

by series to the Legendre, Bessel, and hypergeometric equations will be useful to the student.

The last of the important *Zusätze* (see pages 637–663) is devoted to an exposition of the theory of systems of simultaneous differential equations of the first order.

Having thus passed in quick review the contents of the book, it is now apparent that the translator has certainly accomplished his purpose of making it more useful to the student of pure mathematics. There remains the question whether there are not other additions which would have been desirable in accomplishing this purpose. There is at least one which, in the reviewer's opinion, should have been inserted.

In connection with the theory of formal integration by series it would have been easy to insert a proof of the convergence in general of the series for the case of second order equations; and one can but regret that this was not done. Such a treatment would have required only a half-dozen pages; and it would have added greatly to the value of this already valuable section. The translator's reason for omitting it is obvious; he was making no use of function-theoretic considerations, and such a proof would have required the introduction of these notions. But the great value to the student of having at hand this proof, for the relatively simple case of second order equations, seems to be more than a justification for departing in this case from the general plan of the book; it seems indeed to be a demand for it.

On the whole the translator has rendered a distinct service to beginners in the modern theory of differential equations. The *Zusätze* which he has inserted in this volume have to do with well-selected topics and the treatment is for the most part very satisfactory. The careful arrangement of material and the numerous and convenient cross-references given throughout the *Zusätze* and the *Auflösungen* are especially to be commended as contributing to the reader's comfort. The usefulness of such mechanical conveniences is often overlooked by authors.

R. D. CARMICHAEL.

*Calcul des Probabilités.* Par H. POINCARÉ. Rédaction de A. QUIQUET. Deuxième édition, revue et augmentée. Paris, Gauthier-Villars, 1912. 335 pp.

THE first edition of Poincaré's *Calcul des Probabilités* was published in 1896; thus it has been before the public for sixteen

years. Therefore in this notice it will be necessary to indicate only the changes (not many in number) which have been made in the second edition. These are of two kinds: changes in content, and changes in arrangement and printing.

The principal changes in content consist of two additions. There is an introduction taken from the chapter entitled *Le hasard* in Poincaré's *Science et Méthode*. It has to do with the philosophical considerations connected with the possibility of a mathematical theory of probability. There is a fresh chapter at the close of the book dealing with a number of miscellaneous questions. Besides this there are some rearrangements of old matter and additions of new matter throughout the book; but in no cases do these changes seem to be of sufficient importance to require separate consideration.

In the first edition the material was grouped by lectures and not by topics, and no page headings were given to indicate the nature of the contents at any place. On this account the book was inconvenient for purposes of reference. In the second edition there is an arrangement of the matter by topics into chapters and page headings are given to indicate the chapter to which any page belongs. This adds greatly to the reader's comfort and will increase the usefulness of the book.

Concerning a work of Poincaré's, one scarcely needs to add that it is interesting and valuable to the student of the subject with which it deals.

R. D. CARMICHAEL.

*The Dynamical Theory of Sound.* By HORACE LAMB. New York, Longmans, Green and Co. (London, Edward Arnold), 1910. viii + 303 pp.

To the two hundred or more foreign mathematicians gathered at Cambridge last summer the atmosphere of the Congress may well have appeared somewhat foreign; for prominent among the "home talent" were Sir George Darwin, the president, Lord Rayleigh, the honorary president, Sir J. J. Thomson, Sir Joseph Larmor, M.P., and Professor E. W. Brown, three of the lecturers, all in the front rank of mathematicians in the Cambridge sense, but elsewhere ranked rather as physicists or astronomers. Indeed, although Cambridge has been and still is graced by the presence of eminent pure mathematicians, there is no more striking phenomenon in university history, no more persistent and justified tradition,