prove some vector identities. Thus, he is assumed to be familiar with three-dimensional vectors, and the more general concept of function space is used. The unification of vectors and matrices is typical of the entire text, which emphasizes the underlying relations between superficially different mathematical topics. It is then surprising to find that although the concepts of tensor analysis are closely approached, tensors are not mentioned.

Of course the coverage must be restricted in a book of this size, and most of the material relates to boundary and eigenvalue problems. The principal subjects are calculus of variations, separation of variables, nonhomogeneous boundary-value problems, integral equations, and transform methods. Besides applications to partial differential equations, the chapter on transforms discusses the convolution integral and its essential relation to the transfer function—without ever using the term "transfer function".

Aside from limitations such as those referred to above, this text should interest mature students in physics and engineering, as well as in applied mathematics. Particularly commendable is the way Dr. Dettman has not presented a series of disjointed techniques, but has interwoven the discussions, encouraging one to recognize how knowledge in one area reinforces another.

**The Laminar Boundary Layer Equations.** By N. Curle. 162 pp. Oxford Univ. Press, London, 1962. Paperbound $4.80. *Reviewed by R. E. Street, University of Washington.*

MORE solutions of aerodynamic interest can be obtained from the laminar boundary-layer equations than from the full Navier-Stokes equations or from the turbulent boundary-layer equations. Even then, the mathematics is difficult and complex, so that approximations to these equations are quite often made, and even approximate solutions to the approximate equations are resorted to. The reason lies, of course, in the nonlinear nature of the equations. Special cases based upon simplified properties of the fluid and ingenious transformations of axisymmetric flows to two-dimensional flows or compressible to incompressible flows have been developed. By assumptions regarding the similarity of velocity and temperature profiles, the system of partial differential equations can be reduced to a pair of ordinary differential equations or even to a single nonlinear ordinary equation.

The author of the present monograph has collected almost all of these special solutions of the two-dimensional equations and presented them in a unified, systematic exposition. A considerable amount of the detailed calculation has been left out in most cases, which the reader may or may not want to work out or look up in the references given. It is not necessary to be acquainted with the more exhaustive treatment to be found in the treatises of Goldstein, Howarth, and Schlichting. However, for the derivation of the Navier-Stokes equations, the solution of the three-dimensional

or axisymmetric equations, inclusion of the effects of suction, or the comparison with experiment (which are all left out here), the reader must go to one of these or other texts. On the other hand, if he wants to start with the Navier-Stokes equations and work through the reduction to the boundary-layer equations and the mathematics of the transformations and solutions of the latter, this book is recommended as an introduction to the theory. In addition, solutions which have been published since 1953, when Howarth's two volumes appeared, up to 1961, and associated with the names of Cohen and Reshotko, Curle, Davies and Bourne, Gadd, Görtler, Liepmann, Lighthill, Lilley, Meksyn and Merk, Monaghan, Poots, Spalding, Tani, and others, are summarized.

Some functions are tabulated and a few curves are shown but for most of the results the reader must go to the original papers. Considering the brevity of the book there is a lot of interesting mathematical theory contained within it, but it remains essentially a brief review of part of a much larger field.

**Technical Aspects of Sound.** Vol. 3, Recent Developments in Acoustics. E. G. Richardson and E. Meyer, eds. 346 pp. American Elsevier Publishing Co., Inc., New York, 1962. $14.00. *Reviewed by Walter G. Mayer, Michigan State University.*

AFTER Professor Richardson's untimely death, the publishers of the two previous volumes of *Technical Aspects of Sound* asked Professor Erwin Meyer to take his place as editor and to complete the third volume of this handbook. According to the general plan proposed by Richardson, each chapter of the book was to present a survey of a well-established branch of acoustics. Dr. Meyer followed these original plans very closely.

The first chapter (by D. B. Fry and P. Denes) deals with the role of acoustics in phonetic studies. The principles involved in the generation and analysis of speech are given, forming the basis for descriptions of automatic speech recognizers and vocoders. The second chapter (T. S. Littler) is concerned with the mechanism of hearing, audiometry, hearing loss, and hearing aids. The third section (E. G. Richardson) is entitled Flow Noise. It treats fundamentals and various technical aspects of jet noise, shock waves, and acoustic phenomena related to turbulence, boundary layers, and cavitation. The fourth chapter (B. L. Clarkson) is a study of the effects of noise on structures and people. Special attention is given to the vibration of an aircraft-type structure due to noise. The last chapter (E. Meyer and H. Kuttruff) is devoted to architectural acoustics. A number of old and new measuring techniques are discussed together with electro-acoustic problems. The second half of this chapter considers design problems. The acoustic properties of some recently built concert halls are examined. The chapter also contains discussions of model investigations, anechoic and reverberation chambers.