1. S. L. DIXON, **Fluid Mechanics, Thermodynamics of Turbomachinery**, 2nd edn (1975) Pergamon Press, Oxford. Price $14.00 (£7.00).
2. S. L. DIXON, **Worked Examples in Turbomachinery (Fluid Mechanics and Thermodynamics)** (1975). Pergamon Press, Oxford. Price $10.00 (£5.00).

THE TWO companion books under review form a useful set of intermediate level works on the field of Turbomachinery. The topics covered include: dimensional analysis; basic thermodynamics, fluid mechanics; two-dimensional cascades; axial-flow turbines; axial-flow compressors, pumps and fans; three-dimensional flows in axial turbomachines; centrifugal pumps, fans and compressors; radial flow turbines. The treatment uses SI units throughout and is elementary in the following sense: the demands made of the reader's knowledge of mathematics are quite limited. The governing partial differential equations of the flows treated are nowhere stated in full, nor used. The author manages to extract a remarkable amount of information from integrated forms of these ("overall conservation laws") and from simplified one-dimensional models. The book should therefore be accessible to any student acquainted with thermodynamics and the rudiments of fluid mechanics.

The discussion is supported throughout by appropriate references to experimental work. Within the limits the author has set himself, the qualitative discussions of the various types of flow phenomena encountered in turbomachinery are clearly and effectively presented. The text includes a very useful collection of problems. The latter have been solved in the volume on Worked Examples, available separately. The author and the editor of the series of books to which the present ones belong must be congratulated for their efforts.

Unfortunately, the text is not without its defects. It seems to the present reviewer at any rate that the disinclination of the author to treat at least some of the flows considered in detail has led to a rather superficial work. This is all the more surprising seeing that the present day graduate (and many undergraduates) student in engineering has sufficient knowledge of the necessary mathematics of partial differential equations. It is debatable whether the material provided in the text would help a serious student to understand the various flow situations discussed as opposed to mechanically calculating a bewildering variety of machine efficiencies. It might have helped to cover fewer topics at greater depth.

The process of understanding could have been aided by a Nomenclature List or a review list of important definitions. Tables collecting together important equations used repeatedly in the text would also have been helpful. Although this is a second edition of the text, a number of errors exist. For example, on p. 28, the law of variation of angular momentum is erroneously stated in words [the equation (2.11) immediately following the verbal statement *is* correct]. Again, p. 163 contains a number of misprints likely to cause a good deal of frustration. In some cases (an example being the treatment of constant specific mass flow on p. 165), the discussion is unnecessarily complicated. Must the thorny path to knowledge be made more difficult by nails thrown in by the author?

Nowadays, very effective numerical techniques have been developed for analyzing turbomachinery. At least an introduction to this new and powerful tool of engineering design which utilizes the full potentialities of the modern electronic computer would have provided an effective backdrop to the theoretical discussion and a source of inspiration to the imaginative student. It is essential to introduce the fundamentals of the methods of numerical solution of engineering problems side by side with the development of the basic concepts from first principles. The resulting "arithmetization of fluid dynamics" often provides a remarkable insight into apparently recondite phenomena (for example, "choking" in convergent-divergent nozzles). The author makes only a passing reference to numerical methods and appears not to perceive the enormous pedagogic value of an introduction to such methods in books of this kind in this day and age when most students have access to large computers.

Notwithstanding these blemishes, the works under review are a very useful addition to the growing literature in this field. They give a good qualitative introduction to the many intricacies of turbomachines.

A. THYAGARAJA

Perturbation Methods in Fluid Mechanics. M. VAN DYKE. The Parabolic Press, Stanford, CA (1975). Price $7.00.

THE SECOND, annotated, edition of this book follows a very successful first edition, which has been widely read, quoted and used, and which recently went out of print. Professor Van Dyke is to be congratulated upon producing this updated version of the book, and publishing it himself through his own Press at the same price as the original edition. At 7 dollars there is no doubt that this is tremendous value.

The annotated edition still contains ten chapters. Some minor errors have been corrected. Moreover throughout the text, which is essentially the original text, marginal indications have been given referring the reader to the collection of notes which are appended in 34 extra pages at the end of the book. These notes make comments upon problems which have been the subject of substantial study, with improved understanding, during the last ten years or so. In addition to an extensive coverage of the method of matched asymptotic expansions, some small attention is given to the method of multiple scales and to the analysis and improvement of series, methods which have received extensive study in recent years.

Many more references have been included to work done in the last ten years, including, for example, the substantial literature on the now well-known method of triple-deck theory for treating boundary-layer separations. On the other hand, a topic which interests the reviewer particularly, that of the use of matched asymptotic expansions for flow-instability problems, is not treated. For example, Eagles' paper of 1969 on the use of this method for the Orr–Sommerfeld equation is not mentioned This topic is also the subject of the recent 1975 paper of De Villiers, which appeared too late for consideration for this book, but which gives rigorous justification to Eagles' work.

My view is that the annotated edition of Van Dyke's book will be of immense value to all those concerned with the solution of ordinary and partial differential equations, whether they be engineers, physicists or applied mathematicians. The use of matched asymptotic expansions is often of great help, not least in complementing solutions obtained by digital computation. The book is therefore strongly recommended.

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