The author claims, as the chief results of his inductive examination, to have determined from the monuments the true values of the Sacred Hebrew or Royal Persian cubit, the Royal Egyptian cubit, the Egyptian digit, the Assyrian cubit, the ancient Greek foot, the Olympic foot, the Drusian foot, the Plinian foot, and the Pythic foot, together with the probable errors of these determinations.

He claims also to have found that the principal standard units of length were in more extended use than was previously known, and to have indicated the countries in which they were used. And also that he has brought to light many other units of length of which the knowledge had been previously lost.

It is not probable, however, that all persons who have given mature consideration to the contents of the work will concur in the stated results or be altogether satisfied with some of the mean units obtained. In every case a unit deduced from the actual measurements is stated, and not the measurements themselves. But a large proportion of these deduced units are not whole numbers of the mean unit obtained from them. Thus, taking one of the instances most favourable to the author's views, out of twenty-eight Egyptian monuments, from which the mean length of the royal Egyptian cubit is obtained, twelve only of the deduced units are whole numbers, the others being various fractions of the mean unit, and many of them, such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{12}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{7}$, $\frac{5}{7}$, $\frac{6}{7}$, $\frac{1}{15}$, $\frac{2}{15}$, $\frac{1}{20}$, $\frac{3}{20}$, $\frac{1}{30}$, $\frac{2}{30}$, $\frac{1}{40}$, $\frac{3}{40}$, $\frac{1}{60}$, $\frac{5}{60}$ are fractions not marked upon any of the extant standard cubit rods, which are divided only into seven palms and twenty-eight digits.

The essay will be read with much interest and advantage by those persons who have given their attention to metrological science. It appears to be a valuable contribution to historical and ethnological literature, and to be a ground-work for further researches on the subject.

WOLF'S HISTORY OF ASTRONOMY

II.

Geschichte der Astronomie. Von Rudolf Wolf. (München: R. Oldenbourg, 1877.)

IN our former notice of this valuable addition to astronomical literature (NATURE, vol. xvii. p. 259) reference was made to the great amount of information which the author has compressed within a moderate space in the third and last section of his work which treats of "the newer astronomy." We propose here to take a brief survey of the principal contents of this portion of the volume to assist the reader's appreciation of the work.

The third section is subdivided into four chapters—9—12. The first commences, as before stated, with Sir Isaac Newton's discovery of the principle of universal gravitation, the publication of the "Principia," and the first application of the new theory to the orbits of comets by Halley, whose meritorious connection with the publication of Newton's immortal work is well known. This is followed by some account of the foundation of the Observatories of Greenwich and Paris, and soon afterwards of those of Berlin and Copenhagen, whereby so great an impetus was given to practical astronomy; of Richer's expedition to Cayenne for the determination of

the solar parallax, from corresponding observations of the planet Mars, and the first ideas as to the applicability of transits of Venus for the solution of the same problem. The labours of the earlier workers in the Newtonian theory—of Bernoulli, Euler, Clairault, and others, are particularised; also Bradley's great discoveries of the aberration of light and the nutation of the earth's axis, together with his work in the field of observation, with the similar work of Tobias Mayer and Lacaille. Further on the same chapter treats of the labours of Lagrange, Laplace, Gauss, and others in theory, and of Herschel, Piazzi, Bessel, Struve, and others, in the practice of astronomy. We have some account of the "Theoria Motus," the "Fundamenta Astronomiæ," amongst classical works, and of progress made in the solar, lunar, and planetary theories, and formation of tables and ephemerides. Amongst the remaining varied contents of this chapter there are notices of the discovery of Neptune, stellar parallax, the connection between solar spots and the earth's magnetism, the application of photography to astronomical purposes, and the introduction of the spectroscope.

Chapter 10 is devoted to astronomical instruments and their uses, after some remarks upon methods of calculation introduced in modern practice. There are brief notices of instruments in their various forms, from the complicated heliometer to the simpler appliances in the hands of observers, with descriptions of many of the more important purposes for which they have been brought into use. The chapter concludes with a reference to Lacaille's memorable expedition to the Cape of Good Hope and the expeditions undertaken on occasion of the transits of Venus in 1761 and 1769.

Chapter 11, on "The Structure of the Heavens," is as varied in its contents, amongst which we may note: The periodicity of sun-spots, and the new views upon the physical constitution of the sun; the ring of small planets; the zodiacal light; the meteor-streams and their connection with comets; the physical condition of comets; the distribution of the stars; the Milky Way; solar motion in space; variable and double stars, and binary systems; stellar spectra, star clusters, and nebulae.

In Chapter 12 we have an account of the principal modern literature, periodical and otherwise, bearing upon astronomical science in its various branches. There are notices of the works of Weidler, Lalande, Bailly, Montucla, Delambre, Littrow, Madler, and others, and of such works as the *Acta Eruditorum*, the *Monatliche Correspondenz* and the *Astronomische Nachrichten*.

It should be understood that the one chief advantage which the student is likely to derive from Prof. Rudolf Wolf's "History of Astronomy" will be a knowledge of the authors, methods, &c., with which it may be necessary for him to become acquainted in turning his attention to any particular department of astronomy, an advantage that may not be immediately apparent from the title of the work. Prof. Wolf does not enter into any amount of detail, nor indeed would it have been practicable within the limits of this volume. But as affording in comparatively brief space an accurate idea of the gradual progress and actual state of astronomical science and a valuable guide to any one entering upon its study, this book may be confidently recommended. J. R. HIND

* Continued from p. 259.