Review

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to the pupil. The ground covered is that of Euclid I. to VI.; the theorems of Euclid II. are rightly considered as illustrating algebraic formulæ, not as proved by those formulæ. H. H.

Elementary Pure Geometry, with Mensuration. By E. BUDDEN, M.A., B.Sc. (Chambers.) 1904.

Mr. Budden's book is full of interest, but the method of treatment is probably too condensed for due assimilation by a beginner. Moreover, in some cases the proofs are incomplete, thus in obtaining the locus of points (in a plane) equidistant from two given points he proves that all points on the perpendicular bisector satisfy the condition, but does not show that points not on that line fail to satisfy the condition. This same neglect of the second of the two conditions for a complete locus occurs elsewhere, and spoils the logic of proof based on such loci.

Nevertheless, for older students who wish to have all their geometrical mathematics comprised in a single book, and who are able to correct such slips on their own account, the book is likely to be very useful. It is most comprehensive, including the substance of Euclidean Plane and Solid Geometry with extensions to centres of similitude, antiparallels, etc., elementary trigonometry to solution of triangles, harmonic and anharmonic ratios, and other concepts of modern geometry, geometry of conic sections, and mensuration of solids.

The printing is clear, and the collection of examples excellent, and although some of the earlier proofs may be found fault with on the score of rigorousness, the terse vigour of the proofs in general is most remarkable, and in this respect the book will be found invaluable. Mr. Budden's treatment of "ratio" is worthy of minute consideration, as it appears to cover the case of incommensurables with easy naturalness. The book should be in every mathematical library.

A. LODGE.

Mathematical Problem Papers. By E. M. RADFORD. Pp. 203. 1904. (Cambridge University Press.)

This is a collection of one hundred problem papers, each consisting of twelve questions, intended for the use of candidates for entrance scholarships at Cambridge. A large number of the problems are original and the rest have been compiled from various University and College examination papers "other than entrance scholarship papers," so that the work does not enter into competition with the well-known volumes of scholarship papers issued by the University Press.

Indeed what must strike anyone looking through this collection is the unfamiliarity of the great bulk of the questions. Occasionally one comes across a question from the *Educational Times* (lxxxvi., 3), or the *Gazette* (xlix., 7), or Roberts' *Dynamics* (viii., 11), or Besant's *Dynamics* (xlii., 11), or an old Tripos question (xlix., 11). For the most part, however, the old, tried friends of one's youth have quietly dropped out, and their places are filled by strangers of a later generation and of the most uncompromising aspect. Though, of course, there are scattered here and there a few easy questions, the papers, which are graduated in degree of difficulty, proceed from ordinary flagellation to chastisement with scorpions. One might safely predict that any scholarship candidate who had been nurtured upon, and could assimilate, such strong diet as is here provided, would not only be absolutely certain of success, but could also count upon a respectable place in the Tripos. It might be possible to work steadily through the first half of the book (one paper a week) in the year before going up to Cambridge, and to finish the other half during the first year of residence. This, of itself, would almost prove a sufficient problem equipment for the first four days of the Tripos.

The geometrical questions are sometimes peculiar statements of old properties. For instance (xl., 8) "Prove that all parabolas with a given self-conjugate triangle touch four fixed straight lines." The author has evidently followed recent work in the *Gazette* when he gives (xciii., 1) "Prove that the operations of inversion with respect to two circles are commutative only when the circles cut orthogonally." One of H. E. Dudeney's puzzles appears in (xlix., 1) "Given two points in a plane find a compass construction for the mid-point of their join." This little study in stigmatic geometry will well repay attention.