that of Tycho Brahe (1600), and that of Hevelius (1660). During the short intervals of repose which, amid tumultuous revolutions and devastations of war, occurred between the ninth and fifteenth centuries, practical astronomy, under Arabs, Persians, and Moguls (from Al-Mamun, the son of the great Haroun Al-Raschid, to the Timurite, Mohammed Taraghi Ulugh Beg, the son of Shah Rokh), attained an eminence till then unknown. The astronomical tables of Ebn-Junis (1007), called the *Hakemitic* tables, in honor of the Fatimite calif, Aziz Ben-Hakem Biamrilla, afford evidence, as do also the *Ilkhanic* tables* of Nassir-Eddin Tusi (who founded the great observatory at Meragha, near Tauris, 1259), of the advanced knowledge of the planetary motions—the improved condition of measuring instruments, and the multiplication of more accurate methods differing from those employed by Ptolemy. In addition to clepsydras,† pendulum-oscillations‡ were already at this period employed in the measurement of time.

The Arabs had the great merit of showing how tables might be gradually amended by a comparison with observations. Ulugh Beg's catalogue of the stars, originally written in Persian, was entirely completed from original observations made in the Gymnasium at Samarcand, with the exception of a portion of the southern stars enumerated by Ptolemy,§

* *Cosmos*, vol. ii., p. 222, 223. The Paris Library contains a manuscript of the Ilkhanic Tables by the hand of the son of Nassir-Eddin. They derive their name from the title "Ilkhan," assumed by the Tartar princes who held rule in Persia.—Reinaud, *Introd. de la Géogr. d'Aboulféda*, 1848, p. cxxxix.

† [For an account of clepsydras, see *Beckmann's Inventions*, vol. i., 341, *et seq.* (Bohn's edition).]—*Ed.*

‡ Sédillot fils, *Prolégomènes des Tables Astr. d'Oloug-Beg*, 1847, p. cxxxiv., note 2. Delambre, *Hist. de l'Astr. du Moyen Age*, p. 8.

§ In my investigations on the relative value of astronomical determinations of position in Central Asia (*Asie Centrale*, t. iii., p. 581–596), I have given the latitudes of Samarcand and Bokhara according to the different Arabic and Persian MSS. contained in the Paris Library. I have shown that the former is probably more than 39° 52′, while most of the best manuscripts of Ulugh Beg give 39° 37′, and the *Kitab al-athual* of Alfares, and the *Kanum* of Albyruni, give 40°. I would again draw attention to the importance, in a geographical no less than an astronomical point of view, of determining the longitude and latitude of Samarcand by new and trustworthy observations. Burnes's Travels have made us acquainted with the latitude of Bokhara, as obtained from observations of culmination of stars, which gave 39° 43′ 41″. There is, therefore, only an error of from 7 to 8 minutes in the two fine Persian and Arabic MSS. (Nos. 164 and 2460) of the Paris Library. Major Rennell, whose combinations are generally so successful, made an error of