

*Traité de Balistique Extérieure.* By P. Charbonnier. Vol. I. Paris, Gauthier-Villars, 1921. ix+637 pp.

For a number of years, General Charbonnier has been preparing an encyclopedic treatise on exterior ballistics in six volumes, of which this is the first.

The first part of this volume contains the most exhaustive treatment of the trajectory in vacuum which has yet been written.

The second part deals with the rectilinear motion of a particle in a medium where the resistance depends on the velocity alone; the Siacci ballistic functions are introduced and their simplest properties derived.

The third part is concerned with the general case of the trajectory of a heavy particle, the resistance being a function of the velocity. Here, as in the second part, the change in resistance due to the altitude variation in the density of the atmosphere, is neglected. This part begins with a very detailed study of the qualitative properties of the trajectory profusely illustrated by well-drawn diagrams. This investigation is of particular interest to the mathematician, and might be used as a source of examples of the behavior of the integral curves in an advanced course in differential equations. As far as the reviewer has examined the theorems in this section, they are correct, but the proofs are frequently lacking in rigor and occasionally contain actual errors, which are, however, not very difficult to detect and remedy.

This section also contains a brief and very readable exposition by A. Denjoy of Drach's recent determination of all the forms of the resistance function for which the equations of the trajectory are integrable by quadratures.

The further treatment of the trajectory follows the customary lines of the Siacci and similar theories, and the volume ends with a chapter on the use of power series expansions for computing a small arc of the trajectory.

The modern methods in ballistics are not dealt with here, but are reserved for the later volumes, none of which has yet appeared.

T. H. GRONWALL

*Séries Analytiques. Sommabilité.* (Mémoires des Sciences Mathématiques, No. 7.) By A. Buhl. Paris, Gauthier-Villars, 1925. 55 pp.

This monograph deals with analytic extension by means of various methods of summation applied to the Taylor's series of a function in regions where this series is divergent. The results obtained are those due to Borel and Mittag-Leffler and certain other investigators who have taken their methods as a point of departure. The various theories are unified by basing the whole discussion on a double integral formula which is one of the important generalizations of the well known integral formula of Cauchy. By this synthetic form of treatment Professor Buhl has found it possible to include an unusually large number of interesting results in the fifty odd pages of the monograph.

C. N. MOORE