

higher complex quantities of quaternion type. It possesses another real form which is like the system of ordinary quaternions and these two real forms are the only ones in which systems of higher complex quantities of quaternion type can appear.

The work is manifestly a labor of love. An interesting circumstance in connection is the fact that this first volume was brought out on the hundredth anniversary of the birthday of the author's father.

L. WAYLAND DOWLING.

LINEAR DIFFERENTIAL EQUATIONS.

Vorlesungen über lineare Differentialgleichungen. Von LUDWIG SCHLESINGER. Leipzig and Berlin, Teubner, 1908.

It is over ten years ago that the author of the present "Vorlesungen" completed the publication of his well-known *Handbuch der Theorie der linearen Differentialgleichungen*. As every one familiar with the older book well knows, it was intended to be, as its name implied, a handbook containing a complete treatment of all that was at that time known about the subject. It seemed natural therefore, to expect under the title of "Vorlesungen" a briefer version of the same subject, adapted to the needs of the younger student and rendered more palatable for him by a proper selection of topics and by a more elementary treatment. And in a certain sense the "Vorlesungen" may indeed be considered as an introduction into the theory of linear differential equations, in so far at least as all of the most important results of the theory built up by Fuchs and his successors are discussed. But the method of treatment is so novel and the artistic unity of the book is preserved to such an extraordinary extent that we must look upon it as an important addition to analysis rather than as a treatise of more or less pedagogical merit.

It is well known that Riemann's discussion of the hypergeometric function furnished Fuchs with the fundamental ideas which led to the modern theory of linear differential equations, which theory may be said to date from Fuchs's paper of 1865. But we now know that Riemann himself had intended to construct a general theory of linear differential equations upon the same general principles which had led to such brilliant results in