in greater detail the personal life and the political and theological activities of Priestley, and she has made good use of the material available, some unpublished. The book covers the whole of Priestley's life, and in addition to making clear the great disadvantages under which Priestley carried out his scientific work, it provides a clear picture of the social life of his time. There is a useful bibliography.

Mathematics.

The Elementary Theory of Tensors: with Applications to Geometry and Mechanics. By Prof. Tracy Yerkes Thomas. Pp. ix + 122. (New York: McGraw-Hill Book Co., Inc.; London: McGraw-Hill Publishing Co., Ltd., 1931.) 10*s.* net.

THE difficulties of the theory of relativity are much increased by the combination of unfamiliar physical ideas with the unfamiliar mathematical notation of the theory of tensors. Some universities are trying the experiment of separating these difficulties by giving an elementary course in tensors to undergraduates, with applications to ordinary geometry and dynamics.

Prof. Thomas's book is based on such a course given at Princeton University. After an introductory chapter recapitulating properties of determinants, it gives a brief chapter on the pure theory of tensors. Then follow three longer chapters, dealing respectively with the application to Euclidean geometry (emphasising the invariant point of view), kinematics (especially of the displacements and accelerations of a rigid body), and Newtonian dynamics (with a good deal about Lagrange's equations). The treatment throughout is such as to prepare the way for a study of Einstein's theory.

H. T. H. P.

Vorlesungen über Grundlagen der Geometrie. Von Prof. Kurt Reidemeister. (*Die Grundlehren der mathematischen Wissenschaften in Einzeldarstellungen mit besonderer Berücksichtigung der Anwendungsgebiete*, herausgegeben von R. Courant, Band 32.) Pp. x + 147. (Berlin: Julius Springer, 1930.) 11 gold marks.

THIS book is a comprehensive survey of the present conditions of the foundations of geometry. In the first part, the author follows Klein's programme of Erlangen, and discusses the notions of congruence and invariance, using freely the theory of groups, and giving an analytical treatment of generalised vectors without, however, employing determinants. But algebra is scarcely sufficient for an adequate description of the implications of space: geometry is more than a combination of numbers. So, in the second part of the monograph, the author gives an exposition of geometry as an autonomous axiomatic construction, discussing single systems of axioms with their logical characteristics.

The whole work is limited to plane geometry. On a point of method, however, it seems that a more rational presentation of such a difficult subject could be obtained by starting with axiomatic geometry.

T. G.

Introduction to Vector Analysis: with many Fully Worked Examples and some Applications to Dynamics and Physics. By L. R. Shorter. Pp. xiv + 356. (London: Macmillan and Co., Ltd., 1931.) 8*s.* 6*d.* net.

THERE is still considerable diversity of opinion concerning what amount of time students of mathematics and physics should devote to vector analysis, and at what stage it should be introduced. No one can doubt its value in advanced work such as differential geometry or electrodynamics, but it is still an open question whether it should be introduced to students of elementary geometry, mechanics, and physics. Many years ago, intermediate science students at the University of London were given a fairly full course in vectors, but now it is more usual to give only a very brief treatment, such as an introductory chapter to a textbook of physics. Mr. Shorter has come to the conclusion that this is unsatisfactory, as it does not give the grasp necessary to enable one to use the method with confidence. He therefore reverts to the older idea of supplying a complete elementary course. The distinctive feature of the book is the large number of fully worked examples. Those who can afford the time to study these should have a good grip of the subject.

H. T. H. P.

Metallurgy.

The Elements of Ferrous Metallurgy. By Dr. Joseph L. Rosenholtz. Pp. vii + 248. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1930.) 15*s.* net.

IN view of the importance of the iron and steel industry to Great Britain, it is remarkable that so few textbooks are available to metallurgical students. One or two which formerly enjoyed a well-deserved reputation are now hopelessly out of date. The present volume comes from America, and the descriptions of plant relate to American works, but there is little which is not also applicable to English practice, and it is convenient to have the blast furnace, steel furnaces, and rolling mills well described and illustrated in a single volume of small size, whilst clear accounts are also given of such processes as tube-making.

The second part of the volume is occupied by an account of metallographic methods of study and of the constitution of iron and steel. This is excellently done, and the volume is to be recommended to students of engineering as well as of metallurgy. The chemistry of the various processes is simply and accurately explained. There are a few slips; the experiments suggested to the student on p. 15 could not be actually performed, and it will surprise Sheffield cutlery manufacturers to learn that shear steel cannot keep a cutting edge on account of its slag inclusions—these being the cause of the known great superiority of such steel for cutting. The illustrations have been drawn from other sources with good judgment, and well portray present practice.