tions) is delayed until Corollary 3, page 260, i.e., 25 pages into the chapter.

To summarize, I was most happy to discover the paragraph concerning carefulness and details that opened this review. I have also pointed to some topics I miss and to some problems with the organization. Some of these remarks, however, must not necessarily be interpreted as criticism, but rather as an indication of the kind of audience the author has in mind (although they probably also indicate that this is not my style of writing a textbook for an advanced course in probability). As a consequence, the book does not give the reader any insight into how probability theory connects with applied probability and statistics. It is therefore a suitable text for someone who has the desire to learn about the mathematics behind probability theory rather than for someone who wishes to learn about "probability theory and its applications."

Let me conclude with a remark on layout. The readability of a book depends, to some (a large?) extent, on aesthetics. I must confess that it was a bit tiresome to read this book because many proofs are written in long paragraphs without breaks, which makes it hard to get an overview and the structure of the material—one loses ones breath. Regardless of whether or not this is a result of the author's way of writing or of a publishing house book template, it provides authors and publishers with an important task, namely, to agree on who is responsible for what concerning layout and the typing process.

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Matrix Analysis for Scientists and Engineers. *By Alan J. Laub.* SIAM, Philadelphia, PA, 2005. $36.00. xiv+157 pp., softcover. ISBN 0-89871-576-8.

Any book whose title contains the phrase "Matrix Analysis" must be good. That's what I'm tempted to conclude from the presence on my bookshelves of [1], [2], [3], [4], [5]. Laub's book has another thing in common with those cited: its author is a leading researcher in the subject. So does Laub maintain the run of excellent books on this topic?

Laub's book is short and very different from the illustrious five cited. Based on a course that he has taught many times, it is intended for beginning graduate-level students in mathematics and related disciplines who wish to use matrix analysis in applications. Laub defines matrix analysis to mean "linear algebra and matrix theory together with their intrinsic interaction with and application to linear dynamical systems (systems of linear differential or difference equations)." Prerequisites are calculus and some exposure to matrices and linear algebra.

The book concisely covers linear systems, linear least squares problems, standard and generalized eigenvalue problems, canonical forms (Jordan, Schur, Kronecker), vector spaces, and linear transformations. Norms are included, but there are no perturbation results. Pseudoinverses and the singular value decomposition are introduced unusually early, in Chapters 4 and 5, respectively. Relative to the book's size, the coverage of vector spaces, linear transformations, the Jordan canonical form, and generalized eigenvalue problems is quite detailed. To keep mathematicians on their toes, Laub uses the engineering notation j for the imaginary unit.

The main topics of the book are covered in other textbooks, but not in this way. Laub rigorously gives definitions and theorems (sometimes giving proofs, sometimes not) without undue fuss or unnecessary notation, and he provides plenty of illustrative examples. The exercises, which tend to be oriented towards aspects of practical relevance, are interesting and original and sometimes introduce new ideas and techniques.

In such a slim volume, the treatment is necessarily terse in places and will need augmenting by an instructor. For example, the treatment of QR factorization occupies just half a page, and when explaining how the SVD can be used to solve the linear least squares problem Laub doesn't point out how the minimum 2-norm solution is obtained. (The book is not aimed at a numerical linear algebra course, but could be good preparation for one.) I suspect that similar feedback from instructors may lead

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to a somewhat longer second edition. But the book appears remarkably free from typographical or other errors.

Sprinkled throughout are topics that are less often found in textbooks and are obviously based on Laub's research interests in numerical linear algebra and control theory applications. The final chapter treats the Kronecker product and its application to Sylvester and Lyapunov equations. Four pages are devoted to the matrix exponential. The singular values and pseudoinverse of a companion matrix are identified. And the chapter "Eigenvalues and Eigenvectors" ends with a short section on the matrix sign function (which, oddly, gives little motivation for the interest in this function).

I found Laub's book a delightful read. It has become the sixth valuable "Matrix Analysis" book on my shelves. As well as being admirably suited for the course at which it is aimed, its conciseness and clarity of presentation, together with the good index, make it easy to use for reference. The book is recommended both as a course text and as a handy guide to the subject.

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Lattices and Ordered Algebraic Structures. *By T. S. Blyth.* Springer-Verlag, London, 2005. $79.95. x+310 pp., hardcover. ISBN 1-85233-905-5.

The notion of an *order* relation—a relation that is reflexive, transitive, and antisymmetric—is fundamental both to mathematics itself and to the modeling of the real world. Throughout his career Blyth has made significant contributions to the study of ordered systems and to the application of these ideas to logic and computer science, and it is good to see so many of his ideas put together coherently in this monograph. There have been many books on the general theme of order and lattices: the list [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16] in Blyth's bibliography is probably not complete. Blyth, however, takes a very personal approach to the material, which he makes explicit in the Preface, and so this is a book of considerable originality.

If a is an element of a (partially) ordered set A, then $\{x \in A : x \leq a\}$ is called a *principal down-set* and is denoted by $a_{\downarrow}$. Then a map $f : A \to B$ between ordered sets is called *residuated* if the inverse image of a principal down-set in B is a principal down-set in A. The analogy with topology, where a map $f : X \to Y$ between topological spaces is continuous if the inverse image of an open set in Y is an open set in X, suggests that the concept of a residuated map is a natural one. A map $f : A \to B$ is residuated if and only if it is isotone (order-preserving) and there exists an isotone map $g : B \to A$ such that $(g \circ f)(a) \geq a$ for all a in A and $(f \circ g)(b) \leq b$ for all b in B. The map g, called the *residual* of f, is unique and is denoted by f^{+}. The notions of residuation and residual pervade the whole book. Blyth certainly makes a persuasive case for this approach, but it makes the book harder to dip into, and the nonspecialist might find it difficult to home in on the result or the ideas (s)he needs.

Chapters 2 through 6 are devoted to lattices of various kinds, including boolean algebras, and Chapters 7 and 8 are concerned with Stone and Heyting algebras. Chapters 9 and 10 are devoted (respectively) to ordered groups and fields, and Chapters 11 through 14 contain some more specialized material on ordered semigroups. The exposition is terse, but clear and thorough. Some will find it excessively formalist in style, but the formalism is tempered by well-chosen examples and exercises. The diagrams are excellent.