seminar course on such methods in a statistics, mathematics, or an Operations Research department. This book should be of particular interest to a serious student of Operations Research, because it represents a first systematic attempt towards applying optimization techniques to the stochastic aspects of Operations Research. Professor Rustagi has to be complimented on

developing a book based on material which is highly scattered and seemingly unrelated, and for initiating an effort which attempts to relate two important and useful disciplines.

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SCHERER, CHARLES R., *Estimating Electric Power System Marginal Costs*, North-Holland Publishing Company, 1977, 340 pp., $48.95.

For the last few years considerable attention has been focused on the problem of energy modeling. One of the more difficult aspects of energy modeling is the problem of how to handle the utilities. This book makes a real contribution in this direction.

The purpose of this study is to develop an empirical approach for estimating electric power system peak and off-peak marginal and average costs. Traditionally, electric power rates have been set according to average cost accounting rules. However, the decade of the sixties produced two major trends affecting the total cost to society of supplying electric power: the emphasis on pollution emission standards and the sudden and dramatic increase in the cost of electric power. These two trends have generated interest in marginal cost pricing, especially "peak load" pricing. This book presents methods for determining the actual magnitude of the marginal cost on a time and space specific basis. In addition, this study considers the problem associated with extensive pollution by estimating the costs of production subject to specified pollution emission standards.

The book begins by outlining the major developments of the theory of peak load pricing. The emphasis is on developing a pricing policy for different output levels of electric power in different periods where the returns to scale are not necessarily constant and where there are significant external or side effects (mainly pollution) associated with the production of power. This is followed by a discussion of some of the technical aspects of electric power systems and the definition of system costs. Next, a mathematical programming model of a thermal electric power system is used to estimate the costs. This theoretical basis is then applied to the New York State Electric and Gas Corporation. The book ends with a discussion of the preparation of the pertinent data for the estimations.

Although this book should prove to be a definitive contribution to the literature of energy modeling, its high price, $48.95, for 338 pages will tend to discourage making it a best seller. However, it should be on the bookshelf of any group engaged in energy modeling.

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SPULBER, NICOLAS and IRA HOROWITZ, *Quantitative Economic Policy and Planning Theory and Models of Economic Control*, W. W. Norton & Co., 1976, 413 pp., $16.95.

This book is designed as a textbook "intended for a wide and diversified audience" (p. *xiii*). As such, it covers a great deal of ground, but on the whole, it seems to us, is less than the sum of its parts. Much of the material included as well as much that is excluded seems explainable only by the interests and backgrounds of the authors. A textbook ought to be consistent in its point of view, present this view in an integrated fashion, and according to some set of criteria for inclusion, be comprehensive. Despite the promise implied by the authors' assertions that "economic policy, economic management, and economic planning, no matter how much varying in scope and overlapping in practice, are substantively one and the same thing: acts of economic control" (p. *xi*) and that "policy models, management theory, and planning of all kinds are reducible to a small core of models and their variables" (p. *xiii*), we have difficulty in seeing how the material "hangs together". As a text, we find it hard to see the type of course in the field of policy analysis for which it will be adopted.

On the other hand, it is a book which academics in many disciplines and fields might like to own. At a minimum, we would note that it contains concise, lucid explanations of a large number of economic planning and policy models.

The book is divided into three quasi-independent sections entitled: I) The Elements of Economic Control, II) Systems, Subsystems and Plans, and III) Economic Control: Scope and Issues. Section II deals, first, with planning models, techniques and procedures in general and, then, with specific applications in the areas of technological planning, capital investment, foreign trade, manpower and employment, agricultural and industrial production, and locational and regional planning. This section of the book is a solid, well organized survey of a significant body of literature. Published independently, it would make a fine introductory textbook in wide range planning fields. It's long enough to stand on its own at 178 pages.

The third section of the book is quite interesting in its own right as a comparative analysis of Western and Soviet planning and control systems. It probably reflects the work of Spulber based on his previous writings. This section might appropriately be reprinted in a book of readings on comparative economic systems. Two of the three chapters deal with the State's "agenda" under capitalism and under socialism. The third is concerned with convergence theories and optimal systems. However, we would suggest that it would be improved if greater attention were given to *managerial* and *administrative* control mechanisms. By control mechanisms we mean those mechanisms that assure that whatever we want done will be done. Where the authors are concerned with market mechanisms, the lack of attention to the specific mechanisms of control may be appropriate. Most of us ought to know how these controls are supposed to work. However, control instruments in command economies are less familiar and deserve an extended discussion. Furthermore, a discussion of recent Soviet attempts to design incentives to achieve efficiency, which would operate without markets in the context of a comprehensive plan, would have been appreciated.

Section I is both the most promising and the most disappointing section of this book. It proposes to show how the theory of systems autoregulation and the analysis of information networks of decisions and actions within such systems can be applied to the

solution of problems of national planning and policy selection. This section starts well. However, after the first two chapters the authors shift their attention in Chapter 3, "Models of Rational Policy Choice," from regulatory and adaptive control processes and information flows, to static, multi-attribute decision models. We do not mean to gainsay the value of these models taken individually or the utility of rigorous modelling in general. But we do object to Spulber and Horowitz's claim that they have successfully integrated these models into a general theory of policy planning, albeit at a highly abstract level. The implication of this claim is that, in order to make the leap from formalism to practical relevance, the analyst needs only to apply his understanding of existing institutions and structures to this general framework to generate realistic special-case models and policy solutions. This is easier said than done.

A key analytical problem which must be overcome before the theory of systems autoregulation can be comprehensively applied to policy problems arises out of the fact that rational action requires processes for both calculation and control. Both might be integrated into a systems framework. For the time being, however, the tools at hand, the available choice models, are static in nature. The authors recognize the inconsistency between optimal choice models such as Tinbergen's theory of rational policy choice [1] and the managerial or "steering" problems which can now be dealt with from the standpoint of regulation and adaptive control. However, having noted the inconsistency, they proceed to obfuscate it by carelessly using the term "control" interchangeably with "controls": control in the normative sense having to do with direction of a process toward specified goals or ends and controls in the analytical sense having to do with facts, events of the past, and means of exercising control.

Finally, this section of the book is disappointing in that it fails to pursue many of the more important practical issues it raised to some kind of conclusion. For example, the authors note that: "a multi-measure policy is encouraged by the same principle that underlies the diversification of assets in an investment portfolio" (p. 127). This is an interesting and important observation. There is widespread agreement that a major characteristic of most political systems is the "disjointed" and incrementalist way in which public policy is made [2]. There is considerably less agreement, however, on the merits of this policy making style [3]. The strongest claim usually made by its defenders is that it is the only way decisions can be made in a complex, uncertain world. Spulber and Horowitz's comment that the techniques of portfolio management might logically be applied to instrument selection (given either outcome or value uncertainty) could provide both a rigorous justification for muddling through [4] (which includes the adoption of seemingly inconsistent policy instruments) and, at the same time, point to a set of techniques for more rational management of incrementalism. Spulber and Horowitz, however, fail to pursue these possibilities.

We stress the importance of this particular issue because we believe it is critical to an appreciation of the real contribution that rigorous, quantitative analysis can make in the area of public policy making. We believe that the efforts of policy analysts will be most productive if they are directed at *systematic*, incremental policy making and design. Unfortunately, Spulber and Horowitz, however, fail to pursue these possibilities.

They claim that they ignore social, political, and administrative considerations and constraints. In fact, they make the *strongest* possible assumption about political institutions, processes, etc. They assume a strongly hierarchical system atop which is a unitary controller. Richard R. Nelson could easily have had the Spulber and Horowitz book in mind when he observed:

> Implicit in its basic characterization of problems and solutions is the image of someone or some collective mechanism that is actively involved in steering, making the policy decisions that guide the ship of state. The image involves both a steersman and a steering wheel well connected to the rudder. In many instances no such steersman cum steering wheel exists [5].

The point that Nelson is making is that people who hold to such a world view make strong limiting political assumptions and that these assumptions are wrong. At a minimum, these assumptions must be corrected and normative models must be adapted to the revised set of assumptions before they can have any real practical utility.

Spulber and Horowitz have drawn together a wide variety of formal economic planning and systems control literature. However, a truly comprehensive treatment of policy planning (even confined to economic policy) must involve the integration of mathematical models with the admittedly less precise and "softer" knowledge of the behavioral sciences (including management), political science and emerging policy sciences. Spulber and Horowitz have given us a good beginning, provided the reader is aware, or made aware, of the other side of policy planning and control.

References

[1] Jan Tinbergen, *On the Theory of Economic Policy*, Amsterdam, North-Holland, 1952. See also his *Economic Policy: Principles and Design*, Amsterdam, North-Holland, 1967.

[2] See David Braybrooke and Charles E. Lindblom, *A Strategy of Decision*, New York, The Free Press, 1970, Chapter 5, "The Strategy of Disjointed Incrementalism," pp. 81—110.

[3] See the debate between Yehezkel Dror and C. E. Lindblom in *Public Administration Review*, Vol. 24, No. 3, 1964. For alternative frameworks see T. Lowi, "Four Systems of Policy, Politics and Choice," *Public Administration Review*, July/Aug. 1972, pp. 229—310 and Amitai Etzioni, "Mixed Scanning: A 'Third' Approach to Decision Making," *Public Administration Review*, Vol. 27, No. 6, December 1967, pp. 385—392.

[4] C.E. Lindblom, "The Science of 'Muddling Through'," *Public Administration Review*, Vol. 19, Spring 1959, pp. 79-88.

[5] Richard R. Nelson, "Intellectualizing About the Moon-Ghetto Metaphor: A Study of the Current Malaise of Rational Analysis of Social Problems," *Policy Sciences*, Vol. 5, 1974, p. 381.

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