

an error, but that he then regained his composure and said " 'Null = Null' ist ja ein sehr schönes und richtiges Resultat." But the story of the youth of Gauss will please every one who enjoys the activity of genius. An effective impression of the progress of mathematical instruction is made by a brief account of mathematical instruction in the "good old times." The account of the self-taught Arago's successes when examined on one occasion by Louis Monge and on another by Legendre is inspiring; any one who does not know these stories will be repaid if he looks up the booklet for them alone.

R. D. CARMICHAEL.

Leçons sur les Fonctions automorphes. Par GEORGES GIRAUD. Gauthier-Villars, Paris, 1920. 126 pp. [Collection de Monographies de Emile Borel.]

IN a course of lectures at the College of France the author of this monograph has treated several aspects of the theory of automorphic functions. His central object was to present from a single point of view properties of several sorts of automorphic functions as investigated by many authors following the lead of Poincaré and Picard. The present volume contains an exposition of a part of these lectures.

The plan of treatment proposed places certain limitations upon the choice of material and its method of organization. No attempt is made to give a complete exposition of the theory of the fuchsian functions of Poincaré. Of the topics not treated the following may be mentioned: the theorems on the representation of the coordinates of algebraic curves; those on the integration of linear differential equations with algebraic coefficients and regular singular points; generalizations of these for functions of more than one variable; the theory of the so-called Kleinian functions of Poincaré. A treatment of certain of the omitted topics, it is said (page 4), will be given later in the form of a memoir or perhaps in the form of another volume similar to the present one.

The author's principal purpose of unification is realized through the use of a certain general class of groups (Γ) satisfying certain hypotheses (H) of a rather general character. In the first instance the groups are given, not explicitly but only implicitly through their possession of certain properties. The postulational basis of this treatment is laid at the beginning

of the first chapter (pages 8-11); it is too long for reproduction in the review. The whole treatment proceeds in intimate dependence upon this logical basis. Certain central results are first obtained in association with any group for which hypotheses H are satisfied.

Chapter II is devoted to a class of linear groups: for the case of one variable these became the fuchsian groups whose properties have been treated by Poincaré; for the case of two variables they become the hyperfuchsian groups of Picard; for the case of more than two variables they are groups which have been studied by Fubini. All the groups of the class are shown to satisfy hypotheses H of the first chapter. Further properties of this special class are developed. In Chapters III and IV there is a similar treatment of certain quadratic groups, and of certain groups formed from a set of several given groups. The treatment in these four chapters (pages 8-90) is general and abstract in character and is intimately dependent upon the basic postulates H . The final Chapter V (pages 91-123) is devoted primarily to the functions of Poincaré. On account of the special features of the more restricted theory, certain results become more precise than in the more general theory; and this fact is brought out by a derivation of the detailed results.

R. D. CARMICHAEL.

Archimedes. By SIR THOMAS LITTLE HEATH. Society for the Promotion of Christian Knowledge, London, 1920. vi + 60 pp.

AFTER becoming familiar with the larger works which have made Sir Thomas Heath so widely known, the reader who takes up the little work under review will do so with a feeling of surprise. The academic world has come to expect from his pen only such extended treatises as he has written upon Apollonius of Perga, Diophantus, Aristarchus, Euclid, and Archimedes,—treatises filled with erudition and written in that classical style of which he is a master. If the reader is a man of the cloister, the surprise will be unpleasant; if he is a man among men, it will be the opposite. Since the spirit of the time makes scholars more and more men of the world, the balance of judgment is certain to be in favor—shall we say of the appelland or the defendant?

What Sir Thomas Heath has done is to give a brief and