

the minute finish and careful proportion of parts that we feel justified in expecting from him. And yet revision and consolidation might have seriously interfered with the graphic simplicity of these chapters, and left them less adapted to their special purpose. Any English-speaking association with aims similar to those of the German association for which the pamphlet was prepared would do a service in publishing a thoroughly good translation of this inspiring work and circulating it as widely as possible.

CHARLOTTE ANGAS SCOTT.

BRYN MAWR COLLEGE,
January 15, 1896.

PAINLEVÉ'S LECTURES ON DYNAMICS.

- I. *Leçons sur l'intégration des équations différentielles de la Mécanique et Applications.* Par P. PAINLEVÉ. pp. 291; 4to (lithographed).
 II. *Leçons sur le Frottement.* Par P. PAINLEVÉ. pp. VIII. + 111; 4to (lithographed). Paris, A. Hermann, 1895.

The publication of Mr. Painlevé's lectures on the integration of the differential equations of dynamics will be welcomed by everyone interested in the progress of theoretical mechanics. It is a long time since Jacobi's *Vorlesungen über Dynamik* appeared, and a strong need was felt of a systematic work which would contain the more recent researches in this important branch of mathematical science. Mr. Painlevé has admirably supplied this need. The lectures are not intended for beginners in theoretical mechanics, but rather as a supplementary course for those already familiar with its elements.

The first three lectures contain the fundamental definitions and principles of dynamics, the propositions relating to the first integrals of the motion of rigid systems and the theory of the motion of a solid body, the whole followed by a number of examples. Despite the brevity of this exposition it is clear and instructive, owing to several interesting remarks.

The fourth lecture deals with the general equations of the motion of systems. Lagrange's equations with the multipliers λ (also called Lagrange's equations of the first form) are derived from the consideration of the virtual work, which leads the author to a classification of sys-