The book concludes with a very complete bibliography; this is intended to be the continuation of the one appearing at the end of the *Introduction à la géométrie projective différentielle* (Paris, 1931), by Fubini and Čech; the author's list includes almost all papers and books on this subject from 1931 to 1950, and will certainly be of the greatest aid to everyone interested in projective differential geometry.

V. DALLA VOLTA

Στοιχεῖα θεωρητικῆς γεομετρίας. (*Elements of theoretical geometry*). By N. Sakellariou. Athens, Pountza, 1950. Vol. I, 224 pp.; vol. II, 208 pp.; vol. III, 208 pp.

One approaches the task of reviewing this work with more than usual interest since here at the middle of the twentieth century appears a new *Elements* of geometry written some twenty-two and a half centuries after the *Elements* of Euclid (c. 300 B.C.) and in the same language. Although this work appears in modern Greek, one cannot help but marvel at the fact that most of it can be read with the help of the same dictionary that unlocks the treasures of Euclid.

The author of the present work is a Professor of Mathematics at the University of Athens; Euclid was the head of the mathematics group at the Museum in Alexandria. Both works cover essentially the same material although the modern *Elements* includes many theorems discovered in the centuries since Euclid, such as the circle of Lemoine, the triangle and circle of Brocard, Tucker's circle, and similar complicated constructions. It is also worthy of observation that students who purchased the original *Elements* paid for it in coins of the same denomination as those used to buy the modern text, namely, drachmas, although the values have slipped a bit during the centuries; for while the original might have been purchased, perhaps, for two or three drachmas (3 drachmas = one bushel of wheat) the publisher's announcement states that the first volume of the new *Elements* will cost around 20,000 drachmas.

It is also an interesting matter to compare the contents of the present work with that of Euclid. One difference is the frequency of historical comment which illuminates the text since such material obviously was not available to the father of the subject, although modern historians would have welcomed information on the part of Euclid as to the origin of much of his material, his debt to Pythagoras and Eudoxus among others. The modern work contains pictures of Euclid, Pythagoras, Archimedes, Pierre de Fermat, and K. F. Gauss, with brief biographical sketches of these mathematicians. The first book begins with a short history of geometry starting with Thales

(643–548 B.C.), and many more historical allusions are scattered through the book than are to be found in comparable American texts.

The first volume, of the three which comprise the complete work, deals with traditional material about lines, angles, triangles, and circles and contains 352 exercises, some of them quite elaborate. The second volume continues with theorems about triangles, polygons, and circles. Several proofs of the theorem of Pythagoras, including the traditional one, are given. A five-decimal approximation to π is computed, using the perimeter of an inscribed polygon of 768 sides, and some history of the modern computation and the nature of π is included. Midway through the second volume one finds in succession proofs of the theorems of Menelaus, Desargues, and Ceva, theorems which are usually met with by American students in college courses. This volume concludes with an account of what is sometimes called the modern geometry of the triangle and the circle, the constructions of Lemoine, Brocard, Tucker, and other members of this school which flourished in the nineteenth century. The second volume contains 501 exercises, many of them of a difficult nature.

The third volume is devoted to solid geometry (stereometry) and does not appear in its 208 pages to go much beyond the material usually included in American text books on the subject. One does find, however, a proof of Euler's proposition that in convex polyhedra the sum of the vertices and the sides exceeds by two the number of edges. This volume contains 517 exercises.

The work as a whole forms an excellent treatment of Euclidean geometry and contains material that is usually difficult to find. The volumes are well printed and the figures are clear and well drawn.

H. T. DAVIS