

Oeuvres de G. H. Halphen. Publiées par les soins de C. Jordan, H. Poincaré, É. Picard, avec la collaboration de E. Vessiot. Tome IV.* Paris, Gauthier-Villars, 1924. xv + 657 pp.

The works of G. H. Halphen with the exception of the three-volume *Traité des Fonctions Elliptiques*, are contained in four volumes the last of which is now before us. Each volume opens with a "notice" concerning Halphen and his works written either on the occasion of his death or not long afterwards; in fact, the first volume contains two such notices. It has also Halphen's own account (pages 1-47) of his mathematical works written on the occasion of his candidature for membership in the Academy of Sciences. It is natural to find at the beginning of his *Oeuvres* this summary of his own works up to 1885. Except for this paper his memoirs are arranged in the *Oeuvres* in almost chronological order, the deviations from this order being unimportant and not many in number. Owing to Halphen's custom of carrying one investigation to a complete achievement before taking up another and owing to the fact that the order of completion of memoirs is also very nearly their order of publication, the chronological arrangement of Halphen's work is also to a considerable extent a logical arrangement. But the former in some respects departs considerably from the latter so that it is desirable to have added (as on pages 645-653) the "Table Méthodique Générale."

Among the memoirs contained in the first volume are those on the characteristics in the theory of conics, on singular points of plane curves, and on the points where an algebraic curve satisfies a condition expressed by means of a given differential equation. For the second volume we may mention those on the singularities of twisted curves and of algebraic surfaces, on the differential invariants of plane and twisted curves, and on the representation of functions in various types of series. Two of the four memoirs in volume III contain the best work of Halphen. These are the memoir on the reduction of linear differential equations to integrable forms and that on the classification of twisted algebraic curves.

This leaves to the fourth volume the last works of Halphen other than his treatise on elliptic functions, the memoirs and papers appearing in 1883 to 1890, together with such unpublished material as his editors have seen fit to preserve with his collected works. The papers for the most part deal with differential equations, the theory of numbers, and elliptic functions and their applications; they are more fragmentary in character than the comprehensive memoirs in the earlier volumes, doubtless owing to the fact that Halphen's consecutive

* The previous volumes have been reviewed in this BULLETIN, vol. 27 (1920-21), pp. 466-468 and vol. 28 (1921-1922), pp. 271-272.