Since no metric or topology is assigned directly to the abstract set of "particles" $B$, the meaning of the differentiability assumptions imposed on configuration maps is left unclear. Finally, the inequalities cited in the footnote on p. 191 are merely necessary, but not sufficient, in order that $I_1, I_2, I_3$ be the principal scalar invariants of a symmetric positive-definite tensor, and thus the domain of definition of the function $\Phi$ remains unspecified.

Such minor criticisms cannot, and are not intended to, detract from the value of this worthwhile contribution to the literature on an important subject of growing current interest.

**Computational Techniques for Differential Equations.** Edited by John Noye. North-Holland, The Netherlands, 1984. 680 Pages. Price $74.50.

### REVIEWED BY G. MAJDA[4]

The textbook *Computational Techniques for Differential Equations*, edited by J. Noye, is a very valuable addition to the list of textbooks on computational methods in engineering and applied science. It introduces researchers to five different areas of numerical methods:

(1) the numerical solution of ordinary differential equations,
(2) finite difference techniques for partial differential equations,
(3) the Galerkin method,
(4) the finite element method,
(5) the boundary element method.

The text also contains two chapters on direct and iterative methods for the solution of systems of linear algebraic equations.

Each chapter is written by an expert in the particular field. All techniques are illustrated with model problems rather than with complex problems which often occur in applications. As an example, Poisson's equation is used to illustrate the basic properties of the finite element and the boundary element method. However, practical applications are not ignored. Some applications are presented in the text and generous references to the literature appear throughout the book. The theory behind the numerical methods is either given a heuristic motivation or it is briefly sketched. Again, generous references to the literuatre are given where theoretical results can be studied in detail.

The primary contribution of this book is that it covers a broad set of important topics in an expository fashion. All chapter start in a way that assumes that the reader has no previous experience with the material. Noye's text can be used either as a textbook for a graduate class on the numerical solution of differential equations or as a reference for scientists using numerical methods in their research. It has the special feature of including, in one textbook and in a very readable manner, material that usually appears in five or six different books. It should serve as a useful guide for students and researchers who want to get a good overview of most methods that are typically used in the numerical solution of differential equations.

My primary criticism of this book is that despite its breadth, important topics or references to these topics are omitted. The numerical solution of two-point boundary value problems is never mentioned. The numerical solution of systems of hyperbolic conservation laws is given only a one-paragraph discussion and the only reference to the literuatre on this important topic is a 1967 reference to the method of shock fitting. Very little discussion appears on appropriate methods for imposing the extra boundary conditions that are often required for finite difference approximations of initial-boundary value problems for parabolic and hyperbolic partial differential equations.

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**Atmospheric Dispersion of Heavy Gases and Small Particles.** (A Symposium at Delft, August 29–September 2, 1983, under the sponsorship of the International Union of Theoretical and Applied Mechanics.) Edited by G. Ooms and H. Tennekes. Springer-Verlag, New York, 1984. 440 Pages. Price $38.50.

### REVIEWED BY R. A. DOBBINS[5]

This conference consisted of four review articles and over two dozen research papers from contributors based in Europe and the United States. The topics include: gravity spreading of dense gases; dense gas dispersion; turbulence models and dispersion of dense gas clouds; laboratory and large-scale experiments of heavy gas dispersion; liquified gas spills on the sea; and many related topics. The substantial number of papers and the numerous references in the review and research papers provides an excellent summary of the status of heavy gas dispersion in 1983. All viewpoints, from rigorous theoretical understanding to practical calculation techniques, seem to be represented. There is frequent reference to works in progress which will be reported at future meetings. Thus, this conference not only summarizes the past results but provides at least a limited view on the nature of the works to be reported in the future. A noteworthy editorial defect does emerge from casual examination of the conference proceedings. In one article there is reference to the now unavailable original paper as the source of the equations from which the quoted graphical results originate.

An early motivation for the study of heavy gas dispersion was and remains the inadvertent release of liquified natural gas. News of a catastrophic release of methyl isocyanate at Bhopal, India and similar types of episodes serve as a reminder that heavy gas dispersion is potentially a factor in a variety of accidents in industrial plants. This volume provides a status report of the knowledge of this topic as of September, 1983.

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