but the notable fact is that the author practices what she preaches, not only in showing that the intersection of two planes is a straight line but also in various other theorems in which too many authors are satisfied with half proofs.

Several theorems on parallel lines and planes are given before theorems on perpendicular lines and planes, an arrangement which would seem to offer less resistance to the beginning student. The exercises throughout the book demand thought, most of them being theorems rather than numerical problems.

The last chapter of the book on "Symmetry and similarity" and the Appendix on "Irrational numbers, variables and limits" offer an elementary treatment of topics to which the student of solid geometry does not usually have access.

RAINARD B. ROBBINS.

A Geometrical Vector Algebra. By T. PROCTOR HALL. Western Specialty, Vancouver, B. C. 30 pp.

HALL'S Geometric Vector Algebra is hardly what its name implies, since trigonometry and determinants are constantly needed to help out the computations of the vector algebra. We fail to attain the promise of the introduction, where we are led to expect a calculus of the space elements themselves. The exposition of principles in the first nine pages is fairly sound, although fragmentary. The word "tensor" is not defined, but means "length of a vector." S_{ab} and V_{ab} mean, substantially, the dot and cross products of Gibbs. But the product of two vectors is defined as a new vector, which turns out to consist of the usual vector product plus another vector term having the direction of the multiplying vector and the length S_{ab}. Evidently with this multiplication not much progress can be made toward a working system. The author himself proves that multiplication is not commutative, associative, nor, in general, distributive. The square of a unit vector, by the definition, is equal to the vector itself, but as a perpendicular operator the square is negative unity; whence equals cannot be put for equals.

Trouble comes in the attempt to show that quaternions are special cases of these operations. The first three fundamental characters of a quaternion on page 10 are correctly stated, but the fourth does not hold, for it contradicts the proof on page 6 that an operator is not distributive. We may indeed resolve the vector into components, but to say that, as an operator, the vector can be expressed as the sum of three parts, but cannot be distributed with respect to these parts, has no meaning. A non-distributive operator is in no sense a quaternion, since it does not obey the laws of quaternions (which are associative and distributive), and since no operational meaning can here be attached to the quadrinomial form so important in quaternions.

The reader who studies out the problems of the remaining 20 pages will do well to avoid an increasing sense of irritation. Very little use is made of the principles first laid down; but a great deal of a mysterious looking but trivial notation for loci, in no way a necessary part of the system. The problem work has no advantage in compactness of reasoning over the usual analytic geometry. In this respect it endures no comparison with the pages of Hamilton or Grassmann, of Heaviside or Gibbs. No doubt it is too much to expect such a test of a brief monograph, but one naturally assumes the problems to have been chosen so as to show the method at its best.

FRANK L. HITCHCOCK.

Mechanics of Particles and Rigid Bodies. By J. PRESCOTT. London, Longmans, Green, and Company, 1913. viii+535 pp.

THIS book has been designed to meet the needs of students aiming for a pass degree at a British university and contains all that they require in the subject of applied mechanics except hydrostatics.

Practically all English texts on mechanics include long lists of problems; many of them consist principally of illustrative examples and problems. This volume, however, presents a systematic development of the theory in which no pains have been spared to make the proofs rigorous enough for pure science, while the practical side of the subject has not been neglected. The problems following each chapter have evidently been chosen with great care and cover a wide range. Some of them demand merely substitution in formulas and numerical calculation, while others offer considerable theoretical difficulty. A special feature is that the answer is given to nearly every question.

An elementary course in the calculus is presupposed for the study of this text and the author appreciates the fact that the student who is applying the calculus for the first time to