

An Introduction to the Lie Theory of One-Parameter Groups with Applications to the Solution of Differential Equations. By Dr. ABRAHAM COHEN. D. C. Heath and Company, 1911. vii + 248 pp.

THE theory of continuous groups has become a subject of such general importance, and constitutes a method of such great power, that every attempt to render it more easily accessible should be received gratefully. One of the advantages of the Lie theory is its elementary character, in so far as a large portion of it may be developed with very modest prerequisites. So much the more must we welcome a book which enables us to present this subject to undergraduate classes in our own language. It is always a serious thing to complicate matters for the younger students by adding linguistic to their inevitable mathematical difficulties. The large works of Engel and Scheffers on Lie's theory are written with admirable pedagogic insight, so that there would be little need of such a book as this in German. But the only larger English book on the subject, that by Campbell, is far from being a paragon of lucid exposition. The little book by Page is hardly extensive enough to serve the purpose of more than a mere introduction.

There is then a real field for such a book as Dr. Cohen's. We feel, however, as though the author had overemphasized the differential equation part of the theory. Still, that is a matter of taste.

The book is divided into seven chapters and an appendix. The first chapter naturally begins with the definition of a group of transformations, infinitesimal transformations, invariants, path curves, canonical variables, etc. In Chapter II these notions are applied to differential equations of the first order in connection with the theory of the integrating factor. The third chapter has the heading Miscellaneous theorems and geometrical applications, and deals among other things with isothermal curves. Chapter IV is on differential equations of the second and higher orders, and introduces the notion of n -times extended group. Chapter V is devoted to linear partial differential equations of the first order, while Chapter VI returns to ordinary differential equations of the second order. Chapter VII finally is on contact transformations. In the appendix are developed a number of the more difficult parts of the general theory, these matters being referred to in the