This book is certainly suitable for its stated purpose, which is to introduce college faculty to inverse and ill-posed problems. Not only could it be used as a text for a course on inverse problems, but its many examples could also provide motivational material to be incorporated into other courses. Its reasonable price makes it suitable as a supplementary text. For scientists and engineers faced with inverse problems, the list of techniques in Chapter 5 and the annotated bibliography will both be useful.

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29[65-02, 65D07, 65D17].—RONALD N. GOLDMAN & TOM LYCHE (Editors), *Knot Insertion and Deletion Algorithms for B-Spline Curves and Surfaces*, Geometric Design Publications, SIAM, Philadelphia, PA, 1993, xiv+197 pp., 25 cm. Price: Softcover \$43.50.

This book contains three chapters by Barry and Goldman, two chapters by Lyche and Mørken (one assisted by Strøm), and a final chapter by Banks, Cohen, and Mueller. As this indicates, the book serves largely as a forum for the work of the editors. However, since the most intense existing studies of knot insertion and removal have been made by Lyche and Goldman, a book with this title could not be anything but a forum for the work of these two.

This book is concerned with splines as linear combinations of basis functions, which in turn are composed of piecewise polynomials satisfying certain continuities at the joints. The knot insertion operation derives a containing linear space composed of polynomials having more pieces (and/or relaxed continuities), and explicitly provides the basis conversion operation from the original space to its containing space. The knot deletion operation, conversely, provides the projection from a given space into a subspace having fewer pieces (and/or more strict continuities). Knot insertion can be used to increase the degrees of freedom in spline approximation problems, to change representations from one spline basis to another, and as a means of evaluating splines. Knot deletion has been used as an efficient way of approximating data by beginning with an interpolating spline and passing to a smoothly approximating spline.

The theoretical tools applied by the two editor/authors have been quite different. The chapters contributed by Lyche and Mørken, one on knot deletion and one on how knot insertion influences the size of B-spline coefficients, are based upon discrete splines, the matrices that embody knot insertion, and on least squares problems derived from these matrices. This material is oriented toward the use of B-splines as basis splines. The chapters by Barry and Goldman use multiaffine and multilinear polar forms ("blossoms"). A beginning chapter by Barry provides an overview of the basics of blossoms, but each of the other chapters reproduces the basics again for its own purposes. In all, the blossom material is still too brief (being mainly definitions and statements of a few results) for those who have not encountered the concept before. The references to Ramshaw and Seidel at the end of the first chapter constitute a necessary background. The material by Barry and Goldman covers a wide class of spline bases, some of which also serve as familiar polynomial bases. The class constitutes spline bases whose knot sequences are not necessarily monotone increasing, but are instead "progressive," a property defined to include monotone sequences but having some important nonmonotone examples as well.

The chapters contributed by Lyche and Mørken are selective, organized, and polished. The chapters contributed by Barry and Goldman are a flood of information, shy on the distinction between central results and peripheral material. The chapter by Banks, Cohen, and Mueller provides an example application of knot adjustment in the setting of computer-aided design. The book is a worthwhile reference.

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30[42-02, 42C99, 94A12].—YVES MEYER, *Wavelets: Algorithms & Applications* (translated and revised by Robert D. Ryan), SIAM, Philadelphia, PA, 1993, xii+133 pp., 25 cm. Price: Softcover $19.50.

This is an important book on wavelet analysis and its applications, written by one of the pioneers in the field. It is based on a series of lectures given in 1991 at the Spanish Institute in Madrid. The text was revised and translated in admirable fashion by Robert D. Ryan. The book presents recent research on wavelets as well as extensive historical commentary. The mathematical foundations of wavelet theory are dealt with at length, but not to the exclusion of relevant applications. Signal processing is especially emphasized, it being viewed here as the source from which wavelet theory arises. The text is well written in a clear, vivid style that will be appealing to mathematicians and engineers.

The first chapter gives an outline of wavelet analysis, a review of signal processing, and a good glimpse of the contents of subsequent chapters. Chapter 2 sketches the development of wavelet analysis (which can be traced back to Haar and even to Fourier). Here we find explanations of time-scale algorithms and time-frequency algorithms, and their interconnections. Chapter 3 begins with remarks about Galand's work on quadrature mirror filters, which was motivated by the possibility of improving techniques for coding sampled speech. The author then leads us to the point where wavelet analysis naturally enters, and continues to an important result on convergence of wavelets and an outline of the construction of a new "special function"—the Daubechies wavelet. Further discussion of time-scale analysis occupies Chapter 4. In this chapter the author uses the pyramid algorithms of Burt and Adelson in image processing to introduce the fundamental idea of representing an image by a graph-theoretic tree. This provides a background for some of the main issues of wavelet analysis, such as multiresolution analysis and the orthogonal and bi-orthogonal wavelets, that are the main topics of this chapter. From Chapters 3 and 4 readers can see how quadrature mirror filters, pyramid algorithms, and orthonormal bases are all miraculously interconnected by Mallat's multiresolution analysis.

Chapters 5 through 7 are devoted mainly to time-frequency analysis. In Chapter 5, Gabor time-frequency atoms and Wigner-Ville transforms are viewed from the perspective of wavelet analysis. Not only is this of independent interest, but it also motivates the next two chapters as well. Chapter 6 discusses Malvar