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.

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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 ftp from *netlib* at netlib.att.com in the directory netlib/pltmg, or from *mgnet* at casper.cs.yale.edu in the directory mgnet/pltmg. This book is the only user-oriented documentation available for PLTMG.

PLTMG solves nonlinear second-order elliptic partial differential equations in general two-dimensional regions, with Dirichlet boundary conditions on part of the boundary and natural boundary conditions on the remainder of the boundary. It uses finite element discretizations based on C^0 piecewise linear triangular elements, solves the nonlinear systems with a damped Newton method, and the linear systems with a conjugate gradient method preconditioned by the hierarchical basis multigrid method. It contains a pseudoarclength continuation procedure for parameter dependencies. The package also contains an initial mesh generator, graphics capabilities for several hardware devices, including the X-Window System and PostScript, and the sample test problems that were used to generate the figures in the book. PLTMG was originally developed over 10 years ago as a research code to study multigrid and adaptive refinement methods, and has matured into a stable, well-respected, and widely distributed software package. Version 7.0 was released in early 1994.

The book is organized in seven chapters. The first chapter introduces the class of problems that PLTMG can solve, and the global organization of the software package. The second chapter describes, in full detail, the various data structures that the users must understand in order to use the package to solve their own problem. The third and fourth chapters describe the two principal procedures of the package, mesh generation and equation solution. The fifth chapter describes how to invoke various graphical options available in the package. The sixth and seventh chapters describe the test driver program and example problems provided with the package.

I found the book to be very readable and well organized as a tutorial on PLTMG. All the information required to use the program to solve complicated boundary value problems is available. The depth of the discussions concerning the underlying mathematical methods is intentionally shallow, providing only the detail required to fully understand the user interface. An extensive bibliography is provided to point the interested reader to further details.

As a users' guide to a software package, this book could be improved in two ways. First, there is no provision for quickly learning to use a subset of the program's capabilities. I was able to run the example test problems after reading just Chapters 1, 6 and 7, but to write a program that will solve a different problem, it is necessary to read the entire book. A brief introduction, or "quick start" chapter that provides enough information to write a program that solves a simple problem (for example, Poisson's equation on a square) would be a valuable asset. The full detail contained in Chapters 2, 3 and 4 would still be required to write a program that solves more complicated "real-world" problems.

Second, although the book is an excellent tutorial, the organization makes it difficult to use the book as a reference manual. For example, in order to set the appropriate parameters before calling one of the major procedures, one must first look in the book's Table 2.4 to determine which parameters are used by the procedure, and then look up each of them in the index to determine what page describes the options for that parameter. The addition of a "quick reference guide" that summarizes the parameter values and procedure calling sequences would be very useful.

Anyone who intends to use the PLTMG software will need a copy of this book. Despite the aforementioned deficiencies, the book contains all the information needed to solve complicated boundary value problems, and is written in a clear, easy-to-understand style.

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23[65M55, 65N55].—P. W. HEMKER & P. WESSELING (Editors), *Contributions to Multigrid*, CWI Tract, Vol. 103, Centre for Mathematics and Computer Science, Amsterdam, 1994, viii + 220 pp., 24 cm. Price: Softcover Dfl. 60.00.

From the Preface: This volume contains a selection from the papers presented at the Fourth European Multigrid Conference, held in Amsterdam, July 6–9, 1993.

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24[65L05].—LAWRENCE F. SHAMPINE, *Numerical Solution of Ordinary Differential Equations*, Chapman & Hall, New York, 1994, x + 484 pp., $23\frac{1}{2}$ cm. Price $64.95.

That so many books with more or less this same title have appeared in recent years might lead one to expect nothing new in this volume. This is far from the case. Numerical methods for differential equations is a very difficult and important subject and, while its literature is extremely rich, it is far from mature. Recent textbooks, and more so monographs, are not so much personal expositions of a well-defined body of work but personal contributions to the development of a vital and rapidly-changing research area. Lawrence Shampine has been a significant contributor to the theory and practice of solving differential equations numerically for 20 years and it is his style, developed and honed through his own research and experience, that is stamped on this book.

The book is divided into eight chapters of which the first three are of an introductory nature. The first deals with "The Mathematical Problem" (of solving ordinary differential equations), the second with "Discrete Variable Methods", and the third "The Computational Problem". Chapter four on "Basic Methods" is followed by the theory of "Convergence and Stability". The last three chapters are on "Stability for Large Step Sizes", "Error Estimation and Control" and "Stiff Problems".

References are collected together for standard literature, works actually cited, and codes referred to. The book concludes with a brief appendix on mathematical tools used in the book.

The subject of solving differential equations numerically is a mix of theoretical knowledge, practical insight and computational technique. In the Shampine style, software is also an essential component and it is the balance in emphasis