

- (1) How to integrate the differential equation.
- (2) How to perform the calculations needed to obtain an answer correct within the practical requirements of the problem.

Now this would be excellent were it not for the fact that (2) is (1) in practice; it is the exception to encounter an equation that can be "integrated" in the sense that it belongs to one of the so-called "Standard Forms," and recourse must then generally be had to approximations, *i.e.* to (2). But it is just the processes included in (2) that receive the least attention, and it is exactly a discussion of the "Standard Forms" that usually delimits the scope of the knowledge of differential equations acquired by physical and chemical students. The reason is not far to seek. They owe their pedagogic prominence to the position given to them in the earliest books on "Differential Equations," and retained ever since. For certain branches of "functional" teaching in mathematics little would be lost by "scrapping" the lot.

The present little book is an heroic attempt to make the best of both worlds by restricting attention only to equations that are integrable and useful.

H. LEVY.

*Smithsonian Miscellaneous Collections.* Vol. 74, No. 1: *Smithsonian Mathematical Formulæ and Tables of Elliptic Functions.* Mathematical Formulæ prepared by Prof. Edwin P. Adams; Tables of Elliptic Functions prepared under the Direction of Sir George Greenhill by Col. R. L. Hippisley. (Publication 2672.) Pp. viii + 314. (Washington: Smithsonian Institution.)

THIS volume contains, in addition to the series of formulas of many branches of applied mathematics prepared by Prof. E. P. Adams of Princeton, a table of the elliptic functions, with an illustrated discussion of their chief applications in geometry, dynamics, and electricity.

The table of the elliptic function was prepared and calculated by Col. R. L. Hippisley; it gives, in a form suitable for immediate application, the series of functions  $A(r)$ ,  $B(r)$ ,  $C(r)$ ,  $D(r)$ ,  $E(r)$ ,  $G(r)$ ,  $F\phi$ , for every degree  $r$  of the quadrant, and every degree  $\theta$  of the modular angle, where  $\sin \theta = \kappa$  the modulus. These had been calculated already for the British Association, and printed, but held up for want of money.

Here  $A, B, C, D$  are the theta functions of Jacobi, but normalised to zero degree, so that with  $\frac{r}{90} = \frac{u}{K}$ ,

$$D(r) = \frac{\Theta u}{\Theta_0}, \quad A(r) = \frac{Hu}{HK}, \quad B(r) = A(90 - r), \quad C(r) = D(90 - r),$$

giving

$$\sqrt{\kappa'} \operatorname{sn} u = \frac{A(r)}{D(r)}, \quad \operatorname{cn} u = \frac{B(r)}{D(r)}, \quad \frac{dnu}{\sqrt{\kappa'}} = \frac{C(r)}{D(r)}.$$

Also  $\phi = \operatorname{am} u$  is the inverse function of  $u = F\phi$  of Legendre; and his elliptic integral of the second kind  $E\phi = \frac{rE}{90} + E(r)$ , so that  $E(r) = Zu$ , or  $znu$  of Jacobi.

Provided with these functions, the third elliptic integral II can be expressed in a form that can be calculated numerically from the table, where the results are given to ten decimals.

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*Acoustics of Buildings: including Acoustics of Auditoriums and Sound-proofing of Rooms.* By Prof. F. R. Watson. Pp. viii + 155. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1923.) 15s. net.

THE acoustics of buildings is a subject which has always possessed importance, but with the increasing size of public buildings and the congestion of our urban populations, it has assumed much greater importance in recent decades. Though a good deal has been written on this subject, there are few books which present the problems to be solved in a lay form suitable for those not possessed of scientific attainments. Prof. Watson has succeeded in producing a volume which should prove of great value to architects concerned with the design or acoustic improvement of auditoriums, and has incorporated a number of his own researches. The volume is divided into three parts, a short introductory chapter on the principles of sound transmission scarcely deserving of a main separation, the acoustics of auditoriums, and the sound-proofing of buildings. In part 2, after explaining the behaviour of sound in a room, the nature and control of reverberation, the successful design of an auditorium and sound absorption are discussed, followed by a very interesting chapter on practical examples from existing buildings. Part 3 gives a number of experimental tests on materials by the author and others, followed by examples of sound-proofing rooms and buildings, and a special chapter on ventilation in reference to sound, while vibrations in buildings are shortly dealt with. The work is a successful attempt to bring the investigations of science to the aid of the artist and technician.

*Practical Chemical Analysis of Blood: a Book designed as a Brief Survey of this Subject for Physicians and Laboratory Workers.* By Prof. V. C. Myers. Second revised edition. Pp. 232. (London: Henry Kimpton, 1924.) 25s. net.

THE second edition of this book contains alterations and additions necessary to consider advances made in the subject during the last two years. An additional separate chapter gives the methods of blood analysis followed by Folin and Wu, and Benedict's new method of uric acid estimation is described. This edition also contains descriptions of the estimations of hæmoglobin, oxygen, calcium, inorganic phosphates, and acetone bodies, and a chapter on quantitative micro-methods of urine analysis. Numerous references to original articles, and appendices on colorimeters and standard solutions, perfect a valuable book on a subject of rapidly growing importance.

*Nouvelles Vues Faraday-Maxwelliennes.* Par Charles L.-R.-E. Mengès. Pp. v + 94. (Paris: Gauthier-Villars et Cie., 1924.) 10 francs.

M. MENGÈS reprints and expands some papers which have appeared in the *Comptes rendus* of the Paris Academy of Sciences, chiefly on the electro-optics of moving systems. He finds the special theory of relativity self-inconsistent and proposes in some measure to revert to the older "classical" conceptions. Nothing but a detailed and complete discussion of his views would be worth undertaking; and since it is impossible to find space for this here, we offer no opinion concerning them.