REVIEWS

Einführung in die theoretische Gasdynamik. (3rd ed.) By R. SAUER. Berlin: Springer Verlag, 1960. 214 pp. DM. 29.70.

To write a concise account of a field of fluid dynamics, which combines both the mathematical and physical aspects of real flows, and which at the same time can be useful in practical problems, seems to be a most difficult task. I believe Prandtl's *Essentials of Fluid Dynamics* to be an account of this kind; the book under review is not and its author does not claim it to be. The bulk of it was written about 20 years ago, at Wieselsberger's request, to present in a unified manner some theoretical knowledge which had been accumulated over a long time to a team of aerodynamicists faced with new aeronautical developments in high-speed flight.

It was hardly known at that time what the practical problems were—most of us are not sure even now—and it was assumed as a matter of course that the shapes with acceptable physical properties and types of flow that had been usable in the engineering practice of the classical low-speed aircraft would remain suitable for high-speed purposes also. Thus this book is predominantly concerned with two-dimensional flows, past aerofoils in particular, and with extensions to flows past wings of finite span and bodies of revolution. We may now, after 20 years of work, say that this is too restrictive a choice. Another, intended, limitation is that to steady inviscid continuum flows; coupled with that, experimental aspects are left out altogether.

We are thus left with an introduction to some of the theoretical aspects of gas dynamics written for research engineers, technical physicists, and students of aerodynamics, by an applied mathematician. The main subdivisions are: fundamental concepts; linearized steady flows past aerofoils and bodies of revolution; non-linear steady flows in two-dimensions and past bodies of revolution without shocks; shock waves in steady supersonic flows, transonic and hypersonic flows, three-dimensional steady flows, including wings of finite span and conical flows. The list of contents is largely the same as that of the first edition, with brief sections added on slender-body theory and transonic and hypersonic flows. The general arrangement has been made more convenient for the user.

The first edition, of which several translations into English seem to exist, met with considerable success; it was almost alone in the field and the presentation, as in this third edition, is a masterpiece of conciseness and elegance. Other books on gas dynamics have appeared in the meantime, some of which come closer to the ideal outlined above, but many readers may still turn to this new edition for the lucidity with which the selected topics are presented. It seems to me, however, that we are introduced only to some of the mathematical tools used in work on theoretical gasdynamics, not to gasdynamics.

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Hydrodynamics: A Study in Logic, Fact, and Similitude. By GARRETT BIRKHOFF. Princeton University Press, 2nd edition, 1960. Pp. 184. 42*s*.

Professor Birkhoff's book is assuredly a success. The first edition was reprinted several times, translated into French and Russian and here is the second, and revised edition in English. But it is certainly not a book on hydrodynamics, nor even on selected topics in hydrodynamics. Rather it is book where hydrodynamical examples are used to illustrate two main themes—the relation between theory and experiment and some aspects of group theory. The first theme is introduced by a series of 'paradoxes', defined carefully as apparent inconsistencies between experimental observations and conclusions based on plausible arguments. It is strange to call these inconsistencies 'paradoxical' since there is no apparent logical violation, but merely an inadequate mathematical or physical model. Yet I could not find the term 'mathematical model' in the first part of the book. But perhaps even to mention the phrase would give the game away; I suspect that Professor Birkhoff intends his reader to work himself into such a passion of frustration that he will be forced to think these matters out for himself. The second part of the book contains an assortment of dimensional analysis and some entertaining applications of certain aspects of group theory. As in the first part, the hydrodynamics is entirely incidental, and any one of several branches of physics would have served equally well to provide the required examples. This may well irritate the seriously minded fluid dynamicist who expects a book called 'Hydrodynamics' to be about hydrodynamics, but if he can overcome this rather reasonable prejudice, he may find the mathematical structure of the book of interest.

A curious book, entertaining and infuriating. Perhaps the ideal place for it is with *The Autocrat of the Breakfast Table* and such works, as incidental reading for your guest room.

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