

sums up what has been done to determine the length of the meter in terms of wave lengths of light, and M. Renaud writes of the life and work of the hydrographic engineer, Ph. Hatt, who died in October, 1915.

The body of the volume contains a few changes which are mainly minor additions to and improvements in the astronomical portions which fill over half its pages in the odd years. No lessening of the care which has always been bestowed in making the *Annuaire* useful and up to date is apparent.

ERNEST W. BROWN.

Theory of Errors and Least Squares. By LEROY D. WELD.
New York, Macmillan, 1916.

PROFESSOR WELD'S volume is mainly intended for those research workers who wish to use the method of least squares in dealing with their observations, but who have little knowledge of mathematics. With this end in view, he has attempted to give the necessary formulas in the simplest possible form and has added numerous examples drawn from problems in chemistry, physics, astronomy, geodesy, statistics, etc. Recognizing, however, that the competent observer is rarely willing to use a formula without knowing the basis on which it is constructed, the author devotes the earlier part to a detailed and simple explanation of the principles on which the theory is constructed.

He has attained considerable success in this effort. Nevertheless there is one point of view on which more explanation seems to be advisable. The theory of errors of observation, based on the least square principle, has become so standardized that those who use it much rarely need to remember that its results and technical terms rest on a set of assumptions which, it is true, are founded on experience, but which have not the definite character of a physical law deduced from observations. The beginner, whether an observer or a student learning the subject, needs to have the fact impressed on his mind that the whole theory with its technical terms such as "probable error of an observation," "most probable value" very largely form a language through which an observer may communicate briefly the results of his work and the degree of consistency of his observations. The theory gives no assurance that physical laws are correctly represented. This