

open Cistern of the other. The Parts thus dispos'd, and the Stop-cock being turn'd, the Condens'd Air proceeds strongly thro' the Swan-neck Pipe, which discharges it into the Horizontal Tube .C. Whose Currency so lessens the Pressure of the Atmosphere upon the Cisterns of the respective Barometers as to cause the Mercury to descend 2 inches at least. And 'tis observable, That that Barometer which is 3 foot distant from the Current Air is equally affected, and subsides parallel with the other. Likewise it is to be noted, that as the Current Air is weakned in its force, so doth the Weight of the Atmosphere again Encrease, and the Mercury in the Barometers gradually Ascend.

III. *An Account of some Eclipses of the Sun and Moon, observed by Mr Tho. Brattle, at Cambridge, about four miles from Boston in New-England, whence the Difference of Longitude between Cambridge and London is determin'd, from an Observation made of one of them at London. By J. Hodgson.*

ON the 12th of June 1694. in the morning I went to the Colledge at Cambridge, about 4 miles from Boston, and observed, with the Bra's Quadrant there, with Tellecopick Sights, the Rays of the Sun being transmitted through one of the said Sights, on a clean Paper, pasted on a plain piece of Board, and fastned at right angles at about a foot distance from the said Sight, on which Paper I had drawn a Circle between 2 and 3 Inches Diameter equal to the Suns disk, and within that several Concentrick Circles dividing the Diameter into 24 equal

equal parts, whereby I could observe to $\frac{1}{2}$ a digit, the room in which the Observation was made was darkened with Blankets, and in order to render the Observation the more Exact (Mr *Henry Newman* assisting me all the while) I took the Altitude of the Sun with the aforesaid Quadrant, as followeth.

Observations made of the Suns Altitude before the Eclipse began, in order to rectifie the Watch.

By the Watch		Comp. Altit.		Time by Calcul.		differ.		
h ' "								
at	{	8 26 37	—	49 31	}	8 16 40	—	9 57
		31 27	Mane	48 26		21 40	9 47	
		38 26	—	47 20		28 32	9 54	

The Eclipse was first perceiv'd at 9 25 by the Watch, at which time the Sun had scarcely been eclips'd 1 minute, so that

By the Watch		True time.			
h ' "		h ' "			
At	{	9 24	—	9 14	It began
		9 32	—	9 22	about 1 digit eclipsed
		9 48	—	9 38	full 3 digits.
		9 57 $\frac{3}{4}$	—	9 48	about 4
		10 06	—	9 56	near 5
		10 15	—	10 05	full 6
		10 33	—	10 23	about 8
		10 43	—	10 33	full 9
		10 47	—	10 37	full 9 $\frac{1}{2}$
		10 53	—	10 43	full 10
		10 59	—	10 49	about 10 $\frac{1}{2}$
		11 03	—	10 53	better than 10 $\frac{1}{2}$
11 06	—	10 56	much the same		
11 09	—	10 59	rather decreasing		

By

(1632)

By the Watch

True time

	II 10 $\frac{1}{2}$	—————	II 00 $\frac{1}{2}$	sensibly decreased near
				$\frac{1}{4}$ of a digit
	II 14 $\frac{1}{2}$	—————	II 04 $\frac{1}{2}$	nearest to 10 digits
	II 25	—————	II 15	full 9 digits, <i>i. e.</i> full 3
				3 digits restor'd, or
				the Shadow rather
				within 9 digits
	II 29	—————	II 19	8 $\frac{1}{2}$ complet
	II 34 $\frac{1}{2}$	—————	II 24 $\frac{1}{2}$	full 8 digits
At	II 44	—————	II 34	full 7
	II 48	—————	II 38	full 6 $\frac{1}{2}$ digits
	II 52 $\frac{1}{2}$	—————	II 42 $\frac{1}{2}$	just 6
	o 02 $\frac{1}{2}$ P. M.	—————	II 52 $\frac{1}{2}$	just 5
	o 13	—————	o 03 P.M.	full 4
	o 26	—————	o 16	full 2 $\frac{1}{2}$
	o 32	—————	o 22	better than 2
	o 41	—————	o 31	better than 1
	o 48	—————	o 38	ended.

Observations made after the Eclipse was done, of the Sun's Altitude, in order to rectify the Watch.

Time by the Watch Comp. Altit. True time. differ.

	h	'	"											
At	}	3	31	30	} P. M.	45	52	}	3	21	36	}	9	54
			36	15		46	23			26	16		9	59
			38	10		46	45			28	16		9	54
			46	50		48	19			36	48		10	02
			48	10		48	30			38	20		9	50

Hence it appears, that the Watch went about 10 minutes too fast during the whole Eclipse, as we have all the way allowed.

(1633)

So that the Eclipse

h

Began at 9 14 Mane.

Ended at o 38 P. M.

Lasting in all 3 24.

Note, that in the Calculation, the Latitude of *Boston* was allowed to be 42. 25.

The second is of a Lunar Eclipse, that happen'd *Feb.* the 11th, 1700, in the evening, as follows.

The Moon rose eclipsed, and the Horizon was so over-cast, that I despair'd of having any observation; but at $\frac{1}{2}$ an hour past 6 she came from under the Cloud, and at 6 h 25' I had just a sight of her, and judge her eclips'd about 5 digits, at

h

6 29 The Section equidistant from M. *Ætna* & *Horminius*.

32 *Palus Maræotis* begins to be seen.

34 $\frac{1}{2}$ *Palus Maræotis* and *Mons Apollonius* $\frac{1}{2}$ out.

37 $\frac{1}{2}$ *Palus Maræotis* quite free, and *Palus Maræotis* and *Palus Mæotis* in the perpendicular.

42 $\frac{3}{4}$ The Shadow near an Inch from *Palus Maræotis*, *Mons Horminius* and *Mons Hercules*.

46 $\frac{1}{4}$ *Palus Maræotis* in the Nadir, and that part of *Palus Mæotis* to my right hand in the Prime Vertical.

57 The upper part of the Section is now, and has been for a long time in *Insula Major* in *Mare Caspio* (and the Section now perpendicular) and the lower part wheeling about from *Palus Maræotis*.

7 20 Mount *Sinai* first appears at 22' wholly free.

25 $\frac{1}{2}$ *Palus Maræotis* and *Mons Horminius* near perpendicular.

43 The Eclipse over in the Telescope, and at 49 to to the naked Eye.

My Clock was set by my Ring-Dial about 9 a Clock in the morning, as exactly as I could judge, and the ob-

Y y y y y y y y

servation

(1634)

servation was made with my $4\frac{1}{2}$ foot Telescope, with all four Glafles in it.

The Observacion of the Eclipse of the Sun on the 27th of *November* 1703, was as follows.

At half an hour past 8 in the morning, I set my Clock exactly by my Ring-Dial, and at half an hour past 9 they nicely agreed, at

- h
- 10 00 The Sun was not touch'd.
 - 06 The Moon enter'd on the S S W Point as near as I could judge.
 - 15 The Eclipse was considerably advanc'd.
 - 20 seem'd to be about half a digit eclipsed, rather more than less, and the Section to be a small matter more Westwardly.
 - 10 25 Much the same, and near the same point.
 - 30 seem'd to be less.
 - 33 $\frac{1}{2}$ The middle of the Section nearer the S W, and the Diameter of the Section less every way.
 - 37 $\frac{1}{2}$ Much less and nearer the West.
 - 44 $\frac{1}{2}$ It ended, and was just over, going off near the S W, so that all the while it was within a point or two of the place where it first came on, or between the S S W and the S W.

I judg'd when it was at the height, that the Chord of the eclipsed part was nearest equal to the side of an inscrib'd Decagon, or subtended about $\frac{1}{10}$ of the Periphery of the Sun's Disk.

I observ'd this Eclipse with a Telescope of one joynt, 4 foot and a half in length, and had only 2 Glafles, so that it inverted the object; and I had a red Glafs which suited it, so that I could screw it in just before the Eye-Glafs, and was not fain to hold it in my hand, as when
I ob-

(1635)

I observ'd the Sun's Altitude with the brass Quadrant, which was a great convenience.

The last is an Observation of the Eclipse of the Moon on *December* the 12, 1703 in the morning.
Time by the Clock.

- h
- 11 45 That part of the Moon's Disk near 'Alabastrinus, looks somewhat dusky, and the Eclipse beginning to enter between Palus Maræotis and M. Porphyritis.
 - 11 53 The true Shadow was well entred.
 - 58 M. Porphyritis just cover'd.
 - 12 03 $\frac{1}{2}$ near 3 digits darkened.
 - 7 $\frac{1}{2}$ Mount *Ætna* begins.
 - 9 $\frac{1}{2}$ quite covered.
 - 14 $\frac{1}{2}$ *Lacus Niger major* and M. Sinai almost equidistant from the Section of the Shadow, *Lacus Niger Major*, being somewhat the nearer of the two.
 - 18 $\frac{1}{4}$ *Lacus Niger Major* begins 19 $\frac{1}{2}$ quite covered.
 - 21 $\frac{3}{4}$ Mount Sinai begins.
 - 21 $\frac{3}{4}$ Quite covered and the Moon about 6 digits eclipsed.
 - 12 24 $\frac{1}{2}$ *Besbicus* begins.
 - 26 Quite covered.
 - 28 $\frac{1}{4}$ *Byfantium* begins.
 - 29 $\frac{1}{2}$ Covered and Mount *Horninius* begins.
 - 32 *Apollonia* begins.
 - 33 Covered.
 - 37 The Shadow equidistant from M. *Corax* and Mount *Paropamisus*, or somewhat nearer to Mr *Corax*.
 - 39 $\frac{1}{2}$ between 9 and 10 digits eclipsed.
 - 43 M. *Corax* begins.

Y y y y y y y y 2

- h
- 12 44 $\frac{3}{4}$ Palus Mæotis begins, and at 45 $\frac{3}{4}$ the inner of M. Paropamisus begins.
- 50 Palus Mæotis quite covered.
- 51 $\frac{1}{2}$ The Moon not quite eclipsed.
- 52 Nor yet.
- 53 Nor yet.
- 54 Scarce.
- 54 $\frac{1}{2}$ Quite Immerg'd and the Moræ begins.
- 14 39 Precisely, the Emerg'd between Palus Maræotis and Mons Porphyritis.
- 42 Palus Maræotis begins.
- 43 Quite clear.
- 47 M. Porphyritis quite clear.
- 55 About 3 digits restor'd.
- 59 Mount Ætna begins.
- 15 02 That and Lacus Niger Major at the same time clear.
- 8 $\frac{1}{2}$ Mount Sinai about half free.
- 9 $\frac{1}{2}$ Quite free, and about 6 digits restored.
- 15 Besbicus free
- 19 $\frac{1}{4}$ Byfantium free.
- 29 $\frac{1}{2}$ About 9 digits seem'd to be restor'd.
- 30 $\frac{1}{4}$ Mons Herculis free.
- 32 $\frac{3}{4}$ Palus Mæotis begins.
- 38 $\frac{1}{2}$ Quite free.
- 41 $\frac{1}{2}$ Infula Major in Mare Caspio free, and in the middle of the Section.
- 42 $\frac{1}{2}$ Not yet wholly clear.
- 45 Fully over in the Telescope, tho a kind of a Smoak remained some little after to the naked Eye.

In order to the adjusting of the time, I set my Clock with the greatest exactness I could the morning preceding, both from my Ring-Dial and the rising of the Sun, which I very narrowly watch'd and observed, and found it to agree

(1637)

agree with the Sun's setting the following evening; so that it went all the time the Eclipse was, very steadily and regularly; but for the greater Certainty and Satisfaction, I took the Altitudes of the following Stars with the Brass Quadrant with Telescope Sights out of my Chamber Window, the lowness whereof would not permit me to take them, when they were at all higher elevated.

* in dextro humero Orionis.
By the Watch Comp. Alt.

				Differ.					
h		h	"	'	"				
6	15	78	18	6	13	40	1	20	So that my Clock went by these Ob- servati- ons near- est 1' too fast.
6	21 $\frac{1}{2}$	77	03	6	20	28	1	02	
	26 $\frac{1}{4}$	76	11	6	25	08	1	07	
Procyon									
8	9 $\frac{1}{4}$	77	20	8	08	04	1	11	
	14 $\frac{1}{2}$	76	20	8	13	32	0	58	
	21	75	13	8	19	36	1	24	
Re-	10 8 $\frac{1}{2}$	77	46	10	07	18	1	12	
gulus	17 $\frac{1}{4}$	76	11	10	15	58	1	17	

This is all the account that can be given at present, by

Sir,

Your Humble Servant,

T. B

I had the good fortune (by the assistance of some ingenious Friends in *Finch-Lane*, near the *Exchange*) to make some few observations of the last, of *December* the 11th, 1704 (of which I gave an account to this Honourable Society some time since) as follows.

The Heavens being cloudy most part of the night, it was 35' after 4 in the morning following, before I could

could perceive that the Moon was eclipsed, and then as near as I could judge, she had been so about 3 or 4 minutes at most, from whence we may conclude it began at *London* about 31 or 32 minutes after 4 the same morning.

Mr *Brattle* found, that at 44 minutes after 11 at Night, part of the Moon's Disk look'd somewhat duskish, and that at 52 minutes, the Shadow was well entred, so that from hence, as well as from a Comparison of the Ingress and Egress of the principol Spots, it probably began there about 49 minutes after 11, whence it follows, that *Cambridge in New England* lies $4^{\text{h}} 4' 2^{\frac{1}{2}}$, or $70^{\circ} 37'$ to the Westward of the Meridian of *London*.

I happen'd to see the Moon the same morning at 35 minutes after 5, when she wanted at most but 3 minutes of being totally eclipsed; so that at *London* she immerg'd at 38 minutes past 5.

Mr *Brattle* saw her immerge exactly at 54 minutes after 12, whence it follows, that the difference of the Meridians found by comparing these observations, is $4^{\text{h}} 43^{\frac{1}{2}}$, or $70^{\circ} 52'$ agreeing very well with the former; so that by taking a mean between them, the difference of Longitude of the 2 Places is $4^{\text{h}} 43'$, or $70^{\circ} 45'$.

I saw no more of the Eclipse that morning, and should be very glad to meet with some other observations to confirm these, but their mutual agreement gives great reason to believe that the Deductions are good, and may be rely'd upon.