which reach the heart of the matter at once. The real criticism on the use of vectors is that they practically demand that the curved space under consideration be embedded in a flat space of a requisite number of dimensions. This difficulty, however, seems to exist as well for those methods that insist on coordinates. The work of M. Juvet is an example. A perfect intrinsic treatment would never leave the space itself. This can be accomplished by a properly developed system of general vectors. However, when one realizes that if the curved space is embedded in a flat space, then every formula in terms of vectors in the flat space relating to the curved space is *ipso facto* a covariant formula, he will see the whole matter of "theory of tensors" in the proper light.

Hadamard is certainly correct in taking the position that whatever the value of the relativity theory may be, it has done a great thing for geometry in opening up a new life to it, not of the momentary character of a new attack by some geometer, but of the permanent character infused by nature herself. Not only theorems in physics should be stated without systems of axes for reference, but theorems in geometry should also be so stated. The present work will be welcome to those who do think in coordinates, for its clarity and simple presentation.

JAMES BYRNIE SHAW.

Annuaire du Bureau des Longitudes pour l'An 1922. Paris, Gauthier-Villars. 1922. 7 + 800 pp.

There is little to say concerning the current issue of the ANNUAIRE. The review copy arrived somewhat late in the year but this matters less than might be imagined for an almanac, since the data, chiefly astronomical, which change from year to year, are always given in the almanac of the previous year.

There is an attractive little article on Relativity by E. Picard which sets forth the principal points of the theory and the astronomical tests. An article on Money and Exchange by Ch. Lallemand explains the fundamental bases of past and present currencies, and shows the fluctuations of their gold values in some detail during the past eight years.

E. W. BROWN.

Kartenkunde. By M. Groll. Neu bearbeitet von Dr. Otto Graf. I. *Die Projektionen.* Berlin und Leipzig, Vereinigung wissenschaftlicher Verleger, 1922. 116 pp.

This short treatise on map-projections is No. 30 of the well known Sammlung Göschen, and gives a fairly complete account of the numerous systems of mapping of the terrestrial globe. The introduction, which is concerned with general information about drawing, scales, and drawing instruments, and physical geography, is succeeded by four chapters dealing with various projections of the spherical surface upon a plane. In the fifth and last chapter we find a valuable summary and illustrations of the various methods of mapping in use and an historical sketch of their development.

On the whole the little book will be appreciated by students who wish to acquire a general knowledge of map-projections without spending

too much time in studying more ambitious and special treatises on the subject. ARNOLD EMCH.

A Study of Mathematical Education. By Benchara Branford. New edition, enlarged and revised. Oxford, at the Clarendon Press, 1921. xii + 420 pp.

Comparison with the 1908 edition shows the book under review to be a reprint rather than a completely revised edition; according to the preface "the changes in the original, though numerous, are in general of subordinate details," which changes are certainly minor judging from the obvious identity between the two editions even in the indexes. The last 40 pages, or Part III, are entirely new to this edition and under the caption "The Past, the Present, and the Future" discuss the subjects "Adolescent Technique," "Specialists and Cosmology," "Algebra and Mensuration," and "Comparative Algebra, Geometry and Mechanics."

Even though containing little new matter, "the world-wide welcome generously given the work, including a pre-war German translation and a Russian translation in course of preparation," seems to justify this reprint. The work may be characterized as the interesting and thought-provoking meditations on mathematical education of a teacher of twenty or more years' experience in nearly all grades of English schools. The reader feels some lack of unity in the book as a whole which is no doubt due to the fact that it is largely a collection of articles, courses of lectures and addresses written at various times and for various purposes. The following topics and phrases may give some idea of the type and range of the discussions: experimental mathematics, measurement in geometry, types of evidence, educational principles, suggestions from historical developments, nature of geometric knowledge, culture and occupation, presentation determined by ability and background of the learner, good and bad results of the dethronement of Euclid, degree of rigor best fitted to the maturity of the learner, the tongue-tied practical man, danger of discontinuity of logical treatment, need of smaller logically developed systems of propositions, relations of algebra and geometry, suggestions to teachers from non-euclidean geometries and the Einstein theories, the great unities of mathematics, teaching principles as ideals. The progressive teacher sensitive to new ideas and new viewpoints as suggesters in his own thinking and planning will profit by reading this book. ERNEST B. LYTLE

Lezioni di Statistica Metodologica. By Filadelfo Insolera. Turin, Libreria Fratelli Treves, 1921. 191 pp.

This small volume deals with a large variety of topics, including approximate computation, averages, measures of dispersion, permutations, combinations, probability, binomial distribution of frequency, interpolation by the formulas of Newton and Lagrange, graduation of data, least squares, moments, correlation and contingency. The book gives brief elementary expositions of these topics, and will probably serve well its purpose as a means of preparation for certain examinations. On account of the lack of illustrative examples, the reviewer is of the opinion that the book would not be a suitable substitute for certain English and German books for the beginner in the study of statistics. H. L. RIETZ