

XLIV. *An Account of the late Transit of Venus, observed at Hawkhill, near Edinburgh. In a Letter to the Astronomer Royal, from James Lind, M. D. at Edinburgh. To which are added some Remarks by the Astronomer Royal; and further Particulars relative to the Observations communicated in other Letters.*

Hawkhill, 5 June 1769.

S I R,

Read Dec. 7, 1769. I HAVE the pleasure to transmit to you the account of our observations at this place. James Hoy, our young observer, observed in the house, on the ground-floor, in the room with the house-clock, with the  $3\frac{1}{2}$  feet achromatic telescope with triple object glass; Lord Alemoor observed on the floor above, with the 18 inch reflector, and a watch that shewed seconds, set a few minutes before the transit began, and compared after each contact; I was in the observatory, where I used my own 2 feet achromatic telescope, a mathematical instrument maker counting seconds from the clock. The following is the account of all our observations:

	Ext. cont.		Int. cont.		
	Mean time.				
	h	'	h	'	
Lord Alemoor	6	57 33	7	14 32	18 inch reflector
James Hoy	6	57 30	7	14 35	$3\frac{1}{2}$ f. achromatic, magn. 150
Dr. Lind	6	57 31	7	14 37	2 f. achromatic, magn. 100
			X x 2		In

In the internal contact, James Hoy differed from the other gentleman and me two minutes, he calling it 12 minutes, and we 14 minutes; which of us is wrong, will be no difficult matter to determine. In the internal contact we all observed the black ligament or protuberance, which was not broke for some seconds after the regular circumference of Venus seemed to be within the Sun; and the observation we send you was, as near as we could judge, about the time this protuberance was going to break. Lord Alemoor also, and he only, observed regular circumferences of the Sun and Venus in contact, at  $7^{\text{h}} 14' 10''$ , mean time.

The morning promised ill, yet we got 9 very good altitudes of the Sun near the prime vertical. About noon the day was terrible, with thick clouds, and like settled rain. You may imagine how we felt. About two o'clock the wind began to change from the south to the westward; about three o'clock it was west, and the clouds breaking; so that we got 5 very good corresponding altitudes. There was, about 4 o'clock, a very hard thunder shower, and calm, after which the wind began to blow briskly from the north-west; the clouds blown away, and those near the horizon depressed and held down, the Sun shone clearer than I ever saw it, and not a cloud was to be seen in that quarter. It remained so till after both contacts; when, not half a minute after, small flying clouds passed over the Sun, and shewed us how much we were obliged to kind heaven for the very favourable opportunity we had of making our observations. It appeared, I assure you, as if Providence had withdrawn the clouds over head, and held down those near the

the horizon, for that very purpose. The night continued equally clear and serene, as did the morning, till after the eclipse; half an hour after which it began to overcast, and put on the same cloudy appearance it has wore for some months past. Although the morning was so favourable, yet we lost the beginning of the eclipse, from being too long in getting to our posts; however, I here send you the contacts, with the different spots of the Sun, and its end most exactly. If you observed the spots, it will, I imagine, be as exact as if the beginning and end only had been observed.

I am,

S I R,

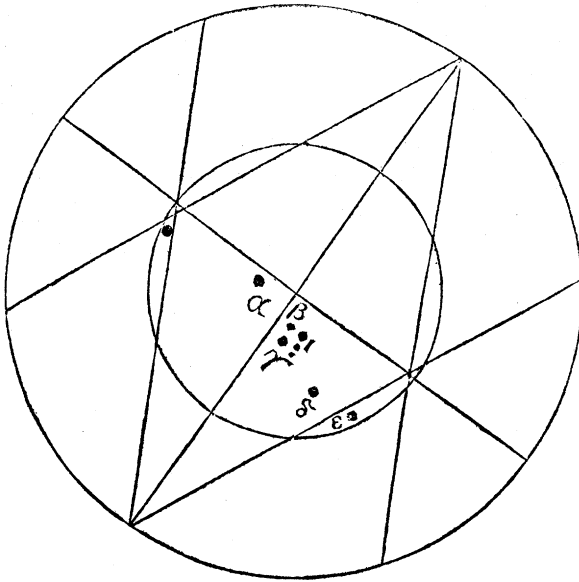
Your most obedient,

humble servant,

James Lind.

P. S. I hear the day proved also very favourable at Glasgow.

Mean times of the contacts of the Moon's limbs, with the spots of the Sun, June 3, 1769.



		Mean time.			
		h	'	"	
α's S. E. limb with	α	Ext. contact	18	47	33
		Center	18	48	1
		Int. contact	18	48	18
	β	Center	18	59	20
		γ	Ditto	19	1
δ	Ditto	19	9	9	
	ε	Ditto	19	18	23
	α's W. limb with	α	Int. contact	19	37
Center			19	37	47
β		Ext. contact	19	38	15
		Center	19	51	16
γ	Ditto	19	52	47	
	δ	Ditto	20	3	46
ε	Ditto	20	15	9	
	End of the eclipse	20	17	30	

Remarks

## Remarks by the ASTRONOMER ROYAL.

Hawkhill is said by Dr. Lind to be about  $1\frac{1}{2}$  miles N. E. of Edinburgh. It is the seat of Lord Alenmore, one of their judges, who is fond of astronomy, and has built a small observatory there with a moveable roof, upon Mr. Smeaton's plan, which I sent to Dr. Lind. The corresponding altitudes, for determining the time of the observations of the transit of Venus, were taken, by reflection, from a basin of quicksilver or treacle, with a brass Hadley's sextant, made by Mr. Ramsden; the surface of the fluid being defended from the wind by a glass ground truly plane. They find that the equal altitudes seldom differ above two or three seconds in determining the time of noon; so that, by taking a great many at once, and taking the mean, they think they cannot fail of coming very near the truth. I have examined the equal altitudes made about the time of the transit, and the times of the contact are given corrected in the foregoing account. The clock in the observatory seems to go pretty well, though it only beats dead quarter seconds; it has a mahogany pendulum, and was made by Mr. Cummins. In the house was a clock beating seconds, and set, by means of the other, in the afternoon, before the beginning of the transit. The latitude of the place was also determined by meridian altitudes, taken by reflection with the sextant, and, by the mean of 10 observations, which all agree within the compass of 2 minutes, is  $55^{\circ} 57' 37''$  N. The end of the Solar eclipse was observed

observed by two persons with the two achromatic telescopes, with treble object glasses, and they agreed to a second.

Dr. Lind writes, another time, that, being from home, at Lees, near Coldstream, 7 miles west of Berwick, he observed the latitude of the place about  $55^{\circ} 37'$ .

The foregoing particulars are extracted from letters received from Dr. Lind. He has also communicated to me the following observations of the transit of Venus and Solar eclipse, made by the Reverend Mr. Brice, at Kirknewton, as follows :

I here likewise send some observations, made in our neighbourhood, by the Reverend Mr. Bryce, Minister at Kirknewton. He is a very good astronomer, and is a writer in the Philosophical Transactions. Kirknewton is in lat.  $55^{\circ} 54' 30''$  N. and about 17 miles W. of Hawkhill, from measuring it on Lawrie's map of the environs of Edinburgh.

The clock had been tried by several transits of a fixed star, and always found to measure time so exactly, that in the space of five days it did not differ one second from the truth; it was also examined by taking equal altitudes of the Sun, and found to be  $18''$  slow. The day was cloudy, with flying showers, till about two o'clock in the afternoon; then it grew somewhat clear, and about four the Sun shone out exceeding bright, when I observed carefully the spots upon the Sun; the brightness continued till about  $15'$  before  $7^h$ , when a cloud came over the Sun, which was not seen till  $6^h 55' 40''$  mean time, as shewn by the clock, and then Venus had made a sensible

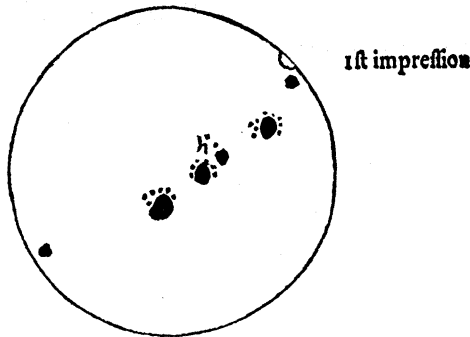
sensible impression upon the upper limb of the Sun's zenith, and  $\frac{1}{10}$ th, as I judged, upon the Sun.

Half on the Sun, as we thought,	h ' "
Internal contact clearly seen	7 3 55
18'' added for the clock too slow	7 11 55
	+ 18
	<hr/>

And if Venus takes 19' from the first impression to the internal contact, the transit began at	} 7 12 13
Seen going till the Sun set in a cloud near the horizon	
	8 24 39

When near the horizon, Venus's edge was full of notches and protuberances, and she appeared as if moving round like a wheel.

Eclipse of the Sun, 4 June, common reckoning.



(1) Beginning of the eclipse	h ' "
(2) The 1st impression made a little above the line of the spots upon the Sun's disk	6 27 50
(3) The Moon's edge touches the great spot	} 6 56 5
(4) 1st cluster of spots touched	
(5) Covered at	7 0 0
(6) Cusps of the Sun upon an horizontal line	7 6 45
(7) Another spot touched	7 7 25
(8) Spot on the Sun's north limb touched	7 16 44
(9) 1st spot of the cluster emerged	7 50 20
VOL. LIX. Y y	(10) 2d

- |      |   |         |
|------|---|---------|
| (10) | 2d spot of the cluster emerged  | 7 50 40 |
| (11) | 3d spot of ditto emerged  | 7 51 32 |
| (12) | Spot on the north limb emerged  | 8 13 40 |
| (13) | Eclipse ended   | 8 15 50 |
| (14) | Last impression made at the spot upon the north limb of the Sun,<br>and the whole eclipse seen very distinctly, from the beginning to<br>the end. |         |
| (15) | An evident irregularity in the under edge of the Moon, which<br>entered upon the south side of the Sun, and traversed it from<br>south to north.  |         |
| (16) | Fahrenheit's thermometer stood all the while, in the shade, at $53^{\circ}\frac{1}{4}$ ,<br>and continued so for several hours after.             |         |

N. B. The clock 18'' slow to be added to the several observations.

N. B. The internal contact is, when the thread of light was completed.

From the above observation, and from every one of any credit, we Hawkhill gentlemen are late in the external contact.