of these principles, but in the absence of proofs of these principles, the value of this approach must be held in abeyance. That the extension principle is valid in special instances is documented by numerous important examples, but the justification in general cases is missing. It is impossible to overlook these defects in a book which otherwise has many good features.

EINAR HILLE

An Introduction to Riemannian Geometry and the Tensor Calculus. By C. E. Weatherburn. Cambridge, University Press; New York, Macmillan, 1938. 11+191 pp.

In the author's words this is "a book which will bridge the gap between the differential geometry of euclidean space and the more advanced work on the differential geometry of generalized space." It is dedicated to Dean Eisenhart and Professor Veblen. Indeed it follows very closely the content, notation and arrangement of the former's *Riemannian Geometry.* But it is purposely more elementary, less rigorous and less complete. Beside the basic essentials there are chapters on congruences and orthogonal ennuples, on hypersurfaces in euclidean and Riemannian space and on general subspaces. At no point does the book venture outside the domain of Riemannian geometry proper.

The following features are noteworthy:

(1) An introductory chapter giving a résumé of theorems of algebra and analysis used freely in the later chapters.
(2) A pleasantly restrained use of the notation of classical vector analysis as in the author's earlier *Differential Geometry of Three Dimensions.*
(3) Sections based on some original work by the author on quadric hypersurfaces.
(4) The very desirable use of R. Lagrange's generalized covariant differentiation in the treatment of subspaces.
(5) 125 exercises distributed among the chapter endings, some of which include important subject matter not in the text proper.
(6) An appended historical note condensed from an address (1932) by the author in which reference is made to the various generalizations of Riemannian geometry.
(7) A bibliography extending from the year 1827 with 132 entries and references to bibliographies by other authors.
(8) The excellent typography and general physical characteristics.

It will be a disappointment to some that the book was not constructed along more original and more stimulating lines although this is much to demand of an introductory text. Greater effort might have been made to lessen the emphasis on formalism which is so difficult to avoid in this field. Basic concepts could have been presented more carefully and given richer meaning. For example, increments and differentials are confused occasionally in accordance with a time-honored but deplorable custom; and the tensor concept as presented here is little more than a law of transformation. The notion of tangent space of differentials would be of assistance on both counts. Important existence theorems and elementary topological considerations would have been welcome. For example, the generalized Gauss-Codazzi equations are written down but their fundamental importance as existence conditions left unmentioned, and throughout the book the word "space" is never precisely defined. An obvious omission on the formal side is that of the alternating ϵ-tensors.

The book is neither for dilettantes nor advanced students of the subject. But to those who are seeking an introductory treatment of textbook character to serve perhaps as a sequel to the author's *Differential Geometry* it is to be recommended.

J. L. VANDERSLICE