In the section on matrix computations there are papers on block algorithms for dense matrix problems; parallel algorithms for the nonsymmetric tridiagonal, nonsymmetric Hessenberg, and generalized symmetric eigenproblem; distributed and shared memory multifrontal methods; parallel nested dissection; direct methods for general sparse nonsymmetric matrices; and parallel implementations of ICCG, GMRES, block Cimmino, multigrid, Lanczos, and various preconditioners.

The papers on nonlinear equations and optimization cover interior-point methods; asynchronous relaxation for neural nets; stochastic global optimization; solving sparse nonlinear systems; and parallel interval Newton/bisection methods.

The differential equations papers include a survey of decomposition principles, parallelization of a 3D implicit unsteady flow code, parallelizing across time in time-dependent PDEs, a parallel Euler solver and domain-decomposed GMRES/ILU on unstructured grids, parallelized codes for transport in porous media, neutron transport, stochastic reaction/diffusion equations, massively parallel CFD, and spectral transforms.

The biological application papers cover the human genome project, parallel search of DNA databases, molecular dynamics and cancer simulation. There were three papers on parallel aspects of oil reservoir simulation. Other application papers cover robot motion control, cellular automata for excitable media, 3D MOS and other semiconductor device simulation, ocean circulation modeling, and the 3D Ising model.

Performance studies include work on load balancing and bandwidth studies in various applications, processor assignment and data placement, graph embedding, message passing, heterogeneous computing, and locality and clustering on SIMD and MIMD machines. Parallel software development tools include automatic blocking, loop transformations, portable parallel programming, unstructured meshes, and finite element generation. Programming environment work addresses data visualization and parallel scatter/gather on networked workstations. Novel hardware systems for coarse grain systolic arrays and lattice gas models are also discussed.

Finally, mathematical software systems discussed include LAPACK for distributed memory machines, PCG/CM for iterative sparse solvers on the Connection Machine, and parallel FISHPAK and HOMPACK.

J. W. D.

37[41–02].—INGRID DAUBECHIES, *Ten Lectures on Wavelets*, CBMS-NSF Regional Conference Series in Applied Mathematics, Vol. 61, SIAM, Philadelphia, PA, 1992, xx + 357 pp., 25 cm. Price: Softcover $37.50.

This is the long-awaited book that resulted from the author's CBMS Lectures in June 1990 at the University of Lowell. The magnitude of the monograph suggests why an interval of two years intervened between its appearance and the lectures. There are ten chapters, 11 pages of references, and copious notes at the end of each chapter. Chapter headings are as follows: 1. The What, Why, and How of Wavelets. 2. The Continuous Wavelet Transform. 3. Discrete Wavelet Transforms: Frames. 4. Time-Frequency Density and Orthonormal Bases. 5. Orthonormal Bases of Wavelets and Multiresolution Analysis.

6. Orthonormal Bases of Compactly-Supported Wavelets. 7. More About the Regularity of Compactly Supported Wavelets. 8. Symmetry for Compactly Supported Wavelet Bases. 9. Characterization of Function Spaces by Means of Wavelets. 10. Generalizations and Tricks for Orthonormal Wavelet Bases.

About two-thirds of the book (by the author's estimate) is devoted to the tutorial aspects of her project. The remaining third delves into various special topics of current research. A special section of nine pages precedes Chapter 1, and reviews the "prerequisites" for reading the book. These include Fourier transform theory, operators on Hilbert space, and integration theory. The interests of nonexperts seem to be well served by the inclusion of detailed proofs, frequent diagrams, and asides referring to the real world of signal processing and so on.

E. W. C.

38[41-02, 41A10, 42A10, 41A15, 41A44].—N. KORNEICHUK, *Exact Constants in Approximation Theory* (Translated from the Russian by K. Ivanov), Encyclopedia of Mathematics and its Applications, Vol. 38, Cambridge Univ. Press, Cambridge, 1991, xii + 452 pp., 24 cm. Price $89.50.

In both numerical analysis and approximation theory, there are many results giving bounds on some kind of approximation process. In most cases, one is content with knowing the order of the approximation, and is willing to accept some fixed (and sometimes not precisely specified) constant in front of the error bound. In such cases, the natural question always arises: can one find the best possible constant? This is often a difficult question to answer, but over the past decade or two, quite a lot of new results have been obtained.

This book provides a comprehensive and detailed treatment of best-constant problems for approximation of smooth functions by polynomials, trigonometric polynomials, and splines. It is divided into eight chapters and an appendix. The first chapter provides background and general theory, including duality theory from convex analysis and the introduction of various standard smoothness classes. The second chapter reviews results on polynomial and spline approximation. Chapter 3 goes into comparison theorems and the construction of standard comparison functions (such as perfect splines, Euler splines, Bernoulli monosplines, etc.). Chapter 4 discusses polynomial and trigonometric approximation, while Chapter 5 is devoted to spline approximation. Jackson inequalities are treated in Chapter 6 for both polynomials and splines. Spaces of functions whose moduli of smoothness have prescribed behavior are discussed in Chapter 7, using certain rearrangement results. Finally, in Chapter 8 the theory of n-widths is investigated.

The book is well organized and well written (the English reads smoothly). The bibliography consists of approximately 400 entries, and is especially valuable because of its concentration on the Russian literature in the area. Each chapter concludes with remarks and historical notes, along with (a limited) set of exercises. While there is no particular computational flavor to the material presented here, the book should be of considerable general interest to numerical