

L. *Observation of the Tranfit of Venus, June 6, 1761, at St. John's, Newfoundland: By John Winthrop, Professor of Mathematicks and Philosophy at Cambridge, New England.*

Read Nov. 15, 1764. **T**HE tranfit of Venus over the Sun, being a very curious and important phænomenon, engaged the attention of America as well as Europe. His excellency Francis Bernard, Esq; governor of the Massachusetts-Bay, a gentleman who seizes every opportunity of advancing the sciences, was desirous to have an observation of it in this quarter of the world; and as Newfoundland was the only British plantation where one could be had, proposed to the General Assembly at Boston to make provision for that purpose, which they readily agreed to do. In consequence whereof, I embarked on board a vessel in the service of the government, taking with me for assistants two young gentlemen my pupils; and such astronomical instruments out of the college apparatus as were necessary. These were, an excellent clock, Hadley's octant with nonius divisions; a refracting telescope with wires at half right angles, for taking differences of right ascension and declination; and a nice reflecting telescope, adjusted by cross levels, and having vertical and horizontal wires, for taking correspondent altitudes; or differences of altitudes and azimuths,

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We arrived at St. John's Newfoundland the 22d of May, where we met with a very kind reception, and all the assistance we could desire. As this town is bounded with high mountains toward the sun-rising, so that no house in it would answer our end, we encamped on an eminence at some distance, from whence we could see the Sun presently after his rising.

Hither we conveyed our instruments, and secured the clock to a pillar set in the ground under a tent. Near this tent, and within call of the clock, we fixed two other pillars firmly in the ground; one, to mount the refracting telescope on; the other, which was above 8 feet high, for a style or gnomon, having at top a plate of lead with a little hole for transmitting the Sun's rays; and we laid an horizontal platform to receive those rays. The platform we kept covered, to defend it from the Sun and weather: and examined its position every time we made use of it, by a very long level. On this we carefully drew a meridian line, by correspondent altitudes of the Sun, taken both by the reflector and by the Sun's image on the platform. These operations we repeated every fair day, and several times in a day. It would be tedious, as well as needless, to give a detail of them: 'tis sufficient that we adjusted the clock with as much exactness as we could have done at home.

Thus prepared, we waited for the critical hour, which proved favourable to our wishes. The morning was serene and calm. The Sun rose behind a cloud that lay along the horizon, but soon got above it; and at 4<sup>h</sup> 18' we had the pleasure of seeing *Venus on the Sun*; though dimly indeed at first. But  
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the planet presently became distinct, and her limb well defined. Upon this, I applied myself to observe the passage of the Sun's and Venus's preceding limbs, by the vertical, and of their lower limbs by the horizontal, wires in the reflector, and made the following observations ; one of my assistants counting the clock, and the other writing down the observations as I made them ; which, having made the proper correction of the time for the change of the Sun's declination, stand as follows.

True time, h			diff. long. ☉ & ♀	Lat. South.
At 4	21' 20"	Sun at the vertical ———	' "	10' 47"
	31	Venus at the same ———	9 2	
23	6	Venus at the horizontal —	9 4	10 50
24	23	Sun at the same. ———		
27	29	Venus at the horizontal —	9 25	10 52
28	47	Sun at the same ———		
35	15	Sun at the vertical ———		10 55
	21	Venus at the same ———	9 56	
37	49	Venus at the horizontal —	10 8	11 00
39	9	Sun at the same ———		

As Venus began now to draw near the Sun's limb, I prepared to observe her egress. The interior contact did not appear so perfectly instantaneous, as Dr. Halley's papers led me to expect. I was not certain of it till 4<sup>h</sup> 47' 21", though I doubted of it at 17". The exterior contact I judged to be at 5<sup>h</sup> 5' 49", doubtful also 3 or 4" ; and so the passage of Venus's diameter, 18' 28".

The above observations gave me several altitudes and azimuths of Venus, from whence I deduced her

right ascensions and declinations; and from them, her longitudes and latitudes. The result of the whole, or the planet's difference in longitude from the Sun's centre and her latitude, is set down above, against each observation of Venus.

From hence I concluded that at the central emersion, which I put at  $4^h 56' 38''$ , the difference of longitude was  $11' 19''$ , and the latitude  $11' 6''$ . Also, that the conjunction in longitude happened at  $2^h 4' 36''$ , the planet's latitude then being  $9' 28''$ .

In these calculations, I supposed the semidiameter of the Sun to be  $15' 50''$ , and of Venus  $29''$ .

By several observations, I found the latitude of the place  $47^\circ 32' N$ ; which falls within the latitudes laid down in several books and maps, which make it from  $47^\circ 25'$  to  $48^\circ 0'$ . I could make no use of Jupiter's satellites in finding the longitude, as they were not risen high enough to be observed above an hour before day-light came on. There were but two of their eclipses that could have been visible there while I was on the island; and though I watched for both of them, I was disappointed of both by unfavourable weather. Neither was I fortunate enough to get so much as one occultation of a fixed star by the Moon, though I spared no pains for it. The only observation I could get for this purpose was of the right ascension of the Moon, which I endeavoured to find, by comparing with that of a fixed star. But whether any mistake was committed in counting the clock, or in writing down the observations, or whether the position of the telescope was disturbed by any accident in the interval between the Moon's and star's passing, I am not able now to say. However, as I am sensible that

that observation is not to be depended on, I think it needless to insert it here. The longitude of St. John's is variously set down by different authors, though none I have met with mention the observations by which it was determined. According to Sir Jonas Moore, it is  $52^{\text{h}} 50'$  West from Greenwich; and as his authority may be as good as any, I keep to this longitude till it can be ascertained by farther observations. I have taken measures to procure such; and if they succeed, shall be ready to communicate the result.

I viewed the Sun with great attention in the reflector both on the 5th and 6th of June, in hopes to find a satellite of Venus; but in vain. There were several spots then on the Sun; but none that I saw could be a satellite.

The variation of the needle there I found  $19^{\circ}$  W.

J. Winthrop.

## R E M A R K.

Mr. Short has computed the parallaxes at the egress for this observation at St. John's, and by comparing this observation with that at the Cape of Good Hope (on the above longitude and latitude of St. John's as set down by Mr. Winthrop) he finds the parallax of the Sun, resulting therefrom,  $= 8'',25$ .