

*Darstellende Geometrie.* By TH. SCHMID, associate professor of geometry at the technical school of Vienna. (Sammlung Schubert, LXV.) Berlin and Leipzig, G. J. Göschen, 1912. vi + 279 pp., and 107 figures.

LIKE the other volumes in the Schubert series, this book is written for beginners, and does not attempt to be an exhaustive treatise. It begins with the ordinary double orthogonal projection, but proceeds rather rapidly, so that only forty pages are required for the usual presentation of rectilinear figures. Considerable emphasis is laid on proportion, and the criteria for determining which of two perspective objects hides the other. A generous number of exercises is added at frequent intervals. At the end of this first part is a good introduction to the theory of shades and shadows, and its application to polyhedra. The second and third chapters treat of the sphere, cylinder, and cone; they comprise two thirds of the volume. The discussion begins with polarity as applied to the circle. Much of the text is divided into two columns, one describing polarity, and the other antipolarity, the product of polarity and a reflection. The first twenty pages are very elementary, but the subject is so presented that problems of considerable complexity are disposed of as easily as the simpler ones. An elementary knowledge of plane analytic geometry is presupposed, but most of the properties of conics that are wanted later are established. In connection with the discussion of curvature use is made of the derivative, and in the rectification of the ellipse a foot-note is provided which expresses the length of arc as an elliptic integral. Mechanical devices for drawing conics are described, and the theory of each explained. A section on the illumination of the sphere is delightful reading. Not only does it present the theory in a clear and concise way, but enlivens it with a discussion of the reasons for including the theory in the discussion; both practical and esthetic grounds are presented that are quite convincing. Different degrees of illumination are expressed quantitatively, and directions given for preparing washes to procure them.

An unusual feature is the extent to which the developments of various space curves on the cylinder and cone are discussed. We meet the conchoid, cardioid, cissoid, serpentine, sine curve, and a number of less well known plane curves as developed from an algebraic intersection.

The detailed discussion of the space quartic curve is also somewhat of a departure, but one that is justified. Without using any other machinery than that provided in the previous part of the text, the appearance of the elliptic, nodal, and cuspidal quartics is found, and some of the properties derived. Here again the theory of shades and shadows is liberally applied.

The last chapter, comprising about one sixth of the volume, is devoted to orthogonal axonometry. Here the presentation is not so successful. Too much detail is given, and the reader does not see readily the advantage of the whole procedure. The elementary projections are given as before, in fact several figures are almost identical with those found in the earlier presentation. After twenty pages, however, the treatment is much more satisfactory. The purpose now appears, and the whole discussion is easier and clearer. A detailed treatment of the determination of the scale in each of three directions is followed by the representation of polyhedra, then by complicated architectural figures. A short discussion of the three round bodies is added, and the results applied to an extension coupling. Only a small number of exercises are given in this last part.

VIRGIL SNYDER.

*Die graphische Darstellung.* By FELIX AUERBACH. Leipzig and Berlin, B. G. Teubner, 1914. (Aus Natur und Geisteswelt, volume 437.) 97 pp. and 100 figures.

THIS little volume is written for readers without mathematical training. Its purpose is to compare the value of various methods of representation. It compares magnitudes by means of lengths of segments of lines, areas of rectangles with constant bases, areas of squares, circles, sectors, and even volumes of certain solids. Incidentally a mass of statistical information is given in the illustrations. After these preliminary notions follows a full and readable discussion of the idea of a plane curve, including periodic and general trigonometric representations. Finally, automatic tide registers, magnetic fields, seismographs, registering thermometers, solar photographs, and sound waves are briefly discussed.

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