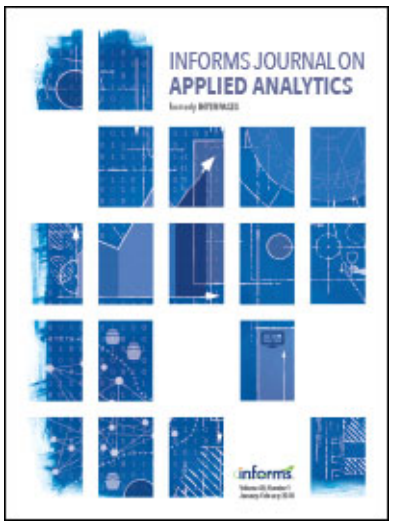

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Book Reviews

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Book Reviews

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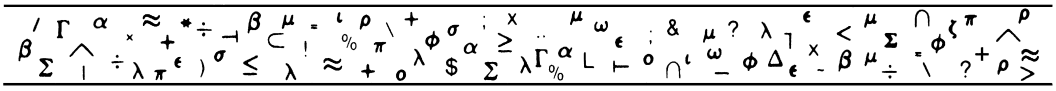

The range of books reviewed is wide, covering theory and applications in operations research, statistics, management science, econometrics, mathematics, computers, and information systems (no software is reviewed). In addition, we include books in other fields that emphasize technical applications. Publishers who wish to have their books reviewed should send them to Professor Benjamin Lev. We list the books received; not all books received can be reviewed because space and time are limited. Those who would like to review books are urged to send me their names, addresses, and specific areas of expertise. We commission all reviews and do not accept unsolicited book reviews. Readers are encouraged to suggest books that might be reviewed or to ask publishers to send me copies of such books.

ALWAN, LAYTH C. 2000, *Statistical Process Analysis,* Irwin/McGraw-Hill, Burr Ridge, Illinois, 751 pp., $83.12.

Alwan's emphasis in this text is a very practical approach to process analysis and control. Topical coverage is complete. The target audience requires only college algebra. The absence of calculus restricts the nomenclature and makes for some awkward, long descriptions of some topics that could easily be expressed mathematically for a more sophisticated audience. The author reviews basic statistical concepts as a substitute for a prerequisite course in probability and statistics. I believe, however, that students will fare much better if they have at least one prior course in probability or statistics. In discussing quality management, Alwan summarizes the contributions of key figures in the development of current approaches and techniques. The chapters cover modeling of process data, control charts, individual and grouped variables measurement, monitoring attribute data, memory control charts, an introduction to process capability analysis, and some special topics. The text is wordy; however, that may be ap-

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propriate for the intended audience.

Each chapter begins with an overview, closes with a summary, and includes a balanced list of texts and papers and an extensive set of exercises. An accompanying CD provides sample data, but the CD was not included for my review. Editing and typesetting are generally very good with only a few errors. None that I found were serious. Tables and flow charts could have been used very effectively in many places to reduce the volume of text needed to explain alternatives. There is no list of acronyms and abbreviations, and they are not included in the index. The author does not differentiate between really important concepts and routine or background material.

In explaining each method, Alwan gives good advice about limitations and restrictions and lots of good practical discussion.

Alwan does a good job of easing the reader into more complex notions. He included an excellent differentiation of control limits and specification limits. I was pleased that he gave CUSUM and other memory control charts a very balanced treatment.

The text is constructed around Minitab release 12. Sample Minitab output designed for line printers appears regularly and detracts from the modern typesetting and style of the rest of the text. This emphasis on Minitab will discourage users of other software. The book should have included references to the capabilities of other software, including spreadsheets.

Alwan usually introduces new topics with examples. I think it will be hard for average students to extrapolate to more general cases. It will also be hard for them to remember all of the steps for a complete analysis. Although Alwan summarizes each chapter, he does not provide an overall system-level perspective. He claims that effective process managers can no longer rely only on control charts, but he devotes only 11 pages to other topics. I would like to have seen a reference or discussion on transformations into the frequency domain for periodic data analysis.

When dealing with time series, the author always indexes the data, which is appropriate only for equally spaced samples.

Alwan cautions readers throughout about the limitations of each process. One key message that he treats lightly is that analysts need to get to the underlying physics, economics, or business principles. They should base models on the best available understanding of first principles, not on attempting to understand why a logarithmic transform seems to explain a lot of the variance.

In summary, instructors should consider Alwan's *Statistical Process Analysis* carefully for a course in statistical process analysis for students without a calculus background. Students in business schools might benefit from Alwan's approach.

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KLEIN, ROBERT 2000, *Scheduling of Resource-Constrained Projects*, Kluwer Academic Publishers, Dordrecht, The Netherlands, 369 pp., $150.00.

Scheduling problems make up a very active multidisciplinary area. During the last three decades after publication of (seemingly) the first monograph [Baker

1974] scheduling problems have been investigated intensively. The theoretical aspects of scheduling problems are important to computer scientists as classical examples of NP-hard problems. Experts in OR/MS are interested primarily in developing and applying efficient codes for large applied scheduling problems. R. Klein devotes his book to a special case of scheduling problems: resource-constrained project-scheduling problems (RCPSP). They are of great importance for efficient planning and management of projects that steadily increase in size and complexity.

The book consists of two parts. In the first part (approximately 1/3 of the book), Klein gives the main definitions and the problem statement, introduces the representations of a project by graphs and by Gantt charts, and discusses managerial aspects and the theoretical complexity of the problem. Thanks to this first part, novice students can read the book.

Klein devotes the second part of the book to the solution of RCPSP. Since RCPSP are NP-hard, exact methods can be developed only for small problems. Klein presents the following motivation for investigating the exact methods: they are useful as a standard for assessing heuristic procedures, and they may be applied as heuristics by simply stopping them after a certain amount of time. As for the other NP-hard problems, analysts seek exact solutions for RCPSP by means of branch-and-bound procedures. Klein describes the new technique PROGRESS, in which a parallel branching scheme is combined with a depth-first search strategy and a lower-bound method. He introduces the improvement of search efficiency and implements the modification of PROGRESS called SCATTER.

He separates heuristic methods into two classes: priority-rule-based heuristics and meta-heuristics. He investigates the first type in detail: serial and parallel scheduling schemes, backward and bidirectional planning, and multipass heuristics based on different and randomized priority rules. He uses tabu-search to represent heuristics of the second type, mentioning simulated annealing and genetic algorithms only briefly. He does not provide many references to papers on such types of heuristics. However, Gen and Cheng [2000] discuss them.

To validate the methods he proposes, Klein performed comprehensive computational experiments, and he presents the results in the last chapter of the book. This material is important for specifying the details of the proposed algorithms and for defining subclasses of RCPSP for rational application of different algorithms. Besides methods proposed in the book, Klein tested the Computer Associates' Super Project 4.0 and Microsoft's Project 4.0. He compares the results with the results described by other authors, for example, those of Kolisch and Hartmann [1999]. Klein uses the test problems developed by Kolisch, Sprecher, and Drexl [1995].

The primary audience for this book will be practitioners working in the field of project planning and management. The methods described can be easily integrated into problem-oriented software packages and applied to different real-world problems. Researchers will find the book full of interesting ideas and implementations concerning lower-bound meth-

ods, branch-and-bound procedures, priority rules, and tabu search as well as rich experimental material for comparison and assessment of different methods.

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Kolisch, R.; Sprecher, A.; and Drexl, A. 1995, "Characterization and generation of a general class of resource-constrained project scheduling problems," *Management Science,* Vol. 41, No. 10, pp. 1693–1703.

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Shanthikumar, J. George and Sumita, Ushio, eds. 1999, *Applied Probability and Stochastic Process,* Kluwer Academic Press, Dordrecht, The Netherlands, 360 pp., $179.95.

This book was conceived as a festschrift for Julian Keilson, to be published in celebration of this 70th birthday in 1995. Sadly, it wasn't published until November 1999, eight months after Professor Keilson's death in March 1999.

The book consists of a "Tribute to Julian Keilson" by the editors Shanthikumar and Sumita (one of Keilson's former students), followed by a "List of publications by Julian Keilson," 20 chapters written by Keilson's distinguished colleagues and admirers, and an index.

The introductory tribute devotes a short paragraph to some biographical facts and then focuses on the main areas of Keilson's research. Of particular interest in the list of Keilson's publications is his autobiographical "Return of the wanderer: A physicist becomes a probabilist" (in Gani [1986]). There Keilson discusses his early life and the factors that influenced his career, including his early interest in mathematics and chess, his PhD studies in theoretical physics at Harvard under Nobelist Julian Schwinger, his return to classical applied mathematics, and his development of a lifelong fascination with applied probability, especially queueing theory. Also, he discusses his collaborators, including E. Arjas and R. Syski, and his students T. Ott, L. D. Servi, and U. Sumita, all of whom are contributors to this festschrift. It would have been nice if this autobiographical chapter had been reprinted and included here, as well.

Keilson's work spanned the spectrum from physics to classical applied mathematics to applied probability and engineering. The chapters in this festschrift are focused largely on probability but, even within this boundary, they cover too much territory to be traced with a single thread. About half the chapters relate to topics directly connected to Keilson's research, primarily queueing theory, while the remainder are more general reflections of Keilson's abiding interest in applying mathematics to describe and understand physical reality.

The chapters are (1) "Comments on the perturbation method," by R. Syski and N. Liu, (2) "Some aspects of complete monoticity in time-reversible Markov chains," by

Mark Brown, (3) "Tranformations of Poisson processes: Particle systems and networks," by Richard F. Serfozo, (4) "On the local time of the Brownian bridge," by Lajos Takcas, (5) "Probabilistic token causation: A Bayesian perspective," by Elja Arjas, (6) "On a statistical algorithm to decode heavily corrupted linear codes," by I. N. Kovalenko and M. N. Savchuk, (7) "Mean cover times for coupon collectors and star graphs," by Erol Pekoz and Sheldon M. Ross, (8) "Models for the spread of infection via pairing at parties," by D. J. Daley and J. Gani, (9) "Extremes of random numbers of random variables: A survey," by Moshe Shaked and Tityik Wong, (10) "Optimality of sequential quality control via stochastic orders," by David D. Yao and Shaohui Zheng, (11) "Reallocatable GSMP with sequentially dependent lifetimes: Clockwise decomposability and its applications," by Masakiyo Miyazawa, (12) "Random matrices and the number of {0,1} matrices with given row and column sums," by Teunis J. Ott and J. George Shanthikumar, (13) "Monotone optimal policies for left-skip-free Markov decision processes," by Shaler Stidham, Jr. and Richard R. Weber, (14) "Optimal routing control in retrial queues," by H. M. Liang and V. G. Kulkarni, (15) "Waiting times when service times are stable laws: Tamed and wild," by Donald P. Gaver and Patricia A. Jacobs, (16) "Winning the hand of the Princess Saralinda," by Peter W. Glynn and Ward Whitt, (17) "Analysis of multiple queues with passing servers," by Ushio Sumita, Masaaki Sibuya, and Norihiko Miyawaki, (18) "Some properties of throughput in a queueing network with changing-speed servers and blocking," by Genji Yamazaki and Hirotaka Sakasegawa, (19) Quasi-stationary distributions of Markov chains arising from queueing processes. A survey," by Masaaki Kijima and Naoki Makimoto, and (20) "Estimating customer loss rates from transactional data," by D. J. Daley and L. D. Servi.

The chapters are carefully written and edited, and the book is attractively produced. (But I must mention that the short blurb on the back cover, which is reproduced in the advertising brochures, contains at least two errors, including the misspelling "Julien." This blurb is the part of the book that will be most widely seen. The authors, and the person they are honoring, deserve better.)

It is a pity that this book was not published in time for Julian to see it.

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