

calorimeter by using benzoic acid. On p. 40 he will find that "If any soot is found outside the crucible, the experiment is rejected. . . . The weight of any soot found in the crucible is determined". However, p. 44 reveals that it is not easy to determine the weight of this soot. On p. 135 he will read, "In the benzoic acid experiments it is found that, with the proper crucible and pelleting, complete combustion occurs in all but a very few experiments". Nevertheless, he may receive some encouragement from the statement (p. 291) that "benzoic acid will burn completely to form carbon dioxide and water under proper conditions but that the investigator must be alert to the possibility of incomplete combustion". He may well conclude that there is much art in this science. One disadvantage of having employed thirteen writers to prepare this book is that certain subjects (for example, the corrections to standard states) have been treated several times. The opportunity should be taken in later editions to unify the text so that the space saved may be devoted to more detailed information on experimental procedures.

E. F. G. HERINGTON

DIFFERENTIAL EQUATIONS

Differential Equations

By S. V. Fagg. (Applied Mathematics Series.) Pp. 128. (London: English Universities Press, Ltd., 1956.) 7s. 6d. net.

Differential Equations

By Prof. Harry W. Reddick and Prof. Donald E. Kibbey. Third edition. Pp. ix+304. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1956.) 36s. net.

Elementary Differential Equations

By William Ted Martin and Eric Reissner. (Addison-Wesley Mathematics Series.) Pp. xi+260. (Cambridge, Mass.: Addison-Wesley Publishing Company, Inc., 1956.) 5.50 dollars.

Ordinary Non-Linear Differential Equations in Engineering and Physical Sciences

By Prof. N. W. McLachlan. Second edition. Pp. x+271. (Oxford: Clarendon Press; London: Oxford University Press, 1956.) 35s. net.

Partial Differential Equations

By Prof. G. F. D. Duff. Pp. x+248. (Toronto: University of Toronto Press; London: Oxford University Press, 1956.) 35s. net.

Transactions of the Symposium on Partial Differential Equations

Held at the University of California, Berkeley, June 20-July 1, 1955. Editorial Committee: N. Aronszajn, A. Douglis and C. B. Morrey, Jr. (Sponsored by Office of Naval Research; University of California, Berkeley, Calif.; University of Kansas, Lawrence, Kan.; and the American Mathematical Society.) (Reprinted from Communications on Pure and Applied Mathematics, Vol. 9, No. 3, issued by the Institute of Mathematical Sciences of New York University.) Pp. vi+334. (New York: Interscience Publishers, Inc.; London: Interscience Publishers, Ltd., 1956.) 6.50 dollars.

THE set of six books under review divides naturally into two parts: three elementary text-books and three advanced expositions, one of which is a collec-

tion of papers delivered at a symposium. The text-books overlap considerably in content with various others on the same subject which are already in print, and it is perhaps unfortunate that so many elementary texts on differential equations are available. The time must surely come when a rationalization of policy with regard to the publication of technical text-books will emerge; but that time is not yet, and meanwhile students and teaching staffs have to face a baffling array of books covering much the same ground in the process of making a choice.

The book by Fagg has the merit of brevity (and hence low price) and it discusses numerous practical examples. Its appeal is at the school level, except for a chapter on the Laplace transform designed to whet the appetite of the more serious reader. Reddick and Kibbey also emphasize practicality, but their book is more extensive (although still elementary) and the third edition contains some new features, such as sections on partial differential equations and the adjoint equation, together with many new exercises. Martin and Reissner have written a book for students of science and engineering who "need to know mathematics rather well". Their text covers more ground than the two previous books and, in addition to a chapter on finite difference equations, describes methods for solving various heat-transfer problems.

The three other books are much more advanced and deal with research topics. McLachlan's book, a revised version of the 1950 edition, is based on lectures given to graduate students at the Universities of Illinois and Washington and at Michigan State University. Its purpose is "to provide engineers and physicists with a practical introduction to . . . non-linear differential equations, and to give representative applications in engineering and physics". This it does exceedingly well. It is not an analytical treatise with technical applications, but rather shows "how certain types of non-linear problems may be solved, and how experimental results may be interpreted by the aid of non-linear analysis". Included are chapters on equations having periodic coefficients or periodic solutions. Graphical and numerical solutions are emphasized, and four theorems are presented for dealing with singular points and stability criteria. The book should be of particular value to engineers concerned with control problems.

The theory of partial differential equations continues to develop; and Duff's book describes particularly advances which have been made over the past twenty years. Equations of the first and second orders are discussed "from the tensor calculus point of view", which is general and penetrating. There is a chapter on linear integral equations and another on the integration of the wave equation. The latter is concerned primarily with the method of Riesz, involving integrals of fractional order. The exposition is concentrated in places and the book is definitely one for the pure mathematician or very theoretical physicist.

The last book records most of the lectures given at a symposium. These lectures, delivered by specialists, cover a wide field. Some deal with local or regularity properties of solutions, others with equations arising in applied mathematics, and still others with numerical solutions and estimates for eigenvalues. A glance at the contents list reveals a very healthy activity in research on differential equations, and the current deep and widespread interest in the subject justifies the appearance of the books under review.

L. S. GODDARD