

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