3[76F05, 76F99, 65-02, 65M70, 76-02, 76D05]—*Dynamic Multilevel Methods and the Numerical Simulation of Turbulence*, by Thierry Dubois, Francois Jauberteau, and Roger Temam, Cambridge University Press, New York, New York, 1999, xix+289 pp., $23\frac{1}{2}$ cm, hardcover, $59.95

This book describes the multilevel methods for time dependent simulations of incompressible turbulence. The authors have performed extensive research in this area and the book is a good source of the state of art in this methodology.

The first three chapters are surveys about the incompressible Navier-Stokes equations, general turbulence theory, and spectral methods. The surveys are brief but references are given for readers desiring more details. Chapter 4 compares DNS (Direct Numerical Simulation) with various turbulence modeling. Long time behavior of the Navier-Stokes equations is discussed in Chapter 5. This is an area in which the third author has done extensive research. This chapter and Chapter 6, which discusses the separation of scales, form the theoretical basis on the applicability of the multilevel methods to incompressible turbulence simulation. In Chapter 7, the basic procedure of multilevel methods is illustrated through a simple system of ODE, which carries many of the essential ingredients of the more complex Navier-Stokes equations but avoids the functional analysis framework. The last three chapters are about the methodology, implementation details, and numerical results of the multilevel methods applied to Navier-Stokes equations in 2D and 3D, both for the periodic cases and for the well-bounded flows. They are based on several recent papers and give the state of the art in the application of this methodology on turbulence simulation.

The authors argue that "new chapters of numerical analysis will have to be written in relation with the multilevel treatment of large evolutionary problems". It is at least safe to say that multilevel or multiresolution methods will play a more important role in large scale scientific computing in the years to come. There is a great challenge to make multilevel methods more efficient. The factor of CPU time saving of the multilevel methods over DNS in this book is about 2 to 2.5. It would certainly appeal to users if this factor can be increased.

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4[65-01, 65Fxx, 65Y05, 65Y10, 65Y20]—*Numerical linear algebra for high-performance computers*, by Jack J. Dongarra, Iain S. Duff, Danny C. Sorensen, and Henk A. van der Vorst, SIAM, Philadelphia, PA, 1998, xvii+342 pp., $25\frac{1}{2}$ cm, softcover, $37.00

This book is meant to provide helpful information on state-of-the-art numerical linear algebra techniques to be used in advanced high-performance computation to a rather heterogeneous community, ranging from graduate students to professionals in computational sciences. In my opinion, one is also very likely to find extremely good advice for implementing recent and advanced algorithms on sequential machines. Quoting from the authors' preface, " ... this book is a major revision of a previous edition of the book, entitled *Solving Linear Systems on Vector and Shared Memory Computers*", published in 1991; indeed, it contains a lot of new material that covers the recent advances in the development of parallel architecture and software.