Plane Algebraic Curves. By Harold Hilton, M.A., D.Sc. Oxford, The Clarendon Press, 1920. 16 + 388 pp.

This is the first treatise on plane algebraic curves to appear in English since Salmon's famous treatise which was published over forty years ago. During the last four decades many new theorems have appeared in the various mathematical journals and thus it is fitting that a new English treatise should be written.

In dealing with such an extensive subject it is of course impossible to include all the known material, and one must expect to find omissions of certain topics. The most striking omission in this text is the modern algebraic-geometric development as set forth by Castelnuovo, Severi, Segre and others. In fact, the whole topic of geometric transformations and the derivation of properties of algebraic curves by means of these transformations has been omitted except for two cases of the quadratic transformations. Thus one is impressed by the fact that this treatise follows to a great extent the same general course as Salmon's, except that topics are more fully discussed and are brought up to date. However, many excellent collections of exercises are scattered throughout the book, and these alone are well worth the price of the text. The great majority of the results have been derived by algebraic methods. In many places the work could be shortened if synthetic methods were used.

The main topics discussed are: coordinate systems, projection, singular points, curve tracing, tangential equations and polar reciprocals, foci, superlinear branches, polar curves, Hessian, Steinerian, Cayleyan, Jacobian of three curves, Plücker's numbers, deficiency, higher singularities, two types of quadratic transformations, unicursal curves, derived curves, intersection of curves, unicursal cubics, non-singular cubics, cubics as Jacobians, use of parameter for non-singular cubics, unicursal quartics, quartics of deficiency one and two, non-singular quartics, ovals and circuits, corresponding ranges and pencils.

This book should be found in every mathematical library, for the topics discussed are most admirably treated. As a text for a first course it is superior to anything that has appeared as yet in any language because of the excellent collection of exercises.

F. M. MORGAN.

Vector Calculus. By Durgaprasanna Bhattacharyya. Calcutta, University of Calcutta, 1920. 90 pp.

In order to present the essential features of vector analysis for use in mathematical physics, the author develops the differential and integral calculus of vectors and functions of vectors directly. He scorns the use of coordinates very properly with much the feeling of Tait that one "should not violate the spirit of the Order." However, he does not overlook the great practical advantage that accrues from the study of ordinary vectors.

The author defines line, surface, and volume integrals of vectors and of vector functions. He then defines gradient of a scalar function F substantially as the vector F in the expression $d\rho \cdot F$. After considering the linear vector function of a vector, he proceeds to the differential calculus of vectors. He uses essentially the derivative dyad $d\sigma = d\rho\cdot\sigma$, that is, the dyad σ. It is now easy to define divergence as the average value of the scalar $\alpha\cdot\sigma\cdot\alpha$ over the surface of a unit sphere, α being any unit vector of variable direction. This gives of course what is commonly written $\cdot\sigma$. In the same manner the average value of $\alpha \times \varphi\alpha$ (where $\varphi\alpha = \alpha\cdot\sigma$) over the surface of the unit sphere, gives the curl. This would be the same as $\times\, \sigma$. There is nothing new in these definitions, as they have been given in one form or another before. A development of formulas that are useful follows.

Part II of 33 pages discusses the steady motion of a solid under no forces in liquid extending to infinity. Some of the well known results are reached. Towards the latter part of the section he considers certain cases of stable motion. The general problem is rather intractable, and the author is content with stating some conclusions of the simplest case. He finds that for this simple case, the two steady motions for which the screws are parallel to the greatest and least axes of a certain ellipsoid, are stable; that steady motion for which the screw is parallel to the mean axis is unstable.

J. B. SHAW.

An Introduction to the Theory of Relativity. By L. Bolton. New York, E. P. Dutton and Company, 1921. ix + 177 pp.

This little book gives a remarkably readable and intelligible account of the theory of relativity. It is by the author of the prize-winning essay in the contest recently conducted by the SCIENTIFIC AMERICAN. The author admits at the outset the impossibility of giving any sort of adequate notion of the theory of relativity without the use of mathematical ideas and symbols. He has set himself the task, however, of presenting his material without presupposing more than elementary algebra and the elements of plane geometry. As a result he finds it necessary to introduce the reader to the notion of the differential of arc, and in so doing brings back to life the "little zeros." There is also (p. 126) a footnote implying that cones and cylinders are the only developable surfaces. Such incidental blemishes may, however, be excused in view of the book's purpose and the extraordinarily satisfactory way in which this purpose has been carried out.

J. W. YOUNG.

Geometria Analytica. Part 1. *Il Metodo delle Coordinate.* By L. Berzolari. Second edition. Milan, Ulrico Hoepli. xiii + 495 pages.

This work belongs to the excellent series of manuals of the firm of Ulrico Hoepli. It aims to define the principal systems of coordinates in space of one, two and three dimensions and to derive the principal theorems and formulas of analytic geometry connected with them. It discusses in detail Cartesian coordinates of points, of lines in a plane and of planes in space. It further deals with homogeneous coordinates, and the fundamentals of analytic projective geometry. Equations of curves and surfaces are properly treated briefly. A short but well-selected appendix on vector analysis is added to this edition. Such topics as line coordinates in space and coordinates of spheres do not fall within the scope of this