

POINCARÉ'S GÖTTINGEN LECTURES.

Sechs Vorträge über ausgewählte Gegenstände aus der reinen Mathematik und mathematischen Physik. Von HENRI POINCARÉ. Leipzig and Berlin, Teubner, 1910. 8vo. 60 pp.

IN these six Göttingen lectures, delivered April 22–28, 1909, at the invitation of the Wolfskehl commission, Poincaré has treated a wide range of interesting subjects in a masterly and illuminating way. It is in the nature of the case that the methods and results should be outlined with exceeding brevity, and this makes the little book hard reading. Fortunately, the reader who is not content with the summary discussions given in it can supplement them for the most part by the use of recent articles by Poincaré.* The topics in their order are (1) the Fredholm equations, (2) the application of the theory of integral equations to fluid motion, (3) the application of the theory of integral equations to Hertzian waves, (4) the reduction of Abelian integrals and the theory of Fuchsian functions, (5) transfinite numbers, (6) the new mechanics. The sixth lecture was popular in its nature and was delivered in the French language.

1. The Fredholm equations. The integral equation of the second kind

$$\phi(x) = \lambda \int_a^b f(x, y)\phi(y)dy + \psi(x)$$

is known to admit two formal solutions, namely the Neumann solution as a power series in positive integral powers of the parameter λ , which converges for small values of λ , and the Fredholm solution as the quotient of two entire functions of λ . Poincaré first derives the fundamental formula for $\log D(\lambda)$, where $D(\lambda)$ is the denominator of the Fredholm resolvent, by a count of combinations, and then defines the numerator at once by a use of the Neumann formula for the resolvent. By this method of comparison a clear analysis of the solution of the integral equation is obtainable. A natural extension of the method enables Poincaré to treat the important case where the

* First lecture: *Acta Mathematica*, vol. 33 (1909), pp. 57–86. Third lecture: *Palermo Rendiconti*, vol. 30 (1910), pp. 169–259. Fourth lecture: *Palermo Rendiconti*, vol. 29 (1909), pp. 281–336. Fifth lecture: *Acta Mathematica*, vol. 32 (1908), pp. 195–200, and *Revue de Metaphysique et de Morale*, 1909, pp. 461–482.