To provide coherence to the book, Neittaanmäki has written an extended Preface, which describes the various topics covered. The papers are not grouped accordingly, but rather are presented in alphabetical order based on the last name of the first-named author. Using the Preface, one can scan for a particular topic area, then easily look up the corresponding paper based on the author names which are provided in the Preface.

The areas described in the Preface are organized in three groups. The first is "Stefan-like problems" devoted to models for phase transition in materials. This group is further subdivided into 'modeling, existence and uniqueness' and 'modeling and numerical methods.' The first of these subgroups has papers with basic information relevant to numerical modeling but which contain nothing about numerics themselves. The second subgroup contains papers more in line with the title of the book. The second group in the Preface is devoted to "optimal control, optimal shape design and identification." The final group is on fluid flow with free boundaries.

There are three distinct areas of fluid flow with free boundaries that are covered in this book. One concerns flow of a fluid in a porous medium, with flow of water through a dam being a typical example. Another example is a two-fluid interface, such as the air-water interface. Two regimes are covered. In the case of an inviscid fluid having a free boundary, waves in the free surface are an area of research covered in the book. For viscous fluids having a free boundary, such as honey pouring from a jar, different phenomena are important, and this is also covered by papers in the book. It would be interesting to explore the relationships (if any) between the various types of free-boundary problems outlined in the Preface, but none exists so far to my knowledge.

Libraries have likely made their acquisition decisions regarding this book, through standing orders, as it appears in a well-known series. It is certainly a valuable library holding, and it will be important for researchers in any area of free-boundary problems to consult it. Whether an individual would want to buy a copy is more debatable. It provides a snapshot of the state of research in an important group of areas. However, some of these areas (for example, fluid-dynamical free-boundary problems) are not covered in sufficient depth to justify buying the book by an individual working only in that area.

L. R. S.

1. Hans G. Kaper et al., eds., *Asymptotic analysis and the numerical solution of partial differential equations*, Lecture Notes in Pure and Appl. Math., vol. 130, Dekker, New York, 1991; Reviewed in Math. Comp. **59** (1992), 303–304.

22[41A15, 65-04, 65D10, 65D17].—Paul Dierckx, *Curve and Surface Fitting with Splines*, Clarendon Press, Oxford, 1993, xviii + 285 pp., 24 cm. Price $53.00.

Over the past fifteen years, the author of this book has developed an extensive collection of algorithms for fitting curves and surfaces using spline functions. This book was written to explain the mathematics involved, to discuss the intricacies of the associated algorithms, to present examples to show how they work in practice, and to serve as a manual for his package (which consists of 83 FORTRAN routines, and is available to the public under the name FITPACK).

The book is divided into four parts. In the first part the author reviews (without proofs) the basic theory of univariate and bivariate splines, with special emphasis on computational aspects. Part 2 is devoted to curve fitting. This includes methods for least squares fitting with both fixed and free knots, smoothing splines with and without end-point constraints, periodic smoothing, and shape-preserving approximation (with emphasis on convexity).

The fitting of surfaces using tensor-product splines is the subject of Part 3. This part includes methods for fitting both gridded and scattered data using least squares and smoothing criteria. The questions of how to choose knots, and how to deal with large data sets and with incomplete data are also addressed. In addition, the author discusses methods for data on a unit disk, for data on the surface of a sphere, and for reconstructing surfaces from planar contours.

Part 4 of the book explains the organization of FITPACK and the main parameters in the various routines. Numerical results are presented to illustrate the performance of the methods, often on real-life problems. The book contains around 50 figures, and about 150 references. The reader should be aware that it is not intended to cover all applications of splines, and that many aspects of curve and surface fitting are not treated here.

I found the book to be well written in a clear and understandable fashion. It should be useful to a wide audience of potential users of splines.

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23[49M30, 65K10].—ELDON HANSEN, *Global Optimization Using Interval Analysis*, Monographs and Textbooks in Pure and Appl. Math., Vol. 165, Dekker, New York, 1992, xvi + 230 pp., $23\frac{1}{2}$ cm. Price $110.00.

The book under review presents techniques for the solution of global optimization problems (with several suspected local minima) and of nonlinear systems of equations with several solutions.

The systematic search for methods which solve the global optimization problem probably began in 1975 with Dixon and Szegö [4]. Ten years ago, the general consensus of researchers in the optimization community was that the complete solution of smooth, nonconvex global optimization problems was beyond tractability. (For the related problem of finding all zeros of nonlinear equations, this was explicitly expressed, e.g., in §2.1 of the book by Dennis and Schnabel [3].)

Therefore, research on global optimization has concentrated on heuristic or stochastic methods for finding good local (and hopefully global) minima, and some of these methods could be proved to produce a global solution with probability $1-\varepsilon$ in finite time, growing rapidly with decreasing ε. See, e.g., Kirkpatrick et al. [7], Levy et al. [8, 9], Byrd et al. [2], and the recent book by Törn and Žilinskas [13].

The situation turned out to be somewhat better for nonlinear systems, where