of the language ADA with a nice historical perspective and some parts on motivation. It also presents Open ADA, a compiler which is available on PC platforms. Chapter 2 describes a library of utilities which is used throughout the book. These include graphics functions for PCs and some standard functions such as random number generators, timers, and standard mathematical functions. Some of these utilities have a somewhat limited portability, but many of them are not publicly available and can be very useful to a first ADA user who is undertaking a sophisticated application in ADA. The other chapters deal with numerical techniques: Matrix computations (Chapter 3), Nonlinear systems (Chapter 4), Approximation and Interpolation (Chapter 5), Numerical Integration and FFTs (Chapter 6), Solution of Ordinary Differential Equations (Chapter 7), and Partial Differential Equations (Chapter 8).

A diskette containing a library of utilities and the programs discussed in the book is provided. The software is meant to be used in a PC platform, which could be a limiting factor for those programming in a Unix environment.

YOUSEF SAAD

Department of Computer Science
University of Minnesota
Minneapolis, MN 55455

21[65N30, 73K05, 73K10, 73K15].—G. PRATHAP, *The Finite Element Method in Structural Mechanics: Principles and Practice of Design of Field-Consistent Elements for Structural and Solid Mechanics*, Solid Mechanics and Its Applications, Vol. 24, Kluwer, Dordrecht, 1993, x + 14 pp., $24\frac{1}{2}$ cm. Price $139.00/Dfl.245.00.

As the subtitle indicates, this book deals with the design of field-consistent elements for structural mechanics applications. To paraphrase the author, 'this book is not intended to be a text-book, delineating the full scope of finite element methodology, nor is it a comprehensive handbook of modern finite element practice for the finite element engineer.' It is a monograph on the design of finite element models of certain structural theories, based on the field-consistency concept the author has been promoting over the last decade. In fact, the book is composed of the papers the author and his colleagues published on the topic.

The book is divided into twelve chapters. Chapter 1 provides a general introduction and the author stresses the importance of "consistency" and "correctness" in finite element formulations. Chapter 2 contains a description of Timoshenko beam elements and a discussion on the associated shear locking phenomenon. The author describes the a priori error associated with the so-called inconsistent formulation and calls his approach "mathematically rigorous". While the approach is variationally correct/consistent, the mathematical rigor can be achieved only through the use of functional analysis tools. No such tools are used in this book to bring more rigor to what is covered. Chapter 3 deals with the membrane locking phenomenon and the simple curved beam element. Essentially, the field-consistent concept is studied with respect to shear flexible beam elements (Chapter 2), curved beam elements, assumed-strain formulations, plane stress elements, plate elements, brick elements, shell elements (Chapters 3–10), and a few other special elements (Chapter 11). Finally, the

author presents a philosophical summary of the contents of the entire book in Chapter 12.

There are several positive aspects to the monograph. It is written in a simple language (despite the author's inclination to use terms like "functional re-constitution"!). The author provides a detailed description of the field-consistency issues, and studies the application of the concept to a whole range of elements (from beam elements to shell elements). The emphasis on 'variational correctness' of the finite element formulations, the subsequent discussions on assumed-strain formulations, and the discussion of the formulations in a more general setting of the Hu-Washizu principle, make the monograph useful.

The reviewer also has a few critical observations. The organization of the book is a little confusing, although the overall structure is good. The organization within the chapters is not very clear. Since sections and subsections have not been identified in the contents page, the reader is not likely to get a good overview of the structure of individual chapters.

The author has a tendency to emphasize concepts repeatedly throughout the book. While repeating concepts and definitions once or twice helps in driving the point home, repeated references hinder the flow of reading. Most of the sections end with concluding remarks, the chapters end with conclusions, and the entire book is summarized in Chapter 12. Perhaps, the final chapter could have been much shorter.

An additional comment pertains to the author's extremely critical view of other finite element techniques to explain locking and measures to alleviate locking. While the author has done an admirable job of describing the field-consistency techniques, he fails to describe at length the other techniques (he has merely stated these techniques in words) and their drawbacks to justify his comments. Perhaps this might seem unnecessary to a person who is aware of these techniques, but to such a person this book will be less useful. However, for a student or a practicing engineer, a complete description of all available methods is necessary before pointing out their deficiencies. Also, the author is either not aware of, or he chose to ignore, many pertinent references on the subject.

While the book has its deficiencies, it will serve as a useful reference book on finite element models of beams, plates, and shells.

J. N. REDDY

Department of Mechanical Engineering
Texas A&M University
College Station, TX 77843

22[65N30, 65N50, 65N55].—RANDOLPH E. BANK, *PLTMG: A Software Package for Solving Elliptic Partial Differential Equations, Users' Guide* 7.0, Frontiers in Applied Mathematics, Vol. 15, SIAM, Philadelphia, PA, 1994, xii + 128 pp., $25\frac{1}{2}$ cm. Price: Softcover $24.50.

This book is a "must have" for anyone planning on using the PLTMG software package for the solution of second-order elliptic boundary value problems in two dimensions. The software can be obtained at no cost by anonymous