Chapter 3 gives a thorough exposition of Linear Multistep Methods along classical lines, with perhaps too many details about individual Adams methods. Delightful is the simple example which shows that the *local* eigenvalues of the Jacobian may not give insight into the solution behavior and thus into the actual stability behavior of a method. Chapter 4 explains the well-known theoretical, and important implementational, aspects of the predictor-corrector approach, with sufficient detail to convey genuine understanding. The difficulty of stepchanging in linear multistep methods is explained and the three customary techniques are discussed. The rationale for choosing the step and order in such methods concludes this chapter.

The following Chapter 5 is necessarily devoted to Runge-Kutta methods. Here, the author has succeeded in presenting and using the essentials of Butcher's theory (based on elementary differentials and Butcher series) in a form which is intuitive and rigorous at the same time. In a concluding section, he even presents the alternative approach of P. Albrecht's A-methods in sufficient detail (not found in most of Albrecht's own publications) to make it transparent, and he establishes its equivalence with Butcher's approach in classical cases.

The final two chapters are devoted to stiffness (Linear and Nonlinear Stability Theory). Again, cleverly chosen examples play an important role in assisting the student to understand the central concepts and technical discussions. The treatment proceeds up to the 1990 state-of-the-art and includes order stars, the algebraic stability concepts, one-sided Lipschitz constants and logarithmic norms, G-stability, and B-stability and B-convergence.

I have no doubt that this book will become the classical text for the audience for which it has been conceived. Besides, it will provide a welcome and urgently needed easy access for computational scientists of all persuasions to appreciate the modern view on solving numerically initial value problems in ODEs.

H. J. S.

36[65-06, 65Y05, 68-06].—Jack Dongarra, Ken Kennedy, Paul Messina, Danny C. Sorensen & Robert G. Voigt (Editors), *Parallel Processing for Scientific Computing*, SIAM, Philadelphia, PA, 1992, xviii + 648 pp., 25 cm. Price: Softcover \$67.60.

This collection of 94 papers and short abstracts from the 1991 SIAM Conference on Parallel Processing for Scientific Computing covers six areas: matrix computations (including dense linear algebra, sparse direct methods, and iterative methods); nonlinear equations and optimization; differential equations; applications, modeling and simulation (including biology, reservoir simulation, simulation and modeling); performance evaluation and software tools (including performance, parallel software development tools, programming environments and novel architectures), and mathematical software. Papers range from theoretical studies to performance evaluation to descriptions of software and hardware systems. Many of the major researchers in these fields are represented, and these papers give a good overview of research in this fast-changing area as of 1991. In this short review we will simply list the topics covered, since the number of papers is too large to mention each one individually.

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.