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# Book reviews

K. Oswatitsch, **Grundlagen der Gasdynamik,** Springer Verlag, Wien/New York, 1976. XIII + 725 pp., price DM 296,–.

This textbook about the basic principles of gasdynamics can be considered as a revised and extended edition of the author's earlier book on gasdynamics which appeared in 1952. The material has been restricted to those parts of gasdynamics that can be presented without a too strong appeal to the mathematical knowledge of the reader. Therefore, flows in three dimensions, transonic flows and hypersonic flows are not dealt with. The presentation is clear and very detailed with the obvious intention to provide a complete picture of the flows considered. This explains the considerable size of the work.

The organisation of the book is such that the reader proceeds from simple special cases to the more difficult general theory. Ch. I deals with thermodynamics. In Ch. II steady one-dimensional flows are treated, and in Ch. III unsteady one-dimensional flows in tubes of varying cross-section. In Ch. IV the basic equations of motion are derived in general form, and Ch. V is devoted to momentum theorems. Ch. VI contains special solutions for plane steady flows. In Ch. VII the perturbation theory is developed which is subsequently applied to subsonic flows in Ch. VIII and to supersonic flows in Ch. IX. The final Ch. X considers the effects of viscosity. There are no exercises.

Summarizing, this book is an outstanding and very complete text on gasdynamics which can be read by any student with some knowledge of basic mathematical analysis. The binding and printing are excellent but the price is extremely high. Reviewer wonders why such a fundamental textbook has not been written in English. This would have enlarged its market greatly.

H. W. Hoogstraten

A. R. Mitchell and R. Wait, **The finite element method in partial differential equations,** John Wiley & Sons, New York, 1977, viii + 198 pages, price $ 13.50.

This book is intended to bridge the gap between the well-known books of Zienkiewicz on the one hand and Strang and Fix on the other hand, which represent the finite-element interests of engineers and mathematicians, respectively. It shares this position with the recent book of Prenter, reviewed in the April 1977 issue of this journal. It seems that both books equally well succeed in accomplishing this purpose.

Chapter 1, an introduction, deals with approximation by piecewise polynomials, function spaces and approximating subspaces. Variational principles, both time-independent and time-dependent (Hamilton's principle) as well as dual variational principles (giving a minimum and a maximum) are considered in chapter 2. Then, chapter 3 continues with the treatment of the methods of Ritz and Galerkin. Also, the semi-discrete method of Kantorovich, where the coefficients of the prescribed space functions are functions of time (when applying the method to time-dependent problems), is explained. Chapter 4 deals with the elementary basis functions to be prescribed for various two- and three-dimensional elements. The use of isoparametric coordinates and the problems arising as a result of curved boundaries are also considered.

Chapter 5, of which in the preface is mentioned that it can be omitted on a first reading of the book, requires substantial mathematical knowledge. It deals with the convergence and the accuracy of the methods. For some of the lemma's and theorems used the reader is referred to other books.

Time-dependent problems are considered in chapter 6 and the methods of Kantorovich and Galerkin are presented as suitable methods of solution. For dissipative equations the adjoint problem is introduced.

Finally, in chapter 7, some special developments, as there is the use of the patch test for non-conforming elements, are described. Also some applications in the form of worked-out problems are given.

A number of exercises in the text may make the reader more familiar with the subject after (s)he has solved them.

A. I. van de Vooren

**Annual review of fluid mechanics,** Vol. 10, 1978, edited by M. Van Dyke, J. V. Wehausen and J. L. Lumley. Annual Reviews Inc., Palo Alto, California, USA, 475 pp., price $ 17.50.

This volume contains the following contributions:
Some notes on the study of fluid mechanics in Cambridge, England, by A. M. Binnie,
Monte Carlo simulation of gas flows, by G. A. Bird,
Hydrodynamic problems of ships in restricted waters, by E. O. Tuck,
Drag reduction by polymers, by N. S. Berman,
Viscous transonic flows, by O. S. Ryzhov,
Dust explosions, by W. C. Griffith,
Objective methods for weather prediction, by C. E. Leith,
River meandering, by R. A. Callander,
Rossby waves—long-period oscillations of oceans and atmospheres, by R. E. Dickinson,
Flows of nematic liquid crystals, by J. T. Jenkins,
The structure of vortex breakdown, by S. Leibovich,
Flow through screens, by E. M. Laws and J. L. Livesey,
Turbulence and mixing in stably stratified waters, by F. S. Sherman, J. Imberger and G. M. Corcos,
Prospects for computational fluid mechanics, by G. S. Patterson Jr.,
Relativistic fluid mechanics, by A. H. Taub,
Turbulence-generated noise in pipe flow, by G. Reethof,
River ice, by G. D. Ashton,
Numerical methods in water-wave diffraction and radiation, by C. C. Mei,
Numerical methods in boundary-layer theory, by H. B. Keller,
Magnetohydrodynamics of the earth's dynamo, by F. H. Busse.

**Proceedings of the Symposium on Applied Mathematics dedicated to the late Professor Dr. R. Timman,** edited by A. J. Hermans and M. W. C. Oosterveld. Sijthoff & Noordhoff International Publishers/Delft University Press, 1978. XII + 241 pages, price Dfl. 60.00/ $ 27.00.

On January 11–13, 1978, the Department of Mathematics of the Delft University of Technology organized a symposium on Applied Mathematics dedicated to the late Professor Dr. R. Timman. The objective of this symposium was to illuminate the broad influence of Professor Timman in the field of applied science.

All of the scientific papers were invited papers presented by a number of his friends and students. The complete list reads as follows:
Slender-body theory for low-Reynolds-number flows, by T. Y. Wu,
Maneuvering, by J. V. Wehausen,
Amplitude relation for trapped waves around a circular island, by A. J. Hermans,
Drift forces and slowly-varying horizontal forces on a ship in waves, by O. M. Faltinson and A. Løken,
Optimization of dynamical systems, by R. Nottrot,
Non-linear acoustics, by L. van Wijngaarden,

Fluid-mechanical aspects in vapour-deposition processes, by W. P. A. Joosen,
Optimal control problems in radiation and scattering, by R. E. Kleinman,
Vorticity in two-fluid hydrodynamics, by J. A. Geurst,
Wave radiation from slender bodies, by J. N. Newman,
Ship motions in large waves, by N. Salvesen,
The intriguing phenomenon of soil behaviour, by H. S. Rutten,
On the mechanics of Cosserat surfaces, by J. H. McCarthy,
End effects in slender-ship theory, by T. F. Ogilvie,
Free-streamline theory—application to propeller cavitation, by L. Noordzij,
The asymptotic approach to the theory of lifting surfaces, by T. van Holten,
External force moving in an inviscid and incompressible fluid, by J. A. Sparenberg.

## Forthcoming papers

The following papers have been accepted for publication in the Journal of Engineering Mathematics:

1. One-dimensional plastic materials with work-hardening, parts I & II, by T. Tokuoka.
2. The virtual mass of a closed torus in axisymmetric motion, by T. Miloh.
3. Separation from a smooth surface in a slender conical flow, by N. Riley.
4. Wave trapping with shore absorption, by R. E. Meyer and J. F. Painter.
5. A note on yawed slender wings, by E. O. Tuck.
6. Cauchy-type integrals and integral equations with logarithmic singularities, by P. S. Theocaris, A. C. Chrysakis and N. I. Ioakimidis.
7. Computation of electromagnetic fields scattered by a cylindrical inhomogeneity in a homogeneous medium of infinite extent, by G. Mur.
8. Filtering of non-linear instabilities, by P. K. Khosla and S. G. Rubin.
9. Hydrodynamic pressure on an accelerating dam and criteria for cavitation, by A. T. Chwang.
10. Rotating flow in a cylinder with a circular barrier on the bottom, by G. J. F. van Heijst.
11. Analytical and numerical results for the non-stationary rotating disk flow, by H. Schippers.