Die Grundgleichungen der Mechanik, insbesondere starren Körper. Neuentwickelt mit Grassmanns Punktrechnung. By A. Lotze. Leipzig, B. G. Teubner, 1922. 50 pp.

A great many quantities which enter into mechanics are vectors and consequently the most natural way to treat mechanics is by vector methods and this has been done by a great many writers. There are, however, difficulties in treating forces which act at a given point, for vectors in general are only determined in magnitude and direction and hence to locate them on definite lines brings in other considerations.

The Grassmann point analysis gives us, however, a natural way out of this difficulty. He considered two elements, $A-B$ (where A and B are points) which represents a vector in the ordinary sense of the word, and AB which represents the segment of the line joining the points A and B. In cases, then, when we wish to localize a vector we can indicate it by AB.

In this little pamphlet Lotze writes up quite an extensive treatment of mechanics from the point of view of Grassmann's analysis. He assumes a knowledge of the point analysis including the notions of the Lückenausdruck and the fraction. No discussion of this is given and in places the argument is not easy to follow. The author has introduced some symbols of his own or at least not known to the reviewer, e.g., in addition to Grassmann's complement he uses $\llcorner\, \bar{v}$ to indicate the vector, in a plane, into which $\bar{v}$ rotates by a positive rotation through $\pi/2$; $\perp \bar{v}$ indicates (in space) the 2-vector perpendicular to $\bar{v}$ and of equal magnitude and so directed that $\bar{v} \perp \bar{v} = v^2$. Different symbols are used to represent the quantities of different order and this lessens the difficulty of reading.

This is a fairly complete text of the mechanics of rigid bodies. It is divided into three chapters: I. Kinematics of rigid bodies; II. General dynamics of material point systems; III. Dynamics of rigid bodies. The general properties of rigid motion are quite fully treated in the first chapter. The second chapter carries us as far as the derivation of d'Alembert's and Hamilton's principles and Lagrange's equations. The last chapter deals with work and energy and the various screws such as the impulse screw and the force screw.

The pamphlet is well worth reading; but it seems to the reviewer as if the reading could have been made much easier.

C. L. E. MOORE

Précis d'Arithmétique. By J. Poirée. Paris, Gauthier-Villars et Cie., 1921. 62 pp.

C. Camichel has written a preface for this delightful little volume in which he says, "L'Arithmétique élémentaire est une excellente introduction à l'étude des Mathématiques. On y trouve sous une forme concrète des modèles de tous les modes de raisonnement depuis les plus simples jusqu'aux plus délicats de l'Analyse. Cependant cette partie des Mathématiques est en général négligée par les élèves." Poirée has presented a few topics from the theory of arithmetic and the theory of numbers in a way that will attract the neophyte and will be approved by the savant. The discussion commences with "Combien y a-t-il de billes?" and leads up to

"Recherche des Racines primitives d'un Nombre premier p." The idea of limit is introduced in connection with fractions, irrationals are connected with square root, logarithms with progressions. Classical theorems and concepts are introduced throughout the book: Euclid's proof of the infinitude of primes, sieve of Eratosthenes, number of divisors and sum of divisors of an integer, Cauchy's indicator, elementary theory of the congruence, Fermat's minor theorem, Wilson's theorem.

Possibly a book of this type needs no references, although some would probably lead a few readers to wider study. The book contains numerous good examples, but is without problems or stimulating questions for its reader. It is an engaging monograph with hardly a typographical flaw, and the reviewer believes that it will be of service either to organize and clarify the mathematical thinking of the younger or to direct students into number theory.

L. C. MATHEWSON

Latitude Developments Connected with Geodesy and Cartography. By Oscar S. Adams. Washington, United States Coast and Geodetic Survey, 1921. Special Publication No. 67. 132 pp.

Elements of Map Projection. By Charles H. Deetz and Oscar S. Adams. Washington, United States Coast and Geodetic Survey, 1921. Special Publication No. 68. 160 pp.

The first of these little books discusses the various "kinds of latitude" that arise in questions connected with geodesy and cartography. Five of these are discussed; namely, 1. *Geodetic, or astronomical, latitude* is the angle which the normal to the earth's surface at any point makes with the major axis of the meridian ellipse through the point; 2. *Geocentric latitude* is the angle which the radius vector makes with the major axis; 3. *Parametric latitude* is the parametric angle when the equation of the meridian ellipse is written in the usual parametric form; 4. *Isometric latitude* is connected with the conformal representation of the earth upon a sphere; 5. *Authalic latitude* is connected with the "equal area" representation of the earth upon a sphere (authalic from Tissot).

The book deals with formulas giving the last four in terms of the first and the eccentricity of a meridian. The formulas are applied to the Clarke spheroid of 1866, and there is a complete table for changing from one latitude to another.

The second book, as its title indicates, is devoted to various methods for constructing maps of the earth's surface, to a discussion of the advantages and disadvantages of each, and to the relative distortions introduced by each. The first half of the book is mostly descriptive and is geometrical in character. The latter half contains a full development of the Mercator projection with tables for computation, and also a mathematical discussion of various other projections. There is an explanation of the French "grid system" so much in use during the war.

The book has many excellent diagrams and maps and can be read by any one familiar with the calculus.

L. W. DOWLING