such as advection-dominated flows, domain decomposition techniques, hierarchical bases. The relationships of finite element methods with other recent techniques, such as spectral elements or p-methods, finite volumes and wavelets, would also have been welcome. Surely, multigrid methods or mixed methods are the object of very active research, but one cannot use this book as a starting point for working in these areas, as the material presented here is too meager and, sometimes, almost misleading. For instance, the use of linear nonconforming methods to avoid *locking* in linear elasticity is recommended in Chapter 9 of the book for Dirichlet boundary conditions, which is a case of no practical interest, but the information that the method does not work for more general cases is hidden in Exercise 10.x.5 at the end of the subsequent chapter. A simple-minded reader might think that he got a sound way for escaping locking, but in truth he got only a mathematical exercise.

More generally speaking, I think that the recent book by A. Quarteroni and A. Valli is a much more powerful instrument as a starting point for somebody who wants to start doing research. But even Johnson's book, in its simplicity, opens much wider perspectives for a beginning applied mathematician. Still the final part of the present book can be useful for a reader with intellectual curiosity, willing to have some ideas on selected topics that go beyond the basic results of the first six chapters, and I strongly recommend it for that.

A final unhappy remark has to deal with citations. As I said, the book is intended (or it should be) as a didactic one more than one oriented toward research. As such, a basic lack of citations can be tolerated. It is also normal for an author to refer explicitly to his own work more often than to the work of others. But the present authors are overdoing it a bit. Finally, I am curious to know what the basic tools contained in the book are that (quoting from the preface) "are commonly used by researchers in the field but never published". I hope they do not refer to all the results obtained by others (and regularly published), presented here without citations.

Franco Brezzi
Istituto di Analisi Numerica–CNR
Via Abbiategrasso 209
27100 Pavia, Italy

15[00A69, 34-01, 35-01, 65-01]—*Industrial mathematics: A course in solving real-world problems*, by Avner Friedman and Walter Littman, SIAM, Philadelphia, PA, 1994, xiv+136 pp., $25\frac{1}{2}$ cm, softcover, \$22.50

This brief, ground-breaking, scholarly text is written for persons who have a two-year basic Calculus background, that includes functions of several variables, along with rudimentary knowledge of ordinary differential equations, linear algebra, infinite series, vector analysis, and who have elementary computer experience (with at least one of these—Fortran, Pascal, C, Maple, Matlab, etc.). In seven concise chapters, mathematical models for the following topics are covered:

(1) Black and white photography, silver crystal growth.
{Ordinary differential equations, theory and methods for numerical solution.}
(2) Air quality.
{Partial differential equations for advection and for advection-diffusion; numerical methods for solution, stability of difference schemes.}

(3) Electron beam lithography (computer chips).
{Integral transforms, heat equation, scattering, Fourier series.}
(4) Color film negative development.
{Diffusion, maximum principles.}
(5) Automobile catalytic converter.
{Optimal control, calculus of variations.}
(6) Photocopy machine (electric image).
{Poisson equation, finite differences, direct and iterative methods for solution.}
(7) Photocopy machine (visible image).
{Free boundary problems.}

This wide range of topics is succinctly and carefully presented. Hence the volume is a valuable teaching resource for a variety of upper level undergraduate and beginning graduate courses. Each chapter begins with a description of the physical phenomena, followed by a mathematical formulation of a model and simplification(s) thereof. The simplest models permit complete mathematical analysis and numerical solution. All of the models have been thoroughly studied in the previously published six volumes by the first author and in other, also given, references. Each chapter concludes with a summary of the topics that were covered. Problems are presented within each chapter. These exercises are generally nontrivial. The authors suggest that some of the computing projects may serve as final examinations, that could well take considerable time and effort to complete!

Here is a challenging noncomputational problem that is given in Chapter 5. The classical brachistochrone problem is stated and provides the motivation for a discussion of simple variational problems. The derivation of the Euler-Lagrange equation is then produced. This Euler equation is a necessary condition that is satisfied by the solution of any simple variational problem. The exercise presented at this point states: "Use the Euler equation to find the solution of the brachistochrone problem."

The authors have performed a valuable service by choosing interesting examples of real-world problems and formulating them as mathematical problems. They achieve their aim to show that Calculus and computers serve as ubiquitous tools for today and tomorrow. The material was used by the second author and a colleague in a one-year upper-level course during 1992–3. The students came "from mathematics, physics, computer science, and various engineering departments." The authors recommend, "One attitude to encourage is that the class is one research organization attacking some problems. Thus, it makes sense to divide the problems among various students or groups of students."

E. I.

16[65-06, 65Y05]—*Environments and tools for parallel scientific computing*, Jack J. Dongarra and Bernard Tourancheau (Editors), SIAM Proceedings Series, SIAM, Philadelphia, PA, 1994, xii+292 pp., $25\frac{1}{2}$ cm, softcover, \$38.50

This book is based on the proceedings of *The Second Workshop on Environments and Tools for Parallel Scientific Computing* which took place at Townsend, Tennessee, on May 25–27, 1994. The book is organized in four parts. The first part addresses issues related to data mapping in HPF, run-time support libraries, and