the principle of the slide rule, change of variables, the calculation of $z = f(x, y)$ by contour lines of the corresponding surface, and its dual method in line coordinates, the nomography of d'Ocagne. The extension of the latter to more than three variables is briefly indicated. Chapter III contains various methods of graphical integration and differentiation, including the determination of the integral curves ot differential equations of the first and second order.

The presentation is concise and very clear, and supported by well chosen illustrative examples and 94 figures, the neatness of which forms a much-needed object lesson to many writers of texts on geometry and graphics.

Regarding literature, there is only a general reference to the corresponding articles in the Encyklopädie; it would have been appropriate to give at least some references for further study, as for instance to d'Ocagne's Calcul graphique et Nomographie, and various papers by Runge, Kutta and others on the graphical integration of differential equations. The book under review brings forth one sad reflection: when will our writers of calculus texts for engineering students see fit to give something really modern and practical on graphical integration and solution of differential equations?

T. H. GRONWALL.

Über die Theorie des Kreisels. Von F. KLEIN und A. SOMMERFELD. Heft I: *Die kinematischen und kinetischen Grundlagen der Theorie.* Zweiter durchgesehener Abdruck. Leipzig, Teubner, 1914. viii+196 pp.

THE second edition of the first part of this standard work differs but slightly from the first one. Literature references have been brought up to date, and occasionally the wording of a theorem is changed.

T. H. GRONWALL.

Konstruktionen in Begrenzter Ebene. Mathematische Bibliothek, herausgegeben von W. LIETZMANN und A. WITTING, XI. Von P. ZÜHLKE. Leipzig und Berlin, B. G. Teubner, 1913. 39 pp. 65 fig.

THIS book treats the subject of constructions in a limited plane primarily from the standpoint of drawing. No restriction is made to a particular set of axioms for proofs, or to any particular set of instruments for constructions. Both metric and non-metric methods are used, the theorems of Desargues and of Pascal (Pappus) being used for a basis for many of the constructions. Cases in which lines are parallel are considered as distinct from cases in which the lines merely fail to meet on the paper, a distinction which is of special importance in case an instrument for drawing parallels is available.

After a brief historical introduction, the book consists of five subdivisions. I. Unreachable points of intersection of two or more lines. II. Bisection of an angle with non-intersecting sides. III. Construction of triangles and polygons with unreachable vertices. IV. Problems in the theory of circles. V. Bibliography.

A large variety of methods is given, although some of those given as distinct differ in only slight particulars. The chapter on circles, in which points are given by means of non-intersecting circles, i. e., by circles of which parts lie on the paper, but whose points of intersection do not, is especially interesting.

It is much to be regretted that material on such subjects as this is not more readily available in the English language. Perhaps our poverty in well-written elementary books of such a character as to supplement our preparatory-school work is responsible for part of the difficulty in stimulating bright pupils to do work outside of the daily minimum requirement of the textbook. Much of the matter in this little book might well be used for this purpose.

F. W. OWENS.

Introduction géométrique à quelques Théories physiques. Par ÉMILE BOREL. Paris, Gauthier-Villars, 1914. viii+139 pp.

THIS book is centered about the theories of relativity and statistical mechanics, and is divided into two distinct parts, of which the first deals in textbook fashion with certain kinematical questions from a purely mathematical point of view, while the second is composed of seven papers, all published before and rather loosely connected with each other, dealing with various topics in mathematical physics in a critical and philosophical manner. The first part contains four chapters on the euclidean displacements in two and three dimensions, the four-dimensional euclidean geometry, a two-dimensional hyperbolic geometry, and the three- and four-dimensional hyperbolic displacements and their application to the kine-