

V.—SUPPLEMENTARY NOTE ON VENUS.—BY A. CAMERON,
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(Read 10th May, 1897.)

In the Transactions of this Institute for 1892-3, (Second Series, Vol. I., Part 3), there is an article of mine on "Venus in Daylight to Eye and to Opera Glass." On page 345, the late M. Trouvelot of the Observatory at Meudon, is quoted to the effect that in a clear sky Venus may be seen in daylight with the naked eye, when her angular distance from the sun is not less than 10° at inferior conjunction, and not less than 5° at superior conjunction.

On pages 347-8 particulars are given of a naked eye observation made at noon on July 6, 1892, when the angular distance between Venus and the Sun was less than 7° . This was a little over three days before inferior conjunction. Three of these conjunctions have occurred since then—in February, 1894, September, 1895 and April, 1897—but, so far as I know, no closer observation was got at any of them. On the morning of February 14th, 1894, I saw Venus with naked eye, when less than two days before inferior conjunction; but this was not a "daylight" observation as defined in the article cited; and, besides, the elongation was more than 7° . This observation was one of a pair, which, as a pair, had some rather curious features. (See Series II., Vol. I., pp. 391-4.)

The chief purpose of this note is to make a few additions to what was said in the Daylight article about observations made near superior conjunction. M. Trouvelot thought that Venus should be as easy to the naked eye in full daylight, when only 5° from superior conjunction as when 10° from inferior conjunction. My reasons for thinking so too are given on pages 349-52. But when writing that article, the best reliable observation of this kind I had been able to make near any superior conjunction was made thirty-six days after the one in May, 1893, when the elongation was 10° . (p. 351.)

There have been two superior conjunctions since then, and at each of them a better observation than the above was made.

At Denver, Colorado, on October 30th, 1894, Mr. Roger Sprague saw Venus with the naked eye at 9.45 a. m. This was thirty-one days before the superior conjunction of November 30th, 1894. The angular distance was $7^{\circ} 46'$. Mr. Sprague says that the planet was "quite a difficult object to distinguish with the naked eye and required very persistent and careful looking to make it out at all." The difficulty of his observation led him to doubt the possibility of seeing Venus at all under the conditions that prevailed on July 6, 1892, Venus was five times as bright to him in October, 1894, as to me in July, 1892; she was nearly a degree farther from the sun; and Denver is 5000 feet nearer heaven and is blessed with a clearer atmosphere than Yarmouth. As the feat of seeing the planet was found extremely difficult under this fourfold set of favorable conditions, it was quite natural for the observer to think it impossible under the unfavorable conditions. I would think so too, had I not had experience of its possibility, and of the wonderful change that even a few minutes sometimes make in the seeing quality of the atmosphere or in the clearness of some particular patch of the sky. The clearest and purest blue is found between broken masses of cloud, and it was in such a swept and garnished bit of sky that I found Venus at her inferior conjunction in 1892. Another thing—she was 28° nearer my zenith then than she was to Mr. Sprague's zenith when he made his observation, and all observers know what a deal of difference that makes. Had he looked again an hour and a half later, when she was on his meridian, he would probably have found her—if his sky was clear—absurdly easy instead of extremely difficult.

Mr. Sprague's observation was the best one near superior conjunction that I had any record of up to that date.

The date of the next superior conjunction was July 9, 1896, at 9 a. m., 60° W. time.

To better the record, it was necessary to see Venus when less than thirty-one days from that date, and less than $7\frac{3}{4}^{\circ}$ from the sun.

The thirty-first day before conjunction was June 8th. The midday sky was cloudy then, and so it was on the 9th, 10th, and 11th. On the 12th we had the pure blue sky that follows summer rain, and at noon my naked eye found Venus "disgracefully easy." So my notes say. I suppose they mean it would have been disgraceful for even a bad eye (as was one of the two that made the observation) not to see her. They go on:—"Eye holds her dodging through clouds, and picks her up over and over again." This was twenty-seven days before conjunction. On the 13th, she was easier than on the 12th. Then there were nine days unfit for observation. On the 23rd, we had another of those glorious skies that follow a spell of rain and fog, and Venus was again easy, and was found very quickly after being located by a field-glass. On the 24th, she was not so easy, because the sky was white. On the 25th, the sky was fine, and my naked eye saw her for the last time before conjunction. It was fourteen days before, and the angular distance from the sun's centre was under 4° .

All the observations from June 12th to June 25th, were made between 12 and 12.30, (60° W. time), when Venus was very near the meridian, As the conjunction was a July one like the inferior conjunction of 1892—the very same day, indeed, July 9, in both cases—I had the advantage of high altitude.

This is likely my last note on this subject, and it may be as well to set down here a summary of the extreme observations which I have managed to make on Venus both with the naked eye and with an opera-glass. A description of the glasses I used is given in the article cited, p. 354.

With naked eye:—

- (a) At inferior conjunction—3 days before the conjunction of July 9, 1892. Elongation $6^{\circ} 50'$ from sun's centre. Altitude 64° .

- (b) At superior conjunction,—14 days before the conjunction of July 9, 1896. Altitude 70° . Elongation, $3^\circ 51'$ from centre, $3^\circ 35'$ from limb.

Both of these observations were made within 15 minutes of mean noon.

- (c) Near greatest elongation or greatest brilliancy,—April 30, 1892: found by eye when 18° above east horizon, the sun at the time being 44° high.

August 23, 1892: held by eye till only 8° above W. horizon, sun being over 35° high.

(Then there is the curious pair of observations already referred to—one after sunset on February 13, 1894, the other on the following morning before sunrise.)

With opera-glass or field-glass:—

- (a) At inferior conjunction,—July 9, 1892: on the day and at the hour of conjunction. Elongation $4\frac{1}{2}^\circ$. Altitude 64° .

- (b) At superior conjunction,—May, 11, 1893: 9 days after conjunction. Elongation $2\frac{1}{4}^\circ$ from limb. Altitude 64° .

December 12, 1894: 16 days after conjunction. Elongation $3\frac{3}{4}^\circ$. Altitude 22° .

- (c) Near greatest elongation or greatest brilliancy,—March 28, 1892: found when $7\frac{1}{2}^\circ$ above East horizon. Sun's altitude $24\frac{1}{2}^\circ$.

August 23, 1892: held till only 3° above West horizon. Sun's altitude 29° .

YARMOUTH, N. S., *April 30, 1897.*