The volume as a whole suffers from a lack of unity, even greater than that usually associated with treatises of this kind. This is due to the desire of the author to cater to the elementary as well as to the advanced student, and to his prejudice in favor of algebraic analysis. On the other hand, the author has managed to include and touch upon many different mathematical notions and has laid out before the prospective student of mathematics an adequate array of interesting directions for further edification and investigation, which, after all, might be considered a justification of a set of Lessons in Analysis.

T. H. HILDEBRANDT

Die Grundlagen der Geometrie, ihre Bedeutung für Philosophie, Mathematik, Physik und Technik. By Hugo Dingler. Stuttgart, Ferdinand Enke, 1933. viii+76 pp.

The author proposes a treatment of the foundations of geometry of a radically new kind, starting, not from a set of axioms whose consequences are to be derived, but from a description and analysis of the experimental process of measuring extended bodies. On this basis he proves that the geometry of physical space is euclidean. "Alle die vielen von Einstein und seiner Schule ohne Überlegung und ohne Erröten vorgebrachten Behauptungen über die Geometrie sind damit für jeden, der noch konsequent und umfassend denken kann, inhaltslos und unmöglich geworden."

The principal error seems to lie in the definition of the concept of a solid body. A body is to be called a solid body if it has the property that, if it is translated along any straight line g and a plane through g, then it is translated at the same time along every plane which passes through g and along every parallel to g which lies in one of these planes through g and in or on the body. Assuming the existence of bodies which are solid in this sense, the author is able to prove the euclidean parallel postulate!

ALONZO CHURCH

Algebraic Functions. By Gilbert Ames Bliss. American Mathematical Society Colloquium Publications, Volume 16. New York, 1933. vi+218 pp.

This book, immediately striking for its conciseness, is one of the most remarkable works ever produced on the subject of algebraic functions and their integrals.

The distinguishing feature of the book is its third chapter, on rational functions, which gives an extremely brief and clear account of the theory of divisors. Here the integrands of the three elementary types of abelian integrals are set up by the arithmetic methods of Dedekind and Weber. The arithmetic treatment is definitely simpler and more elegant than the potential-theoretic method of Riemann, or the geometric method of Brill and Noether which is based on the reduction of the singularities of algebraic curves. The theory of divisors, hitherto available chiefly in the ponderous classic treatise of Hensel and Landsberg, is presented by Bliss in hardly more than thirty pages.

A very readable account is given of the topology of Riemann surfaces and of the general properties of abelian integrals. Abel's theorem is presented, with

some simple applications. The inversion problem is studied for the cases of genus zero and genus unity.

The chapter on the reduction of singularities is very noteworthy. Here one finds a thorough treatment of the problem of reducing the singularities of an algebraic curve, by means of a birational transformation, to double points with distinct tangents. This question is examined for the projective plane, and also for the space of analysis. In this chapter, as in the chapter on divisors, the influence of Bliss's own researches is seen.

A final chapter illustrates the general theory with some examples. In particular, constructive methods are given for treating algebraic relations which are of the third degree in one of the variables. There is a good bibliography.

The arithmetic theory of algebraic functions is a good thing. In making its study easy, Bliss has performed a service which will win him the gratitude of an ever increasing number of readers.

J. F. RITT

Theory of Elasticity. By S. Timoshenko. New York, McGraw-Hill, 1934. 416 pp. and 203 figures.

This is one of the Engineering Societies Monographs published under the editorial supervision of a committee representing four national engineering societies.

The subject of the theory of elasticity has become so large that no one book can cover the entire theory and applications. In fact some of the older books such as Love's *Theory of Elasticity*, although not covering many topics now regarded as essential, have reached such encyclopaedic proportions as to render them unsuitable as texts. The present book is the best general text the reviewer has seen in English. In comparison with other books of Professor Timoshenko on the same subject, it is more theoretical and less detailed in engineering applications.

After an introductory chapter concerned with Hooke's Law and the general relations of stress and strain, the following five chapters, constituting nearly half of the book, are restricted to cases of plane stress and plane strain. The principal concepts are thus introduced with the simpler mathematics of these two-dimensional fields. The more general analysis is then given, and applied to cases of bending and torsion in which three-dimensional tensors play an essential role. The last chapter is concerned with the propagation of waves in elastic media. For cases of steady vibration the author refers to his book on *Vibration Problems in Engineering*.

A feature of the treatment is the more general use of components of stress rather than components of displacement, the differential equations being furnished by the body force and compatibility conditions. In the common case of known surface stresses, the boundary conditions are thus expressed by relations between the unknown functions instead of relations between their derivatives. In comparison with the older books much more attention is given to experimental methods, such as photo-elastic and soap film measurements, and hydrodynamic and electrical analogies.

H. B. PHILLIPS