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REVIEW

Dimensional Analysis for Engineers. By EDWARD S. TAYLOR. Oxford University Press, 1974. 162 pp. £5.75.

The classic presentation of this subject is, I suppose, Bridgman's *Dimensional Analysis* (Yale University Press, 1931/1963). It is directed more to the physicist than to the engineer, but its incisive exposition and graceful style (which I find reminiscent of Eddington) make it the standard against which all subsequent efforts must be compared. Taylor's book "is primarily addressed to teachers, advanced students, and practising engineers". It covers essentially the same basic ground as (and acknowledges its debt to) Bridgman but goes on to consider more complex problems, especially those for which a full mathematical description is either unavailable or intractable. In this respect, it differs significantly from Sedov's *Similarity and Dimensional Methods in Mechanics* (Academic Press, 1959), which gives not only the fundamentals of dimensional analysis and its application to experiment, but also exploits similarity as a powerful tool for obtaining analytical solutions of the equations of fluid mechanics.

Taylor's presentation may be divided into three parts. The first three chapters and most of the fourth, roughly one-third of the book, are devoted to the fundamentals of dimensional analysis. The remainder of chapter 4 and chapter 5 deal with applications to design and experiment and, especially, with geometric similarity in both engineering and nature: "why birds weighing more than 40 lb cannot fly, why whales can be forty times as large as elephants, and why very small creatures must lower their temperatures at night to conserve energy". The last, and longest, chapter deals with "five real problems": an eddy-current brake, the sleeve bearing, geometrically similar piston engines, performance of sailing boats, and aeroplane performance. The exposition is clear, even though it lacks that elegance which makes Bridgman such pleasurable reading. The overall level is about that of a first-year graduate student in engineering, although most of the material could be handled by an engineering student in his final undergraduate year. The mathematical level is about right for the latter student (in contrast to Sedov, which assumes a rather complete mastery of function theory and partial differential equations), but a moderately firm grasp of the fundamentals of thermodynamics, heat transfer, and fluid mechanics also is required. There are no exercises for the student (Bridgman gives thirty-two); however, there are many worked examples in addition to the five design problems mentioned above.

In balance, I believe that Taylor has attained the goals that are explicit in his introduction and implicit in his title, *Dimensional Analysis for Engineers*. Bridgman surely remains the choice for the fundamentals, and Sedov offers a more sophisticated treatment for the specialist in fluid mechanics, but the engineer, be he studying, teaching, or practising, will find Taylor a useful addition to his library.

J. W. MILES