Integralgleichungen. By G. Kowalewski. Berlin and Leipzig, de Gruyter, 1930. 11 figures. 302 pp.

To those who have derived inspiration and guidance from the lucid account given in Kowalewski's *Einführung in die Determinantentheorie* (1909) of the theory of infinite determinants and its application to integral equations, the present volume comes as a welcome addition to the literature of this subject. The book was obviously written as a text and not as a treatise, the author defining his purpose in the preface as follows: "Several chapters in my book on determinants appearing in 1909 were the first textbook presentation of the theory of integral equations in Germany. In the second edition, since sharp abbreviation was necessary, a considerable part of these chapters was omitted. I was again invited to write a special book on integral equations. Thus the present work was commenced. It is to be regarded as a book for our students."

The book consists of an extensive introduction and four chapters headed as follows: Integral Equations of Volterra Type; Integral Equations of Fredholm Type; Fredholm Equations with Symmetric Kernel; Several Applications of Integral Equations.

The book is noteworthy for its clear exposition of the subject. It does not make extensive excursions into recent developments, the discussion of singular equations, etc., but adheres closely to what might be called the classical theory. The book opens with adequate discussions of the Abel equation and the Fourier transform in its integral equation form. The connection between differential and integral equations is discussed more thoroughly than in most texts. The Cauchy problem, in which conditions are imposed at one point only, is reduced to the solution of a Volterra integral equation; the Lagrange problem, where conditions are imposed at more than one point, is shown to lead through Green's functions to Fredholm integral equations.

The Volterra integral equation is treated by standard methods and no attempt is made to go into the case of singular kernels except for the elementary case $k(x, y)/(x-y)^m$, $(0 \leqq m < 1)$.

Most of the book is devoted to the Fredholm equation. The author has done an excellent thing from the standpoint of exposition by basing much of his argument and discussion on the bilinear kernel, $K(x, y) = \sum_{i=1}^{n} A_i(x)B_i(y)$. It will be recalled that the original derivation of the Fredholm theory from this point of view was made by E. Goursat (Bulletin de la Société Mathématique de France, vol. 35 (1907), pp. 163–173) and H. Lebesgue (ibid., vol. 36 (1908), pp. 3–19), the former developing the formal theory and the latter extending Goursat's results to the infinite case. This approach, rather than the one through the limiting form of a set of algebraic equations, has much to recommend it as an introduction to the theory of the Fredholm equation. Actual solutions can be attained for special cases and properties of the Fredholm determinant can be developed as properties of polynomials. The author makes admirable use of the Goursat-Lebesgue kernel to display many of the attractive theorems associated with the theory of elementary divisors without complicating the picture by means of infinite determinants and matrices. It must be added, however, that these modern tools are used freely throughout the book.

The book concludes with a very brief chapter on applications. Only the