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 Decemb.	d	Time per Clock. h	′	″	h	′	″	
☿ ·· ✱ ··	24	4	28	40	.	.	.	
			30	18+	5	25	3	Equal Altitudes of Capella.
			32	5½		26	40	
·· ✱ ··	28	4	28	41	5	20	59	
			30	22+		22	47−	Equal Altitudes of ditto.
			32	10		24	30½	
·· ✱ ··	30	4	5	52½	5	43	24+	
			7	12		44	46½	Equal Altitudes of ditto.
			8	34		46	4½	
1767 January.								
♃	1	4	10	33	5	37	45	
			11	55		39	10	Equal Altitudes of ditto.
			13	19½		40	31−	

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

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 state of therm.
Decemb.		h	′	″	″	°
	24	4	57	40+	16,3	35
	28		56	35	18,0	23
1767	30		55	59	13,4	6
January.	1		55	32+	14,8	37
	7		54	3	17,0	20
	8		53	46	16,3	37
	16		51	36	16,0	31
	19		50	48+	15,63	33
	27		48	43+	15,35	28
February.	4		46	40½	15,5	30
	8		45	38½	15,9	35
	25		41	8—		

1764 March. ☽ eclipsed Time per watch.

	h	′	″		
♑ 17	8	4	10	Eclipse of the ☽ ended.	
	h	′	″		
	8	58	46	10 27 30 ::	Equal altitud. of Regulus.
	9	1	16	29 41	
		4	5	32 9	

The watch went very regular sider. time.

—Hence the eclipse ended at $8^h\ 21'\ 59''$ app. time, in the forks of the river Brandiwine.

N. B. The edge of the earth's shadow on the ☽'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 wraped 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° 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 ♃'s satellites were observed with a reflecting telescope of one foot focus, that magnified about 70 times.

1766 Decemb. d		Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the after. in the Tent	Air	Vibration of the pend. on each side of O. that is, half the arch of vibration. ° ′	
☿	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		
	30			32	32		
	31	5 above O.	3 below O.	18	20	both above O.	

Near midn. the ther. in the { Tent 20 Air 16

At $10^h\frac{1}{4}$ P. M. therm. in the { Tent 29 Air 28

Near midn. in the Tent 17 Air 14

		Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	Vibration of the pend. on each side of O. that is, half the arch of vibration.	
1766 Decemb.	d						
	31	At $8^h\frac{1}{4}$ P. M. ther. in the tent at O. in the air at 7 below O.					
1767		At $10^h\frac{1}{4}$ P. M. ditto in the tent at 3 below O. in the air at 13 below O.					
Jan.	1	At 7^h 6′ in the morn. the ther. in the { Tent 10 / Air 20 } below O.					
		At 0^h 45′ P. M. ther. in the { Tent 21 / Air 17 } above O. Vibration = 1° 12′					
		At 11^h 4′ P. M ditto in the { Tent = 3 / Air = 12 } below O Vibration = 1 10					
	2	At 6^h 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 }
♄	3	11	9				
☉	4	before ☉ rise	34	39	39	1° 20′	
	5	37	37	48	49	1 35	{ Pend. now swings rather farthest 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^h 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	d	Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	Half the arch of vibration.	
	16	30	30	39	37	1° 35′	The pend. ſwings as before.
		At 9h 5½ P. M. ther. in the { Tent 24 / Air 21					
	17	at 9h A. M. { 28 tent / 25 air		43	39		
☉	18	33	31	39	39		
	19	25	26	39	36	At 9h 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 ſwings 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 4h ½ P. M. ther. in the { Tent 32 / Air 32			
♂	27	21	20	At 4h ½ P. M. in the { Tent 27 / Air 25			
				9 ditto		{ Tent 15 / Air 12	
	28	11	14	36	32	1° 20′	The pendulum ſwings as before.
	29	15	13	35	34		
	30	16	16	31	35	1 20	
	31	32	35	At 4h ¼ P. M. in the { Tent 36 / Air 36			
Feb.	1	36	35	36	37		
	2	15	13	40	34		
	3	16	15	41	38	1° 30′	
				At 9h ½ P. M. in the { Tent 26 / Air 25			
	4	14	10	34	32	1° 30′	
		At 9h P. M. in the { Tent 24 / Air 23					
	5	30	32	45	41		
	6	13	12	28	24	1 30	
	7	13	12	34	36		

1767	d	Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	Half the arch of vibration.		
Febr.	8	25	24	54	52	1°	35′	
		At 8h ½ 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 4h 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 (ſhewing the degrees and minutes) than it did when it was ſet up.

Took down and packed up the clock.

1767		Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	
June	6					
	7				93	
	8				91	
	9				80	The air much altered, being very cool and pleaſant.
	10	At 4h ½ P.M.		90 at 7h P.M.	80	

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

XLIV. *Extract*