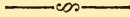


ON THE TRANSIT OF MERCURY OVER THE SUN'S  
DISC, NOV. 5TH, 1868.



By FRANCIS ABBOTT, F.R.A.S., &c.

I lay on the table a diagram in which is embodied the elements, and a full explanation, of the transit of Mercury, with the true path of the planet over the sun's disc on the 5th of November, 1868. The observations were made with a five foot equatorially mounted achromatic telescope. Other observations were also made at the time, and near the same place, with a small Gregorian reflector. The day was fine, and the passage of the planet over the sun's disc was observed as a well-defined round black spot. When the true limb of the planet reached the true limb of the sun, the light being cut off, a fine dark ligament appeared to connect the limb of the planet and the sun, showing the true time at first contact.

The Hobart Town time of transit was computed from the Nautical Almanac; the observations made with a half second chronometer, and when compared with the normal clock it was found to be remarkably close, I scarcely think one second in error.

The sun's limb was well defined, and the tremor by no means considerable. Some measures were made of the difference of right ascension of the Sun and Planet, they have been corrected for refraction, and for the motion of the sun, and are compared with the elements given in the nautical almanac, as shown in the diagram. In the observation I saw neither central bright spot, halo, nor satellite. My attention was directed to time determinations for ascertaining longitude, rather than to any peculiarities that might be presented during the transit.

The Royal Astronomical Society are in full possession of all the means employed by Commander Kay for determining the geographical position of the Magnetic Observatory here, the whole series of observations consisted of moon culminating stars, of which 41 sets from both limbs of the moon were observed on the meridian, with an excellent transit instrument by Troughton and Simms. The solar eclipses, and the eclipses of Jupiter's satellites were observed with a telescope made for the purpose by Jones. When the distance of any two given places is not very great, the longitude is determined with accuracy by transmission of chronometers, for which purpose Captain Kay availed himself of the well known positions of the observatory at Parramatta and Fort Macquarie, Sydney Harbour; by this method no less than 76 chronometers were

employed, independent of 110 astronomical observations, and a triangulation. The whole of these observations were made from the year 1843 to 1846, and in order to obtain the corresponding observations of the moon culminating stars, previous arrangements were made at Greenwich, Edinburgh, Cambridge and Oxford. The lunar observations were afterwards placed in the hands of Mr. Riddle, head Mathematical Master of the Nautical School at Greenwich, for reduction, and the whole series were reduced, and a paper drawn up from the results by Captain Shadwell, for the Astronomical Society, which gave for the longitude of Hobart Town, 9h. 49min. 29.6 secs.

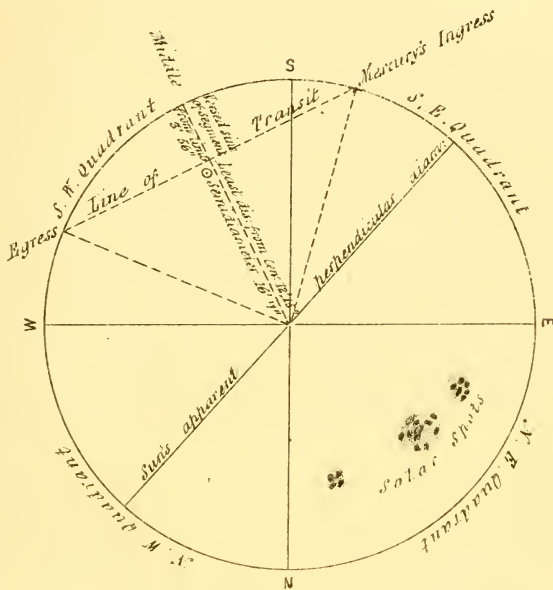
Since the time this result was arrived at Captain Denham, when stationed at Garden Island, sent an officer into these waters for the purpose of confirming the longitude of Hobart Town. The mean result of all observations made at that time, gave for the longitude 9h. 49m. 28.8s. being a small difference of (0.8)—eight-tenths of a second. There remains, however, still much doubt as to the correct geographical position of any of the Australian colonies being correctly known. Captain Kay thinks with the Astronomer Royal, that for observing the forthcoming Transit of Venus, in December 1874 and 1882, they are not suited until better known. Mr. Ellery thinks differently, he considers the longitude of the Melbourne Observatory as well known as that at the Cape of Good Hope. The Sydney Astronomers believe the longitude established at Fort Macquarie, Sydney Harbour, and at the Observatory, Parramatta, by the late Sir Thomas Brisbane, assisted by his computer and observer, Mr. Rurnker, and Mr. Dunlop, to be the best known of any in these colonies. The authorities for the establishment of the longitude of Fort Macquarie, Sydney Harbour, and the chronometrical differences of meridians employed in the determination of the longitude for Hobart Town, from them, were very numerous.

The determination of the latitude of any place is a much simpler problem; the latitude obtained by Captain Kay, was the result of sextant observations by the method of circum-meridional altitudes of the sun and stars. In their reduction, Baily's Tables and Formulæ of reduction to the meridian, and Ivory's Tables of refraction, with their correction for pressure and temperature were used. Captain Kay thinks that the latitude assigned to the observatory cannot be much in error. If we consider the number of observations made and the large amount of labour bestowed upon them, the authority connected, and the result obtained, we have an equal right to consider the geographical position of Hobart Town, as correct as any of the Australian colonies. In all probability not one of the

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HOBART TOWN TIME OF	INGRESS	$3^h . 14^m . 9^s$ P.M.
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ten principal observers engaged at the transit of Venus in 1769 had a fixed position more correct than that at Hobart Town.

The re-discussion of the transit of Venus in 1769 recently made by Mr. Stone, at the Greenwich observatory, from results of all observations made at the time, has reduced the sun's distance to near that arrived at by the opposition of Mars, and the speed of light, viz., 91,700,000 miles. This great problem therefore may be considered almost settled within the requirements of our present astronomy, and only waits for confirmation at the next transit of Venus to make all things accordant. This necessity is more felt owing to some doubt having arisen on a misinterpretation said to be made by Mr. Stone, in his re-discussion on Chappe's statement made at the time of contact of the sun and Planet, and the circumstance of Pauly having left his telescope before the last contact.

This question of the correct geographical position of these colonies therefore, is a problem that will require to be settled before the time arrives for ascertaining the true value of the solar paralax.

There is a great uncertainty of any expedition being able to reach either Wilks Land or Sabrina Land in the month of December. In all probability the Australian colonies will be made the southern limit of observation. If, therefore, some well-defined spot is fixed upon in the interim, and suitable means employed to establish it as a starting point for determining the correct geographical position of any other spot with equal accuracy, either by telegraphic communication or transmission of chronometers, several different stations could be either confirmed or corrected for the reception of any number of expeditions that might be sent to these colonies.