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REVIEW

Strömungslehre, Vol. 2. By O. Tietjens. Springer-Verlag, 1970. 440 pp. DM 86 or $23.70.

Thirty-six years after the publication of the two well-known books, *Fundamentals of Aero- and Hydromechanics* and *Applied Aero- and Hydromechanics*, by L. Prandtl and O. Tietjens, the second author has now published volume 2 of his new series on fluid mechanics with the subtitle *Motion of Fluids and Gases*. Apart from Tietjens' rather personal approach to viscous fluid flow, one of the pleasures of reading a book of this kind is in seeing a most exciting time in the development of fluid mechanics shine through the printed page, much as it must have been in Göttingen during the first 30 years of this century. It is this influence which could have induced the author to choose the three main topics for his book: the influence of viscosity on the motion of fluids, transition and features of turbulent flow, and the effect of density changes due to high-speed flow (gas dynamics). In each chapter emphasis is put on a rather broad description of the physical background before theory is – each time extensively – dealt with. By this approach Tietjens hopes to provide the student with a firm foundation and the confidence to apply theory and to develop it further. In pursuit of this aim the author confines the description of viscous fluid flows to a few selected topics, all of which, however, are well explained and illustrated by simple applications.

After an introductory chapter about the short-term and the long-term effect of viscosity on the motion of fluids in laminar pipe flow, the Navier–Stokes equations are derived. Two classes of solutions are discussed at length: the flow at very small Reynolds numbers around a sphere, and boundary layers. For the illustration of the first class of solutions many streamline configurations are presented whereas in the second case the author makes use of the well-known flow photographs by Prandtl and himself. The main part of the chapter on wall boundary layers deals with incompressible laminar flow along a flat plate and a circular cylinder including similarity solutions and separation.

The next two chapters are entitled 'Fully developed turbulence' and 'Transition to turbulence', but in fact both of these are concerned with pipe flow and hardly at all with boundary layers or jets. The chapter on the flow in straight pipes gives an extensive introduction into the mechanism of turbulent flow which could have been shortened in favour of treating the flow in boundary layers.

The chapter on transition starts with Reynolds' famous experiments and then deals with transition in the flat plate boundary layer, discussing the method of small oscillations by which it could be proved that transition is a stability problem but which cannot fully explain this difficult phenomenon.

The final chapter gives an introduction to classical gas dynamics and describes the effects of compressibility, due to high speed flow. One- and two-dimensional flows are considered with emphasis on potential flow – a subject which was extensively dealt with earlier in volume 1 on incompressible flow.

Tietjens' book has certainly achieved the goal the author has set, but it must be regarded as only a limited introduction to the motion of fluids and gases because of the small number of topics discussed and because it lacks a survey of references in the international literature during the period after 1950.

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