

No. III.

Abstracts of Calculations to ascertain the Longitude of the Capitol, in the City of Washington, from Greenwich Observatory, in England. By William Lambert.—Read July 18th, 1817.

JANUARY 21st, 1793.

Occultation of α *Tauri* (Aldebaran) observed by Andrew Elliott, Esq. supposed to have been at the Capitol, in the city of Washington. Latitude of the place of observation stated at $38^{\circ} 52' 40''$ North.

Latitude of the place, reduced (320 to 319)	-	38° 42' 9".51 N.
Longitude assumed for the calculation	-	76 46 0.0 W.

Immersion, at	7h 55' 49".50	}	P. M. apparent time.
Emersion, at	9 25 21.50		

By De La Lande's Tables.

Star's <i>mean</i> right ascension	66° 0' 57".64	<i>Mean</i> declination N.	16° 4' 47".47
Nutation	— 0 2.87	Nutation	— 0 9.10
Aberration	+ 0 11.84	Aberration	+ 0 0.27
	66 1 6.61		16 4 38.64
Right ascension	-	Declination N.	-
	66 1 6.61		16 4 38.64
Obliquity of the ecliptic, January 21st, 1793		-	23° 27' 48".32
Star's longitude, by computation		-	66 53 59.50
latitude, south		-	5 28 54.0

Moon's Longitude at Greenwich (Naut. Alm.).

1793. Jan. 20.	Midnight	53° 46' 59" A	+	6° 12' 35" a 1	-	3' 14" a 2	
	21. Noon	59 59 34 B	+	6 9 21 b 1	-	2 50 b 2	+ 24' a 3
	Midnight	66 8 56 C	+	6 6 31 c 1	-	2 26 c 2	+ 24 b 3
	22. Noon	72 15 26 D	+	6 4 5 d 1	-		0' a 4
	Midnight	78 19 31 E	+				

Moon's Latitude, South.

1793. Jan. 20. Midnight	4° 46' 3" A								
21. Noon	4 56 59 B	+	10'	56" a 1	-	3' 31" a 2	-	0' 2" a 3	+ 5" a 4
Midnight	5 4 24 C	+	7	25 b 1	-	3 33 b 2	+	0 3 b 3	
22. Noon	5 8 16 D	+	3	52 c 1	-	3 30 c 2			
Midnight	5 8 38 E	+	0	22 d 1					

By the Immersion.

Apparent time of the immersion	7h 55' 49".50			118° 57' 22".50
Estimated longitude, West,	5 7 4.			
Corresponding time at Greenwich	13 2 53.50	Sun's R. A.	304 52 19.03	
Right ascension of the meridian, from beginning of ♍	-	-	63 49 41.53	
Do. do. from beginning of ♋	-	-	153 49 41.53	
Altitude of the nonagesimal	-	-	72 51 36.14	
Longitude of the nonagesimal, from beginning of ♍	-	-	68 53 14.05	
Moon's true longitude (Naut. Alm.)	-	-	66 41 2.33	
true latitude, South,	-	-	5 4 52.75	
true distance from the nonagesimal (West)	-	-	2 12 11.72	
equatorial horizontal parallax	-	-	0 55 7.78	
horizontal parallax reduced (320 to 319)	-	-	0 55 3.71	
parallax in longitude	-	-	0 2 3.74	
apparent distance from the nonagesimal (West)	-	-	2 14 15.46	
parallax in latitude	-	-	0 21 7.91	
apparent latitude, South,	-	-	5 26 0.66	
augmented semidiameter, arising from apparent altitude	-	-	0 15 15.26	
inflexion of light	-	-	- 0 2.98	
semidiameter, corrected	-	-	0 15 12.28	
Difference of apparent latitude, * south of ♃'s center	-	-	0 2 53.34	

To find the Difference of Longitude between the Moon's Limb, at the Point of Occultation, and the Moon's Center.

Moon's semidiameter, corrected	-	912".28		
Difference of apparent latitude	-	173.34		
	Sum,	1085.62	-	log. 3.0356778
	Diff.	738.94	-	log. 2.8686092
				2)5.9042870
				2.9521435
Arith. comp. cosine Moon's apparent latitude	-		-	0.0019558
Diff. ♃'s longitude	-	14' 59".70	=	899".70
				log. 2.9540993

Star's longitude,	-	-	-	-	66° 53' 59".50
Parallax in longitude,	-	-	-	-	+ 2 3 .74
True longitude γ 's limb, at the point of occultation,	-	-	-	-	66 56 3 .24
Difference of longitude,	-	-	-	-	- 14 59 70
True longitude of γ 's center, by calculation,	-	-	-	-	66 41 3 .54
Apparent time at Greenwich, when the Moon had that longitude,	-	-	-	-	13h 2' 55".86
Apparent time of the immersion at Washington,	-	-	-	-	7 55 49 50
Longitude, in time, found by the immersion,	-	-	-	-	5 7 6 .36
				Equal to	76° 46 35 .40

By the Emersion.

Apparent time of emersion	9h 25' 21".50	141° 20' 22".50
Estimated longitude, West,	5 7 4 .—	
Corresponding time at Greenwich	14 32 25 .50	Sun's R. A. 304 56 14 29
Right ascension of the meridian, from beginning of φ	-	86 16 36 .79
Do. do. from beginning of γ	-	176 16 36 .79
Altitude of the nonagesimal	-	74 43 18 .57
Longitude of the nonagesimal, from beginning of φ	-	86 59 19 .53
Moon's true longitude (Naut. Alm.)	-	67 26 43 .90
true latitude, South,	-	5 5 30 .86
true distance from the nonagesimal (West)	-	19 32 35 .63
equatorial horizontal parallax	-	0 55 6 .04
horizontal parallax reduced (320 to 319)	-	0 55 1 .97
parallax in longitude	-	0 18 5 .56
apparent distance from the nonagesimal (West)	-	19 50 41 .19
parallax in latitude	-	0 19 8 .96
apparent latitude, South,	-	5 24 39 .82
augmented semidiameter, arising from apparent altitude	-	0 15 14 .09
inflexion of light	-	— 0 2 .98
semidiameter, corrected	-	0 15 11 .11
Difference of apparent latitude, * south of γ 's center	-	0 4 14 .18
Moon's semidiameter, corrected	-	91" 11
Difference of apparent latitude	-	254 .18
	Sum,	1165 .29 - log. 3.0664340
	Diff.	656 .93 - log. 2.8175191
		2)5.8839531
		2.9419765 5
Arith. comp. cosine Moon's apparent latitude	-	0.0019406.6
Diff. γ 's longitude	-] <u>14' 38".85</u> = <u>878".85</u>	log. <u>2.9439172</u>

Star's longitude,	-	-	-	66° 53' 59".50
Parallax in longitude,	-	-	-	+ 18 5 .56
True longitude of ☽'s limb, at the point of occultation	-	-	-	67 12 5 .06
Difference of Moon's longitude,	-	-	-	+ 14 38 85
True longitude, Moon's center, by calculation,	-	-	-	67 26 43 .91
Apparent time at Greenwich, when the Moon had that longitude,	-	-	-	14h 32' 25".52
Apparent time of emersion at Washington,	-	-	-	9 25 21 .50
Longitude, in time, found by the emersion,	-	-	-	5 7 4 .02
Equal to	-	-	-	76° 46 0 .30
By the immersion,	-	-	-	76 46 35 .40
Mean result—Longitude found by occultation of January 21st, 1793,	-	-	-	76 46 17 .85

OCTOBER 20th, 1804.

Occultation of ν Pleiadum (Alcyone,) by the Moon, observed by Messrs. Abraham Bradley and Seth Pease, North 75° W. one mile $\frac{7}{10}$ ths (estimated) from the Capitol. Difference of longitude, — $1' 49''.75$.

Latitude of the place of observation, estimated,		38° 53' 30".00 N.
Do. do. reduced (320 to 319)		38 42 59 .44
Longitude assumed for the calculation	-	76 56 51 —W.
Time of immersing by watch,	9h 30' 2".—	
Watch too fast,	— 7 32 .8	
Apparent time of immersion,	9 22 29 .2	
Time of emersion, by watch,	10h 24' 40".—	
Watch too fast,	— 7 32 .8	
Apparent time of emersion,	10 17 7 .2	

By De La Lande's Tables.

Star's mean right ascension	53° 58' 33".80	Declination N.	23° 29' 35".20
Nutation	+ 0 14 .96	Nutation	+ 0 8 .10
Aberration	+ 0 18 .77	Aberration	+ 0 3 48
Right ascension	53 59 7 .53	Declination N.	23 29 46 .78
Obliquity of the ecliptic, October 20th, 1804,	-	-	23° 27' 54".25
Star's longitude, by computation	-	-	57 16 37 .44
latitude, north. do.	-	-	4 2 1 .16

Moon's Longitude at Greenwich (Naut. Alm.).

1804. Oct. 19. Midnight	39° 44' 37" A	+	7° 34' 6" a 1	-	0' 57" a 2	-	1' 11" a 3	+	6." a 4
20. Noon	47 18 43 B	+	7 33 9 b 1	-	2 8 b 2	-	1 5 b 3	+	6." a 4
Midnight	54 51 52 C	+	7 31 1 c 1	-	3 13 c 2	-			
21. Noon	62 22 53 D	+	7 27 48 d 1	-		-			
Midnight	69 50 41 E	+		-		-			

Moon's Latitude, North.

1804. Oct. 19. Midnight	4° 56' 34" A	-	8' 49" a 1	-	5' 1 a 2	+	0' 18" a 3	+	9." a 4
20. Noon	4 47 45 B	-	13 50 b 1	-	4 43 b 2	+	0 27 b 3	+	9." a 4
Midnight	4 33 55 C	-	18 33 c 1	-	4 16 c 2	+			
21. Noon	4 15 22 D	-	22 49 d 1	-		+			
Midnight	3 52 33 E	-		-		+			

By the Immersion.

Apparent time of immersion,	9h 22' 29" .2	=	140° 37' 18" .00
Estimated longitude, West,	5 7 47 .4		
Corresponding time at Greenwich,	14 30 16 .6	Sun's R. A.	205 31 17 .37
Right ascension of the meridian, from beginning of φ ,			346 8 35 .37
Do. do. from beginning of ψ ,			76 8 35 .37
Altitude of the nonagesimal,			49 35 51 .28
Longitude of the nonagesimal, from beginning of φ ,			5 51 6 .63
Moon's true longitude, (Naut. Alm.),			56 26 12 .93
true latitude, North, do.			4 30 25 .30
true distance from the nonagesimal, (East,)			50 35 6 .30
equatorial horizontal parallax,			1 1 3 .33
horizontal parallax, reduced (320 to 319),			1 0 58 .82
parallax in longitude			0 36 17 .78
apparent distance from nonagesimal, (East,)			51 11 24 .08
parallax in latitude,			0 37 26 .94
apparent latitude, North,			3 52 58 .36
augmented semidiameter arising from apparent altitude,			0 16 47 .78
inflexion of light,			0 2 .98
semidiameter, corrected,			0 16 44 .80
Difference of apparent latitude, * north of \mathcal{D} 's center,			0 9 2 .80

Moon's semidiameter corrected,	-	1004".80	
Difference of apparent latitude,	-	542 80	
Sum,		1547 60	log. 3.1896587
Diff.		462 -	log. 2.6646420
			2)5.8543007
			2.9271503.5
			0.0009981.5
Arith. comp. cosine Moon's apparent latitude,			log. 2.9281484
Difference \mathcal{D} 's longitude,	14' 7".57	=	847".57

Star's longitude,	-	-	-	-	-	57° 16' 37".44
Parallax in longitude,	-	-	-	-	-	— 36 17 78
True longitude ☽'s limb, at the point of occultation,	-	-	-	-	-	56 40 19 66
Difference ☽'s longitude,	-	-	-	-	-	— 14 7 57
True longitude Moon's center, by calculation,	-	-	-	-	-	56 26 12 09
Apparent time at Greenwich, when the Moon had that longitude,	-	-	-	-	-	14h 30' 15".26
Apparent time of immersion at Washington,	-	-	-	-	-	9 22 .29 20
Longitude, in time, by the immersion,	-	-	-	-	-	5 7 46 06
				Equal to		76 56 30 90

By the Emersion.

Apparent time of emersion,	10h 17' 7".2	-	=	154° 16' 48".00
Estimated longitude, West,	5 7 47 4			
Corresponding time at Greenwich,	15 24 54 6	Sun's R. A.	205 33 26 53	
Right ascension of the meridian, from beginning of ♄,	-	-	359 50 14 53	
Do. do. from beginning of ♃,	-	-	89 50 14 53	
Altitude of the nonagesimal,	-	-	54 55 35 78	
Longitude of the nonagesimal, from beginning of ♄,	-	-	17 34 3 38	
Moon's true longitude, (Naut. Alm.),	-	-	57 0 29 46	
true latitude, North,	-	-	4 29 6 04	
true distance from nonagesimal, (East),	-	-	29 26 26 08	
equatorial horizontal parallax,	-	-	1 1 2 72	
horizontal parallax, reduced, (320 to 319)	-	-	1 0 58 21	
parallax in longitude,	-	-	0 32 9 36	
apparent distance from nonagesimal, (East),	-	-	39 50 35 44	
parallax in latitude,	-	-	0 32 18 54	
apparent latitude, North,	-	-	3 56 47 50	
augmented semidiameter, arising from apparent altitude,	-	-	0 16 50 15	
inflexion of light,	-	-	— 0 2 98	
semidiameter, corrected,	-	-	0 16 47 17	
Difference of apparent latitude, * north of ☽'s center,	-	-	0 5 13 66	

Moon's semidiameter corrected,	-	1007".17	
Difference of apparent latitude,	-	313 66	
		1320 83	log. 3 1208469
		693 51	log. 2 841527
			2)5.9616096
			2.9809498
Arith. comp. cosine ☽'s apparent latitude,	-	-	0 010311
Difference ☽'s longitude,	-	15' 59".36 = 959".36	log. 2.9819809

Star's longitude,	-	-	-	-	-	57° 16' 37".44
Parallax in longitude,	-	-	-	-	-	— 32 9 36
True longitude ☽'s limb, at the point of occultation,	-	-	-	-	-	56 44 28 08
Difference of ☽'s longitude,	-	-	-	-	-	+ 15 59 36
True longitude ☽'s center, by calculation,	-	-	-	-	-	57 0 27 44
Apparent time at Greenwich, when the Moon had that longitude,	-	-	-	-	-	15h 24' 51".37
Apparent time of the emersion at Washington,	-	-	-	-	-	10 17 7 20
Longitude, in time, found by the emersion,	-	-	-	-	-	5 7 44 17
				Equal to	-	76° 56' 2 55
				By the immersion,	-	76 56 30 90
Mean result—Longitude of the place of observation,	-	-	-	-	-	76 56 16 72
Difference of longitude to the Capitol,	-	-	-	-	-	— 1 49 75
Longitude of the Capitol, by occultation of Oct. 20th, 1804,	-	-	-	-	-	76 54 26 97

Annular Eclipse of the Sun, on the 17th September, 1811, observed by Seth Pease, Esq. and others. North 71° W. one mile 3-8ths from the Capitol. Difference of longitude, — 1' 26".89.

Latitude of the place of observation, (estimated)	-	-	-	38° 53' 25".00 N.
Do. do. reduced, (320 to 319)	-	-	-	38 42 54 43
Longitude assumed for calculation of the external contacts,	-	-	-	77 0 0 0

Beginning of the eclipse, at	-	-	0h 22' 9"	} P. M. Apparent time.
Annulus formed, at	-	-	2 2 6	
broken, at	-	-	2 6 53	
End of the Eclipse, at	-	-	3 36 53	

Obliquity of the ecliptic, September 17th, 1811, - - - 23° 27' 42".70

Moon's Longitude at Greenwich (Naut. Alm.).

1811. Sept. 16. Noon	158° 44' 5"	A	+ 5° 53' 27"	a 1	+ 0' 22"	a 2	+ 0' 17"	a 3	- 1" a 4
Midnight	164 37 32	B	+ 5 53 49	b 1	+ 0 39	b 2	+ 0 16	b 3	
17. Noon	170 31 21	C	+ 5 54 28	c 1	+ 0 55	c 2			
Midnight	176 25 49	D	+ 5 55 23	d 1					
18. Noon	182 21 12	E							

Moon's Distance from the North Pole of the Ecliptic.

1811. Sept. 16. Noon	90° 47' 30"	A	- 32' 36"	a 1	- 0' 11"	a 2	+ 0' 19"	a 3	+ 1" a 4
Midnight	90 14 54	B	- 32 47	b 1	+ 0 8	b 2	+ 0 20	b 3	
17. Noon	89 42 7	C	- 32 39	c 1	+ 0 28	c 2			
Midnight	89 9 28	D	- 32 11	d 1					
18. Noon	88 37 17	E							

Difference of Sun and Moon's Longitudes.

1811. Sept. 16. Noon	346° 3' 0 A	+ 5° 24' 9 a 1	+ 0' 22 a 2	+ 0' 16" a 3	+ 1' a 4
Midnight	351 27 9 B	+ 5 24 31 b 1	+ 0 22 a 2	+ 0 16" a 3	+ 1' a 4
17. Noon	356 51 40 C	+ 5 25 9 c 1	+ 0 38 b 2	+ 0 17 b 3	+ 1' a 4
Midnight	2 16 49 D	+ 5 25 9 c 1	+ 0 55 c 2	+ 0 17 b 3	+ 1' a 4
18. Noon	7 42 53 E	+ 5 26 4 d 1	+ 0 55 c 2	+ 0 17 b 3	+ 1' a 4

By the external Contacts.

Apparent time of beginning of the eclipse,	0h 22' 9"	-	=	5° 32' 15".00
Estimated longitude, West,	5 8 0			
Corresponding time at Greenwich,	<u>5 30 9</u>	Sun's R. A.	174 23 15 12	
Right ascension of the meridian, from the beginning of φ ,		-	179 55 30 12	
Do. do. from beginning of \mathcal{W} ,		-	90 4 29 88	
Sun's longitude,		-	173 53 7 47	
horizontal parallax,		-	0 0 8 70	
semidiameter,		-	0 15 57 23	
irradiation of light,		-	— 0 1 62	
Altitude of the nonagesimal		-	55 1 1 16	
Longitude of the nonagesimal, from beginning of φ ,		-	162 14 15 29	
Moon's true longitude (Nant. Alm.),		-	173 13 47 43	
true latitude, north ascending,		-	0 32 53 39	
true distance from the nonagesimal, (East)		-	10 59 32 14	
horizontal parallax, reduced, (320 to 319)		-	0 54 5 38	
horizontal parallax from the Sun,		-	0 53 56 68	
parallax in longitude,		-	0 8 32 13	
apparent longitude,		-	173 22 19 56	
apparent distance from nonagesimal, (East)		-	11 8 4 27	
parallax in latitude,		-	0 30 54 16	
apparent latitude, North,		-	0 1 59 23	
augmented semidiameter, arising from apparent altitude,		-	0 14 56 84	
inflexion of light,		-	— 0 2 98	
semidiameter, corrected,		-	0 14 53 86	
Sun's semidiameter,	957".23			
irradiation of light,	— 1 62			
semidiameter corrected,	955 61			
Moon's do. do.	893 86			
Sum,	1849 47			
Moon's apparent latitude,	119 23			
Sum,	1968 70		log. 3.2941795	
Diff.	1730 24		log. 3.2381065	
			2)6.5822858	
			3.2911429	
Arith. comp. cosine Moon's apparent latitude,			0.0000001	
Difference of apparent longitude,	30' 45".62 = 1845" 62		log. 3.2661430	

LONGITUDE OF WASHINGTON CITY.

Sun's longitude, at beginning of the eclipse,	-	-	-	173° 53' 7".47
Parallax in longitude,	-	-	-	— 8 32 13
True longitude ☽'s limb, at the point of contact,	-	-	-	173 44 35 34
Difference of apparent longitude,	-	-	-	— 30 45 62
True longitude ☽'s center, by calculation,	-	-	-	173 13 49 72
Apparent time at Greenwich, when the Moon had that longitude,				5h 30' 13".35
Apparent time of beginning of eclipse at Washington,				0 22 9 —
Longitude, in time, by 1st external contact,	-	-	-	5 8 4 35
			Equal to	77° 1' 5".25

Second external Contact.

Apparent time of the end of the eclipse,	3h 36' 53"	-	54° 13' 15".00
Estimated longitude, West,	5 8 0		
Corresponding time at Greenwich,	8 44 53	Sun's R. A.	174 30 32 25
Right ascension of the meridian, from the beginning of φ ,		-	228 43 47 25
Do. do. from the beginning of ν ,		-	41 16 12 75
Sun's longitude,		-	174 15 57 26
semidiameter,		-	0 15 57 26
horizontal parallax,		-	0 0 8 70
irradiation of light.		-	— 0 1 62
Altitude of the nonagesimal,		-	36 10 25 85
Longitude of the nonagesimal, from beginning of φ ,		-	209 18 40 65
Moon's true longitude, (Naut. Alm.)		-	174 49 40 69
true latitude, north ascending,		-	0 41 43 03
true distance from the nonagesimal, (West)		-	34 28 59 76
horizontal parallax, reduced, (320 to 319)		-	0 54 6 19
horizontal parallax from the Sun,		-	0 53 57 49
parallax in longitude,		-	0 18 10 25
apparent distance from the nonagesimal, (West)		-	34 47 10 01
apparent longitude,		-	174 31 30 44
parallax in latitude,		-	0 43 34 22
apparent latitude, South,		-	0 1 51 19
augmented semidiameter, arising from apparent altitude,		-	0 14 52 62
inflexion of light,		-	— 0 2 98
semidiameter, corrected,		-	0 14 49 64

Sun's semidiameter,	-	957'' .26		
irradiation of light,	-	1 62		
semidiameter, corrected,	-	955 64		
Moon's do. do.	-	889 64		
Sum of semidiameters,	-	1845 28		
Moon's apparent latitude,		111 19		
Sum,	1956 47	-	log.	3.2914710
Diff.	1734 09	-	log.	3.2390716
				2)6.5305426
				3.2652713
Arith. comp. cosine Moon's apparent latitude,				0.0000004
Difference Moon's longitude,	30' 41'' .92 =	1841'' 92	-	log. 3.2652714
Sun's longitude at end of the eclipse,				174° 1' 3'' .24
Parallax in longitude,				+ 18 10 25
True longitude ☽'s limb at the point of contact,				174 19 13 49
Difference ☽'s longitude,				+ 30 41 92
True longitude ☽'s center, by calculation,				174 49 55 41
Apparent time at Greenwich, when the Moon had that longitude,				8h 45' 22'' .89
Apparent time of the end of the eclipse at Washington,				3 36 53 —
Longitude, in time, by end of the eclipse,				5 8 29 89
			Equal to	77° 7' 28' 35

By the internal Contacts.

Annulus formed at,	-	2h 2' 6'' .00		30° 31' 30'' .00
Estimated longitude, West,	-	5 8 18 79		
Corresponding time at Greenwich,	7 10 24 79	Sun's R. A.	174 27 0 19	
Right ascension of the meridian, from beginning of ♀,	-		204 58 30 19	
Do. do. from beginning of ♃,	-		65 1 29 81	
Sun's longitude,	-		173 57 12 42	
semidiameter,	-		0 15 57 25	
horizontal parallax,	-		0 0 8 70	
Altitude of the nonagesimal,	-		45 10 41 21	
Longitude of the nonagesimal, from beginning of ♀,	-		184 18 3 45	
Moon's true longitude,	-		174 3 9 19	
true latitude, north ascending,	-		3 37 26 30	
true distance from the nonagesimal, (West)	-		10 14 54 26	
horizontal parallax, reduced (320 to 319)	-		0 54 5 79	
horizontal parallax from the Sun,	-		0 53 57 09	
parallax in longitude,	-		0 6 53 04	
apparent distance from the nonagesimal, (West)	-		10 21 47 30	
apparent longitude,	-		173 56 16 15	
parallax in latitude,	-		0 38 2 19	
apparent latitude, South,	-		0 0 35 89	
augmented semidiameter, arising from apparent altitude,	-		0 14 55 49	

No allowance is made in the calculation by the internal contacts, for irradiation of the Sun's, or inflexion of the Moon's, light.

Sun's semidiameter,	-	975'' 25		
Moon's augmented do.	-	895 49		
	Diff.	<u>61 76</u>		
Moon's apparent latitude,		35 89		
	Sum,	97 65	-	log. 1.9896722
	Diff.	25 87	-	log. 1.4127964
				<u>2)3.4024686</u>
				1.7012343
Arith. comp. cosine Moon's apparent latitude,	-	-	-	0.0000000
Difference Moon's longitude,	=	<u>0' 50'' 26</u>	-	log. <u>1.7012343</u>
Sun's longitude,	-	-	-	173° 57' 12'' 42
Parallax in longitude,	-	-	-	+ 6 53 04
Difference ☽'s longitude,	-	-	-	<u>- 0 50 26</u>
True longitude ☽'s center, by calculation,	-	-	-	<u>174 3 15 20</u>
Apparent time at Greenwich, when the Moon had that longitude,				7h 10' 36'' 91
Apparent time of formation of annulus at Washington,	-	-	-	<u>2 2 6 -</u>
Longitude, in time, by first internal contact,	-	-	-	<u>5 8 30 91</u>
			Equal to	<u>77° 7' 43'' 65</u>

Second internal Contact.

Annulus broken at,	-	2h 6' 53'' 00	-	31° 43' 15'' 00
Estimated longitude, West,	-	<u>5 8 18 79</u>		
Corresponding time at Greenwich,		7 15 11 79	Sun's R. A.	174 27 10 92
Right ascension of the meridian, from beginning of ♄,	-	-	-	206 10 25 92
Do. do. from beginning of ♃,	-	-	-	63 49 34 08
Sun's longitude,	-	-	-	173 57 24 11
semidiameter,	-	-	-	0 15 57 25
horizontal parallax,	-	-	-	0 0 8 70
Altitude of the nonagesimal,	-	-	-	44 42 9 15
Longitude of the nonagesimal, from beginning of ♄,	-	-	-	185 26 28 61
Moon's true longitude,	-	-	-	174 5 30 51
true latitude, north ascending,	-	-	-	0 37 39 31
true distance from the nonagesimal, (West)	-	-	-	11 20 58 10
horizontal parallax, reduced (320 to 319)	-	-	-	0 54 5 81
horizontal parallax from the Sun,	-	-	-	0 53 57 11
parallax in longitude,	-	-	-	0 7 33 02
apparent distance from the nonagesimal, (West)	-	-	-	11 28 31 12
apparent longitude,	-	-	-	173 57 57 49
parallax in latitude,	-	-	-	0 38 21 24
apparent latitude, South,	-	-	-	0 0 41 93
augmented semidiameter, arising from apparent altitude,	-	-	-	<u>0 14 55 17</u>

Sun's semidiameter,	-	957".25	
Moon's augmented do.	-	895 17	
		<hr/>	
	Diff.	62 08	
Moon's apparent latitude,	-	41 93	
		<hr/>	
	Sum,	104 01	log. 2.0170761
	Diff.	20 15	log. 1.3042751
			<hr/>
			2)3.3213502
			<hr/>
			1.6606751
Arith. comp. cosine Moon's apparent latitude,	-	-	0.0000000
			<hr/>
Difference \mathcal{D} 's longitude,	-	0' 45".78	log. 1.6606751
		<hr/>	
Sun's longitude,	-	-	173° 57' 24" 11
Parallax in longitude,	-	-	+ 7 33 02
Difference \mathcal{D} 's longitude,	-	-	+ 0 45 78
			<hr/>
True longitude \mathcal{D} 's center, by calculation,	-	-	174 5 42 91
			<hr/>
Apparent time at Greenwich, when the Moon had that longitude,	-	-	7h 15' 37".39
Apparent time of breaking annulus at Washington,	-	-	2 6 53 —
			<hr/>
Longitude, in time, by 2d internal contact,	-	-	5 8 44 39
			<hr/>
		Equal to	77° 11' 5".85
		By 1st internal contact,	77 7 43 65
		1st external do.	77 1 5 25
		2d external do.	77 7 28 35
			<hr/>
Mean result—Longitude of the place of observation,	-	-	77 6 50 77
Difference of longitude to the Capitol,	-	-	— 1 26 89
			<hr/>
Longitude of the Capitol, by solar eclipse,	-	-	77 5 23 88

JANUARY 12th, 1813.

Occultation of ρ *Taurus*, by the Moon. Immersion *only*, observed with sufficient accuracy, by Messrs. Abraham Bradley and Seth Pease. North 75° W. one mile 7-10ths (estimated) from the Capitol—difference of longitude — $1' 49''.75$.

Latitude of the place of observation, estimated,	-	38° 53' 30".00 N.
Do. do. reduced (320 to 319)	-	38 42 59 .44
Longitude assumed for the calculation	-	76 57 30 — W.

By De La Lande's Tables.

Star's mean right ascension	62° 17' 24".14	Mean Declination N.	15° 10' 5".82
Nutation	— 0 10 .54	Nutation	— 0 8 .62
Aberration	+ 0 13 .56	Aberration	+ 0 0 .93
Right ascension	62 17 27 .36	Declination N.	15 9 58 .13
Obliquity of the ecliptic, January 12th, 1813,			23° 27' 43".50
Star's longitude, by computation			63 11 18 .25
latitude, south, do.			5 45 6 .07

Moon's Longitude at Greenwich (Naut. Alm.).

1813. Jan. 11. Noon	41° 38' 21" A	+ 7° 10' 4" a 1	+ 55" a 2	— 30" a 3	— 6". a 4
Midnight	48 48 25 B	+ 7 10 59 b 1	+ 25 b 2	— 36 b 3	
12. Noon	55 59 24 C	+ 7 11 24 c 1	+ 11 c 2		
Midnight	63 10 48 D	+ 7 11 13 d 1			
13. Noon	70 22 01 E				

Moon's Latitude, South.

1813. Jan. 11. Noon	5° 9' 49" A	+ 3' 16" a 1	— 4' 54" a 2	+ 0" a 3	+ 7" a 4
Midnight	5 13 5 B	+ 1 38 b 1	— 4 54 b 2	+ 7 b 3	
12. Noon	5 11 27 C	— 6 32 c 1	— 4 47 c 2		
Midnight	5 4 55 D	— 11 19 d 1			
13. Noon	4 53 36 E				

Time of immersion by watch,	5h 55' 28"			
Watch too fast,	— 8 39			
Apparent time of immersion,	5 46 49		86° 42'	15".00
Estimated longitude, West,	5 7 50			
Corresponding time at Greenwich,	10 54 39	Sun's R. A.	294. 15	30 95
Right ascension of the meridian, from the beginning of φ ,			20 57 45 95	
Do. do. from beginning of ψ ,			110 57 45 95	
Altitude of the nonagesimal			62 26 37 89	
Longitude of the nonagesimal, from beginning of φ ,			34 43 50 50	
Moon's true longitude, (Naut. Alm.),			62 31 38 54	
true latitude, south,			5 5 42 58	
true distance from the nonagesimal, (East)			27 47 48 04	
equatorial horizontal parallax,			0 59 28 91	
horizontal parallax, reduced, (320 to 319)			0 59 24 51	
parallax in longitude,			0 24 59 84	
apparent distance from nonagesimal, (East)			28 12 47 88	
parallax in latitude,			0 31 54 57	
apparent latitude, South,			5 37 37 15	
augmented semidiameter, arising from apparent altitude,			0 16 26 55	
inflexion of light,			0 0 2 98	
semidiameter, corrected,			0 16 23 57	
Difference of apparent latitude, * south of \mathcal{D} 's center,			0 7 28 92	

CALCULATIONS TO ASCERTAIN THE

Moon's semidiameter, corrected	-	983'' 57		
Difference of apparent latitude	-	448 92		
		<hr/>		
	Sum,	1432 49	-	log. 3.1560916
	Diff.	534 65	-	log. 2.7280696
				<hr/>
				2)5.8841612
				<hr/>
Arith. comp. cosine Moon's apparent latitude	-			2.9420806
				0.0020978
Diff. γ 's longitude	-	14' 39''.38	=	879''.38
		<hr/>		log. 2.9441784
				<hr/>
Star's longitude,	-			63° 11' 18''.25
Parallax in longitude,	-			- 24 59 84
				<hr/>
True longitude γ 's limb, at the point of occultation,	-			62 46 18 41
Difference of longitude,	-			- 14 39 38
				<hr/>
True longitude of γ 's center, by calculation,	-			62 31 39 03
				<hr/>
Apparent time at Greenwich, when the Moon had that longitude,				10h 54' 39''.82
Apparent time of the immersion at Washington,	-			5 46 49 -
				<hr/>
Longitude, in time, found by the immersion,	-			5 7 50 82
				<hr/>
			Equal to	76° 57' 42'' 30
Difference of longitude from the place of observation to the Capitol,	-			- 1 49 75
				<hr/>
Longitude of the Capitol,	-			76 55 52 55
				<hr/>

Results.

By the occultation of January 21st, 1793,	-			76° 46' 17''.85
of October 20th, 1804,	-			76 54 26 97
Solar eclipse, Sept. 17th, 1811,	-			77 5 23 88
occultation of January 12th, 1813,	-			76 55 52 55
				<hr/>
Mean result,	-			76 55 30 31
				<hr/>

Equal to 5h 7' 42''.02, in time.

City of Washington, July 4th, 1817.

SIR,

IT was my intention to have sent you the above abstracts of astronomical calculations, some time ago, for the use of the American Philosophical Society. Relying on your candour, and knowledge of the subject, I flatter myself, that the work submitted to your inspection, will be estimated according to its *real* value. The ratio of 320 to 319, of the equatorial to the polar diameter of the earth, has been used, as a proportion supposed (if not actually found) to be more accurate than that of 334 to 333, or 230 to 229. The Moon's positions, at noon and midnight, in longitude and latitude, as given in the British Nautical Almanacs, have been considered as *strictly correct*, as well as the apparent times of the phenomena: and as no corresponding observations at Greenwich could be resorted to, the errors in the lunar tables are not known. It will be recollected, that M. Burg's improved tables were not used at Greenwich, until the year 1813, so that, in the preceding years, the errors of the tables might considerably affect the latitude of a place as far distant as the city of Washington. Whether these, or any arising from the apparent times, have produced a variance of 19 minutes of longitude between the results of the first and third observations, I am at a loss to discover; but if a mean of both be taken, it will be found not to deviate much from the results of the others, as shewn by the following statement:

Result, January 21st, 1793	-	76° 46' 17".85
Do. September 17th, 1811		77 5 23 .86
		<hr style="width: 100%;"/>
Mean result	-	76 55 50. 86
		<hr style="width: 100%;"/>

agreeing very nearly with the last, and differing 1' 23'' $\frac{1}{2}$ of longitude from the third observation.

I need not remark to you that occultations and solar eclipses afford the best means to ascertain the longitude of a place with precision; and although that of the Capitol in Washington, from Greenwich, may not yet have been correctly determined, for want of a greater number of observations, it is believed, that the *mean* result herewith furnished, is a near approximation to the truth.

I am, very respectfully,

Your most obedient servant,

WILLIAM LAMBERT.

Robert Patterson, Esq.

A Vice President of the Am. Phil. Soc. Philadelphia.