Principles of Geometry. Vol. III. *Solid Geometry.* By H. F. Baker. The Cambridge Press, 1923. xix+288 pp.

The first two volumes of this series on *Foundations* and *Plane Geometry* have not been reviewed in the BULLETIN.* The first deals with the underlying ideas of projective geometry, the treatment deviating sharply from the traditional British method of heaping projective geometry on top of metric geometry. The second deals with conics, circles, and non-euclidean geometry; it might be described as a successful feat in showing what can be done with the incidence relations of the "ordered framework" of the first volume. The algebraic counterpart is available when necessary for testing results, and consideration is given to the logical basis of the algebraic symbols, but let us quote from the preface: "It (the volume) suggests the question whether, in the case of distance, as in many other cases, we may not have derived from familiarity with physical experiences, a confidence which a more careful scrutiny can only regard as an illusion. . . . It will be of importance if the reader come to see how deep lying are the questions involved in the use of coördinates, and the assumption of distance as a fundamental idea."

With the third volume on *Solid Geometry* the author assumes that the reader appreciates his views on foundations, coordinates, and distance, and says no more of them; but the book, and particularly Chapter II, must be read in the light of these earlier considerations. Chapter I is on quadric surfaces; Chapter II on the relations of quadric surfaces to an arbitrary absolute conic; Chapter III on cubic curves in space; Chapter IV, which is on a somewhat different footing, is entitled: The general cubic surface, introductory theorems.

In relatively few but concise pages various definitions of quadric surfaces and of cubic curves are given, and the essential properties and constructions are brought out. The algebraic representation is not suppressed, but the reader is never allowed to forget that he is studying geometry by synthetic methods. The less essential relations and properties are included under the "examples," nearly 200 in number, which occupy considerably more than half of the pages of the first three chapters. Some of these are left to the reader, but many of the more substantial type are solved in detail:—examples involving such topics as normals to a quadric, Moebius tetrads, geodesics on a quadric surface, and special cubic transformations. The fourth chapter is at once intimately related to the preceding chapters and introductory to the theory of cubic surfaces, which is promised us in a later volume. Here we find such topics as the double-six, the figure of 27 lines, definitions of a cubic surface, the Hessian surface, representation of cubic surfaces on planes and on quadrics. It is to be hoped that when this scholarly series is complete, the content and purport of these books may be more critically examined. The author implies that the series is especially suited to the physicist and engineer. This is surely

* Since this was written, vol. II has been reviewed by F. S. Woods, this BULLETIN, July, 1925, p. 370.

a striking statement. The preface states that the material of the third volume "may be regarded as essential to any student who professes to have received a mathematical education." We are inclined to take exception to this statement as regards chapter IV. We await the appearance of the remainder of this series with much interest.

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Théorie Mathématique de l'Electricité, First Part. By Th. de Donder. Paris, Gauthier-Villars, 1925. 198 pp.

The first part of Professor de Donder's treatise is divided into three sections entitled respectively "The Electrostatic Field," "The Stationary Magnetic Field," and "The Variable Electromagnetic Field." The first section takes up the greater portion of the volume, while the third section is compressed into a short chapter on Maxwell's equations. It is to be presumed, however, that the second part, yet to be published, will contain some amplification of this important section. At the end of the volume are tables giving the dimensions of electrical and magnetic quantities in terms of ϵ and μ, ϵ and c, and μ and c and giving the relations between Gauss's units, electrostatic units, electromagnetic units, and practical units. A table of contents is provided, but no index. Vector analysis is used freely, the cumbersome continental notation of parentheses, brackets, grad's, div's, and rot's being preferred to Gibbs' dots, crosses, and dels.

The theory is developed from the basis of the experimental laws of Coulomb, Ampère, and Faraday in the Maxwellian manner instead of from the point of view of the special relativity theory. While this method of treatment is perhaps desirable in an elementary exposition, it lacks the simplicity and unity which the subject acquires when developed from the point of view of the emission theory. Few applications to the solution of problems are made, no mention being made of the method of images, conjugate functions, or spherical harmonics.

A large share of the volume is devoted to a discussion of polarized media. Here Professor de Donder finds it convenient to distinguish between the electric force and the electric resultant. The former he defines as the negative of the gradient of the potential, and the latter as the limiting value of the mechanical force on a unit charge placed in a small cavity in the medium as the volume of the cavity approaches zero. The electric resultant so defined depends upon the shape of the cavity which must be specified in advance. His definition of electromotive force (page 13) as the line integral of the electric force seems rather unhappy, as in most applications to current circuits the electromotive force is the line integral of a quantity which cannot be expressed as the gradient of a scalar function of position in space.

The book is written clearly and logically, and constitutes a notable addition to the literature on the subject. It should prove especially serviceable to those who desire a working knowledge of Maxwell's theory rather than a unified exposition from the point of view of modern ideas. In particular the detailed discussion of polarized media is to be commended.

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