Fonctions Entières et Fonctions Méromorphes d'une Variable. By G. Valiron. Mémorial des Sciences Mathématiques, Fascicule II. Paris, Gauthier-Villars, 1925. 56 pp.

Sur les Fonctions Hypergéométriques de Plusieurs Variables. Les Polynomes d'Hermite et autres Fonctions Sphériques dans l'Hyperspace. By Paul Appell. Mémorial des Sciences Mathématiques, Fascicule III. Paris, Gauthier-Villars, 1925. 75 pp.

So brief a time has elapsed since the appearance of Valiron's former work, *Lectures on the General Theory of Integral Functions,* that one naturally expects the present small volume to follow essentially the development given in the former book. The condensation of material in order to confine the subject to fifty pages is most noticeable. On this account the beginner in this field will probably prefer the older book, where the pace is more leisurely and the exposition more detailed. The bibliography is more complete in the later treatment. The author's own fertility almost caused him embarrassment, since he just exhausted the alphabet in listing his own titles.

In the work on the hypergeometric functions of several variables Appell has brought together a brief account of the work, extending over a number of years, of a number of mathematicians, of whom he himself is very conspicuous. The work consists of generalizations in rather natural directions. Guided by the celebrated series of Gauss, four different series in two variables and four to five parameters are constructed. For the functions so defined properties analogous to those of the hypergeometric function are developed. One expects to find nothing especially novel or interesting, and his expectations are confirmed. It seems to the reviewer that a number of celebrated mathematicians have deprived lesser ones of much fine material for theses. It is, of course, useful to have an account of what has been done in the field, even though it has limited significance, and it gives gratification to have it done so ably.

K. P. WILLIAMS

Exercices de Calcul Différentiel et Intégral. By Abbé Potron. Volume I. Paris, Hermann, 1926. xviii + 332 pp.

This book is a typical representative of the set of French "Exercises" or "Collections of problems." The final goal here is to train the students for the technically difficult examination for the "Certificate in Differential and Integral Calculus."

Accordingly, the problems which have been given at such examinations for a number of years in Paris and in other cities, are "analysed" here, or decomposed into their simplest elements, where the solution is reduced to a mere question of routine computation. The "synthesis," namely the problems as they have been actually given and their solutions, are promised in the second volume.

This method perhaps is well fitted for the particular purpose as mentioned above, but it is at least questionable as to its general educational value. However, American teachers will find many a good example to be

assigned to students for their home-work, among the total of 1080 problems gathered in this book.

The problems are classified into six parts: I. Derivatives, differentials, geometric applications. II. Integral calculus. III. Differential equations (ordinary). IV. Partial differential equations. V. Functions of a complex variable. VI. Supplements. Each part is subdivided into smaller chapters, and the latter in turn into paragraphs. Each paragraph is supplied with short outlines of the corresponding parts of the theory, which not always are above reproach, particularly when the attempt is made to be rigorous.

Most completely treated are the applications of calculus to geometry, especially those which require formal computations. Some other topics, however, are treated quite inadequately: they might have been omitted altogether without any loss; as for instance, ruled surfaces (2 problems), contact of plane curves (1), improper integrals (3), elliptic and hyper-elliptic integrals (6), transformations of surfaces (3), trigonometric series (4), calculus of variations (6) and so on.

The order of the problems is not always the best possible; some problems are repeated at different places. Some problems are not very clearly or carefully stated; see for instance, p. 8 (20, 21), p. 124 (43).

The book is very neatly printed, although misprints are not infrequent.

J. D. TAMARKIN

A Treatise on the Analytical Dynamics of Particles and Rigid Bodies; with an Introduction to the Problem of Three Bodies. By E. T. Whittaker. Third Edition. Cambridge, University Press, 1927. xiv+456 pp.

The first edition of this book, which was published in 1904, received an extensive review by E. B. Wilson in this Bulletin (vol. 12 (1906), pp. 451–458). The second edition, which appeared in 1917, (see this Bulletin, vol. 26 (1920), p. 183) differed from the first mainly in the matter of references to or brief outlines of more recent researches.

In the third edition the first fourteen chapters, with some corrections and additional references, have been reproduced photographically from the second edition. Chapter XV on the general theory of orbits and Chapter XVI on integration by series have been completely rewritten in order to present the subject as it has been developed by the researches of the last eleven years. As illustrations of periodic and asymptotic orbits the author has treated the paths which small particles describe in the gravitational field due to a single attracting mass when the newtonian law of gravitation is replaced by the laws belonging to the general relativity theory. There is also a brief account of Synge's geometry of dynamics, in which dynamical problems are treated by aid of the tensor analysis. References only are given to the work of Birkhoff on the classification of the various types of motion of a dynamical system with two degrees of freedom.

Wilson's excellent account of the characteristics of the first edition makes it unnecessary to comment in more detail upon the present edition.

W. R. LONGLEY