

XLIII. *Astronomical Observations, made in the Forks of the River Brandiwine in Pennsylvania, for determining the going of a Clock sent thither by the Royal Society, in order to find the Difference of Gravity between the Royal Observatory at Greenwich, and the Place where the Clock was set up in Pennsylvania; to which are added, an Observation of the End of an Eclipse of the Moon, and some Immersions of Jupiter's First Satellite observed at the same Place in Pennsylvania: By Charles Mason and Jeremiah Dixon.*

Read December 15, 1768.

The Place where these Observations were made is the Northernmost Point of the Lines that were measured for a Degree of Latitude, or Point N. (see TAB. XIII. fig. 2.) relative to that Measure; it lies 31 Miles West, by Measurement; and 10", 5 South of the Southernmost Point of the City of Philadelphia, as found by the Sector.

1766		Time per Clock.							
Decemb. d	h	'	"	h	'	"			
24	{	4	28	40	5	25	3	} Equal Altitudes of Capella.	
.. *		30	18+	26	40				
.. *		32	5½						
28	{	4	28	41	5	20	59	} Equal Altitudes of ditto.	
.. *		30	22+	22	47-				
.. *		32	10	24	30½				
30	{	4	5	52½	5	43	24+	} Equal Altitudes of ditto.	
.. *		7	12	44	46½				
.. *		8	34	46	4½				
1767									
January.									
24	{	1	4	10	33	5	37	45	} Equal Altitudes of ditto.
		11	55	39	10				
		13	19½	40	31-				
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[ 33° ]

1767		Time per Clock.					
January.	d	h	'	"	h	'	"
♄	7	3	50	26	5	55	8½
			51	39+		56	27
			52	56½		57	41½
} Equal altitudes of Capella.							
♃	8	4	4	48	5	40	3
			6	7½		41	24
			7	30—		42	44½
} Equal altitudes of ditto.							
.. * ..	12	59	30	} The first Satellite of Jupiter immerged.			
} Apparent time 8 17 42 47½							
♃	10	6	21	28	8	2	45
			22	43		4	3
			24	00		5	18—
} Equal altitudes of Castor.							
.. * ..	7	34	18	} The first Satellite of Jupiter immerged.			
} Apparent time 10 12 10 23.							
♄	16	4	5	4+	5	35	23
			6	25		36	47
			7	50		38	7
} Equal altitudes of Capella.							
♃	19	4	4	8½	5	34	44
			5	27½		36	8
			6	52		37	29
} Equal altitudes of ditto.							
♄	27	3	32	53	6	2	7
			34	5—		3	21½
			35	19½		4	34½
} Equal altitudes of ditto.							
February.							
♄	3	4	21	12½	6	36	10½
			22	22		37	24
			23	35+		38	34 :
} Equal altitudes of β Aurigæ . . Windy.							
♄	4	3	34	52—	5	56	0½
			36	5		57	16+
			37	20		58	29
} Equal altitudes of Capella.							
♃	8	3	55	32	5	33	5½
			56	50+		34	26+
			58	12		35	45½
} Equal altitudes of ditto.							
♃	16	13	44	50	} The first Satellite of Jupiter was not immerged } flying		
.. * ..	13	46	25	} Ditto was immerged. } clouds.			
♄	25	4	11	43—	5	7	9
			13	21		8	55½
			15	7—		10	32+
} Equal altitudes of Capella.							
.. * ..	10	42	50 ::	} First Satellite of ♃ immerged. Ap. time 25 <sup>d</sup> 12 <sup>h</sup> 24 <sup>'</sup> 40 <sup>"</sup> ::			
} From							

From these observations we have the time of Capella's passing the meridian, and the rate of the clock's going as follows :

1766	* passed merid. per clock.	Clock loses of Sid. time per day.	Mean rate of therm.	1764 March.	D eclipsed Time per watch.
Decemb.	h ' "	" "	o	h ' "	" "
24	4 57 40+	16,3	35	h 17 8 4 10	Eclipse of the D ended.
28	56 35	18,0	23		
1767	30	55 59	13,4		
January.	1	55 32+	14,8		
	7	54 3	17,0		
	8	53 46	16,3	8 58 46	10 27 30 :: } Equal altitud. of Regul.
	16	51 36	16,0	9 1 16	29 41
	19	50 48+	15,63	4 5	32 9
	27	48 43+	15,35	The watch went very regular sider. time.	
February.	4	46 40½	15,5	—Hence the eclipse ended at 8 <sup>h</sup> 21' 59" app. time, in the forks of the river Brandiwine.	
	8	45 38½	15,9		
	25	41 8—			

N. B. The edge of the earth's shadow on the D's disk was the best defined I ever saw : it was remarkably distinct from the penumbral shade.

N. B. The clock was firmly screwed to a piece of timber, 22 inches in breadth, and five inches and a quarter thick ; the said piece of timber was let four feet into the ground, which was composed of a very firm, dry, hard clay.

The clock was placed in a tent, with Fahrenheit's thermometer hung to its side ; and a blanket was wrapped round the clock and thermometer, to secure it from any wind that might enter the tent. The pendulum was adjusted to the upper scratch, with N<sup>o</sup> 3, at the Index, as directed by the Rev. Mr. Maskelyne, Astronomer Royal : but the spring at the suspension of the pendulum having been broke, (when the ship, in which it was sent, was wrecked on the Jersey coast) we cannot be certain that the pendulum is now of the same length as it was when sent from London.

Those observations marked : are a little dubious ; those marked :: are very dubious ; those marked . . \* were made per Mr. Dixon. The eclipses of U's satellites were observed with a reflecting telescope of one foot focus, that magnified about 70 times.

1766	Height of the ther. at about 7 <sup>h</sup> in the mor. in the Tent Air		Height of the ther. at about 2 <sup>h</sup> in the after. in the Tent Air		Vibration of the pend. on each side of O. that is, half the arch of vibration.
Decemb. a					
§	24	.. ..	43	45—	
	25	.. ..	44	46	
	26	38 37	45	47	1 40—
	27	38 41	40	42	
	28	21 18	31	26	1 35
	29		28	28	Near midn. the ther. in the Tent 20 Air 16
	30		32	32	At 10 <sup>h</sup> ¼ P. M. therm. in the Tent 29 Air 28
	31	5 above O. 3 below O.	18	20	Near midn. in the Tent 17 Air 14

Height of the  
ther. at about 7<sup>h</sup>  
in the mor. in the  
Tent Air

Height of the  
ther. at about 2<sup>h</sup>  
in the aft. in the  
Tent Air

Vibration of  
the pend. on  
each side of O.  
that is, half  
the arch of vi-  
bration.

1766  
Decemb. d

31 At 8<sup>h</sup> $\frac{1}{2}$  P. M. ther. in the tent at O. in the air at 7 below O.  
1767 At 10<sup>h</sup> $\frac{1}{2}$  P. M. ditto in the tent at 3 below O. in the air at 13 below O.  
Jan. 1 At 7<sup>h</sup> 6' in the morn. the ther. in the { Tent 10 }  
{ Air 20 } below O.  
At 10<sup>h</sup> 45' P. M. ther. in the { Tent 21 }  
{ Air 17 } above O. Vibration = 1° 12'  
At 11<sup>h</sup> 4' P. M ditto in the { Tent = 3 }  
{ Air = 12 } below O Vibration = 1 10

2 At 6<sup>h</sup> 42' in the morn. ther. in the { Tent 9 }  
{ Air 22 } below O.  
At 10 ditto vibration of the pendulum = 1° 5' on each side of O.  
The pendulum now swings a little farther on the west side of O. than  
on the east side. The clock faces the north.

21 15 1° 7' At 9 P. M. In the { Tent 9 }  
{ Air 5 }

5 3 11 9  
⊙ 4 before ⊙ rise 34 39 39 1° 20'  
5 37- 37 48 49 1 35 { Pend. now swings rather far-  
{ theft on the east side of O.  
6 49 53 54 1 40 At 8 $\frac{1}{2}$  P. M. in the { Tent 43 }  
{ Air 44 }

7 At 11<sup>h</sup> P. M. in the tent 25, in the air 26.  
8 28 at 10 $\frac{1}{2}$  P. M. ther. in the tent 23.  
9 17 40 40 1° 35' { Pend. swings 8' more on the  
{ east side of O. than on the w.  
10 43 At midn. ther. in the air 25.  
⊙ 11 50 47

12 At 4 P. M. in the { Tent 42 }  
{ Air 44 }  
13 42 45 1° 40' The pend. swings as on the 9th.  
14 23 33 33  
15 33 39 41

1767 January	Height of the ther. at about 7 <sup>h</sup> in the mor. in the		Height of the ther. at about 2 <sup>h</sup> in the aft. in the		Half the arch of vibration.	
	Tent	Air	Tent	Air		
16	30	30	39	37	1° 35'	The pend. fwings as before.
	At 9 <sup>h</sup> 5½ P. M. ther. in the				{ Tent 24 Air 21	
17	at 9 <sup>h</sup> A. M. { 28 tent 25 air		43	39		
18	33	31	39	39		
19	25	26	39	36		At 9 <sup>h</sup> ½ P. M. ther. in the { Tent 21 Air 18
20			39	40		
21	39	39	40	40		
22	23	21	27	27	1° 30'	{ The pendulum fwings to the eastward as before.
23	25	23	32	32		
24	32	32	43	40	1° 30'	Wound up the clock.
15	32	32	31	30		
26	28	27	At 4 <sup>h</sup> ¼ P. M. ther. in the		{ Tent 32 Air 32	
27	21	20	At 4 <sup>h</sup> ½ P. M. in the		{ Tent 27 Air 25	
			9 ditto		{ Tent 15 Air 12	
28	11	14	36	32	1° 20'	The pendulum fwings as before.
29	15	13	35	34		
30	16	16	31	35	1 20	
31	32	35	At 4 <sup>h</sup> ¼ P. M. in the		{ Tent 36 Air 36	
Feb:	1	36	36	37		
	2	15	40	34		
	3	16	41	38	1° 30'	
			At 9 <sup>h</sup> ½ P. M. in the		{ Tent 26 Air 25	
	4	14	34	32	1° 30'	
		At 9 <sup>h</sup> P. M. in the		{ Tent 24 Air 23		
	5	30	45	41		
	6	13	28	24	1 30	
	7	13	34	36		

1767 Febr.	Height of the ther. at about 7 <sup>h</sup> in the mor. in the		Height of the ther. at about 2 <sup>h</sup> in the aft. in the		Half the arch of vibration.
	Tent	Air	Tent	Air	
8	25	24	54	52	1° 35'
	At 8 <sup>h</sup> $\frac{1}{2}$ P. M. in the		{ Tent 33 Air 32		
9	32	32	42	41	
10	41	41	34	35	
11	25	25	40	38	1 40 The pendulum swings as before.
12	30	29	38	41	
13	31	31	32	33	
14	28	24			
15	26	27	At 4 <sup>h</sup> P. M. in the { Tent 34 Air 33		
16	18	10	39	48	
17	25	17	28	28	
19			39	44	
♀ 20	near noon	{ tent 46 air 55	48	59	
☉ 22	14	12			
♂ 28			69		1° 40' { Pend. vibrates about 8' farther on the E. side of O, than on the W. side of O, as before.
March 1			56		
2			46		
3			57		
4			49		
5			51		
6			51		
7			48		
8			56		
9			51		
10			50		
12	at ☉ rise	11	26		
13	ditto	7	28		
14			36		
15			47		
16			71		
17			67		
18	snow				
June 4			91		
5			95		
6			95		

The point of the pendulum swings something farther back from the arch (showing the degrees and minutes) than it did when it was set up.

Took down and packed up the clock.

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1767 June	d	Height of the ther. at about 7 <sup>h</sup> in the mor. in the		Height of the ther. at about 2 <sup>h</sup> in the aft. in the	
		Tent	Air	Tent	Air
	7				93
	8				91
	9				80
	10	At 4 <sup>h</sup> $\frac{1}{2}$ P.M.		at 7 <sup>h</sup> P.M. 80	

{ The air much altered, being very cool and  
pleasant.

N. B. The thermometer is in the shade, and in the same place it was in last winter.

XLIV. *Extract*