activities were all in the interests of applied mathematics, yet Klein has continued the directorship and editorship of the MATHEMATISCHE ANNALEN since the death of Clebsch; he completed fifty years in this office last November.

The memoirs on Lamé functions are followed by those on the zeros of the hypergeometric series, the representation of the hypergeometric function by means of definite integrals, and the auto-reviews of the autographed lectures on the hypergeometric function and the linear differential equation of the second order, given in 1893–4. These were all published in the MATHEMATISCHE ANNALEN. The remaining essays were all published elsewhere. They include: a short report on recent English investigations on mechanics, a discussion of space collineations which occur in optical instruments, the greeting given at the opening of the mathematical congress at Chicago, the Princeton sesquicentennial lectures, two papers on graphical statics, one on Painlevé's criticism of Coulomb's law of friction, and finally one on the formation of vortices in frictionless liquids. The list is followed by a detailed explanation of the causes which led to the respective studies. The third and final volume is now in press. It contains the memoirs in the theory of functions.

VIRGIL SNYDER

LÉVY ON FUNCTIONALS

Leçons d'Analyse Fonctionnelle. By Paul Lévy, avec une préface de J. Hadamard. Paris, Gauthier-Villars, 1922. vi + 442 pp.

The increasing importance which is being given to the theory of functionals, or functions of lines, is illustrated by the fact that three of the Borel monographs in the last ten years have been concerned with this branch of mathematics, and the great breadth of the subject is illustrated by the fact that there is so little overlapping between the most recent of these, which is the subject of this review, and the earlier ones by Volterra,* and the more recent Cambridge Colloquium Lectures by Evans. In his introductory chapter, Lévy makes an interesting distinction between "algèbre fonctionnelle" and "analyse fonctionnelle." The first includes problems in which the unknowns are ordinary functions, but where the methods of the theory of functionals are used in determining them. The second includes problems where the unknowns themselves are functions of lines, or where the problems themselves could not be considered independently of the notion of a functional. Most of the work of Volterra and Evans mentioned above would belong to the "algèbre." The present monograph is primarily concerned with the "analyse."

The idea of a continuous functional is of fundamental importance. A functional $U(x(t))$ is said to be continuous if $U(y_n(t))$ approaches $U(x(t))$

* *Leçons sur les Equations Intégrales et les Équations Intégro-differentielles,* reviewed by Westlund in this BULLETIN, vol. 20 (1914), pp. 259–62, and *Leçons sur les Fonctions des Lignes,* reviewed by Bliss, ibid., vol. 21 (1915), pp. 345–55.