

Observations on the Eclipse of the Sun, April 1, 1764: In a Letter to the Right Honourable James Earl of Morton, Pres. R. S. from the Reverend Thomas Hornsby, M. A. and Savilian Professor of Astronomy at Oxford

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XXV. *Observations on the Eclipse of the Sun, April 1, 1764: In a Letter to the Right Honourable James Earl of Morton, Pres. R. S. from the Reverend Thomas Hornsby, M. A. and Savilian Professor of Astronomy at Oxford.*

My Lord,

Read May 10, 1764. **I** Take the liberty to transmit to your Lordship the following observations of the great eclipse of the Sun on the 1st of April last, in hopes that your Lordship may think them not unworthy of the attention of that learned body, over which you preside.

On the morning of the 1st of April, the heavens were so uncommonly serene, that I could not but flatter myself with the hopes of a sky very favourable to observation. But about eight o'clock a haziness began to appear, and several clouds to arise from the South-west, which at small intervals deprived us of a sight of the Sun; these clouds however went off entirely to the North-east, and the Sun's limb appeared very nicely defined, and without the least undulation, through an excellent refracting telescope of 12 feet focus made by Mr. Bird, to which had been applied a system of eye-glasses similar to those used for reflectors, and the usual aperture of which had been

Inch.

contracted to 1, 2. I continued to keep my eye very attentively fixed upon that part of the Sun's limb,

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where

where I expected the Moon would make the first impression; and at $8^h 59' 33''$ apparent time, saw a very slight alteration on the Sun's limb, which I flatter myself may be considered as the time of the beginning of the eclipse very accurately ascertained; since a gentleman then present, with a reflecting telescope of 18 inches, saw that the eclipse was begun about $6''$ later by the same clock.

As the eclipse advanced, I proposed to measure both chords and the quantity of the lucid parts with a reflecting telescope of 9 inches, armed with a micrometer executed by Mr. Dollond himself, and which was very obligingly left me for that purpose by my worthy colleague the reverend Mr. Bliss. And accordingly at $9^h 37' 17''$ apparent time (as are all the times hereafter mentioned) I measured the chord of the part eclipsed and found it $= 25' 45'', 8$. At $9^h 50' 24''$ the unobscured part of the Sun was $= 13' 17'', 7$; and at $10^h 3' 39'' = 8' 33'', 8$. At the time of which observation the colour of the sky was remarkably changed.

At $10^h 19' 15''$ I determined, by the old micrometer applied to the 12 foot tube, the quantity of the lucid parts to be $3' 45''$: but, as I found such measurements could not be taken with that instrument, without great difficulty, I immediately endeavoured to determine, by the other micrometer, the quantity of the Moon's horizontal diameter as seen upon the Sun, and found it, by a mean of three observations, hardly differing from each other, to be $29' 45'', 1$.

It was formerly a dispute among the astronomers, whether the Moon's diameter did not appear less when viewed upon the Sun, than when seen upon a darker

darker ground. The observations of Mr. le Monnier in Scotland, in the year 1748, seemed to leave little room for doubt : and it is to be hoped that observations made with larger and better instruments than mine, and in places where the eclipse was annular, or nearly so, will fully settle this point. At the time of the middle here, the Moon's centre was about 39 degrees high, and therefore the Moon appeared under a greater angle to the eye of the observer than if seen from the earth's center, by about 18 seconds. The true horizontal diameter from the above observations was therefore $29' 27''$; which is but $7''$ less than according to the latest and best tables; which tables may perhaps give the Moon's diameter too large, because constructed from observations made with refracting telescopes, through which the diameters, both of the Sun and Moon, must necessarily appear under an angle somewhat enlarged.

About the time of the middle of the eclipse, I carefully attended to the distance of the cusps : because, from some calculations which had been laid before the public, the Northern limit of the annulus was to pass within 4 or 5 miles of this place ; and by other accounts I might have expected to have found myself considerably within the path of the annular penumbra. But as nearly as I could estimate by my eye, the distance of the cusps was not less than $\frac{2}{7}$ of the whole circumference of the Sun. The quantity of the Sun's light was now very sensibly diminished ; a very distinct halo was seen at the distance of 12 or 14 degrees round the Sun ; and we might have expected to have seen the planet Venus, had not the sky been covered with a considerable haziness. As

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this haziness continued, I began to fear that I might be prevented from observing the end, and therefore measured, as carefully as unfavourable circumstances would permit, the following chords.

At	11 ^h	33'	56"	chord	=	19'	52"	5
	11	40	25	—	=	16	27	9
	11	42	7	—	=	15	28	5
	11	45	7	—	=	13	46	0
	11	46	57	—	=	12	9	4

But the sky began to clear up; and at 11^h 58' 3" by the clock, or 11^h 54' 20 $\frac{1}{2}$ " apparent time, I observed the end, which I believe may be depended upon to 3 or 4 seconds.

About 20 minutes after the Sun had passed the meridian, I measured the Sun's horizontal diameter with Dollond's micrometer, and found it = 32' 0", 8.

At seven o'clock in the morning, a Fahrenheit's thermometer, made by Mr. Bird and placed in the shade, stood at 42 $\frac{1}{2}$ degrees. At 7^h 32' I exposed another thermometer of the same scale to the direct rays of the Sun. In five minutes the mercury rose from 43 to 59. At 7^h 44' it stood at 67 $\frac{1}{2}$; and about twenty minutes before the eclipse began this thermometer had risen even to 84.

During

During the time of the eclipse the following observations were made on each thermometer.

Apparent time.	Thermometer in the shade.	Thermometer in the Sun.
At 9 11 //	53	62
9 30	53	
9 38	$53\frac{1}{4}$	$70\frac{1}{2}$
9 52	$52\frac{3}{4}$	69
10 14	$51\frac{1}{4}$	$60\frac{3}{4}$
10 32	$49\frac{1}{2}$	$53\frac{1}{2}$
10 44	49	53
10 50	$49\frac{1}{2}$	$54\frac{1}{2}$
11 20	$51\frac{1}{4}$	59
11 37	$53\frac{1}{4}$	$63\frac{1}{4}$
12 10	$55\frac{1}{2}$	$66\frac{1}{2}$

For several minutes before and after the middle of the eclipse, the air was very sensibly colder.

I am, my Lord,

Your Lordship's most obedient
humble servant,

Oxford, April 30,
1764.

Thomas Hornsby.