

whose practical solution must be left to future ages.* When we compare our Sun with the other fixed stars, that is, with other self-luminous Suns in the lenticular starry stratum of which our system forms a part, we find, at least in the case of some, that channels are opened to us, which may lead, at all events, to an *approximate* and limited knowledge of their relative distances, volumes, and masses, and of the velocities of their translatory motion. If we assume the distance of Uranus from the Sun to be nineteen times that of the Earth, that is to say, nineteen times as great as that of the Sun from the Earth, the central body of our planetary system will be 11,900 times the distance of Uranus from the star α in the constellation Centaur, almost 31,300 from 61 Cygni, and 41,600 from Vega in the constellation Lyra. The comparison of the volume of the Sun with that of the fixed stars of the first magnitude is dependent upon the apparent diameter of the latter bodies—an extremely uncertain optical element. If even we assume, with Herschel, that the apparent diameter of Arcturus is only a tenth part of a second, it still follows that the true diameter of this star is eleven times greater than that of the Sun.† The distance of the star 61 Cygni, made known by Bessel, has led approximately to a knowledge of the quantity of matter contained in this body as a double star. Notwithstanding that, since Bradley's observations, the portion of the apparent orbit traversed by this star is not sufficiently great to admit of our arriving with perfect exactness at the true orbit and the major axis of this star, it has been conjectured with much probability by the great Königsberg astronomer,‡ “that the mass of this double star can not be very considerably larger or smaller than half of the mass of the Sun.” This result is from actual measurement. The analogies deduced from the relatively larger mass of those planets in our solar system that are attended by satellites, and from the fact that Struve has discovered six times more double stars among

* Bessel, *Untersuchung des Theils der planetarischen Störungen, welche aus der Bewegung der Sonne entstehen* (An Investigation of the portion of the Planetary Disturbances depending on the Motion of the Sun) in *Abh. der Berl. Akad. der Wissensch.*, 1824 (Mathem. Classe), s. 2-6. The question has been raised by John Tobias Mayer, in *Comment. Soc. Reg. Götting.*, 1804-1808, vol. xvi., p. 31-68.

† *Philos. Trans.* for 1803, p. 225. Arago, in the *Annuaire*, 1842, p. 375. In order to obtain a clearer idea of the distances ascribed in a rather earlier part of the text to the fixed stars, let us assume that the Earth is a distance of one foot from the Sun; Uranus is then 19 feet, and Vega Lyrae is 158 geographical miles from it.

‡ Bessel, in Schum., *Jahrb.*, 1839, s. 53.