

KG

11366

x.915

XXXIX



1744.

1747



Harvard Lunar Plates

Measures and Reductions.

Mary Fowler.

Volume XXXIX

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MC1744

1913 Oct. 20

1

Stars - measures.

α	δ	α	δ
101605-6	11420	16026	18754
3.3	61	9290	15480
31.0	9926	91	8180
		26	38
<u>30.9767</u>	<u>9761</u>	<u>3.3263</u>	<u>3269</u>
2	10316	9550	11636
15.0	1007580	40	1092028
14.0	85	8850	20
<u>140236</u>	<u>0245</u>	<u>15.0693</u>	<u>0713</u>
3	14733	11908	1081019
24.9	1211005	11080	16
21.3	05	78	9908
	30		
<u>21.2625</u>	<u>2629</u>	<u>24.9173</u>	<u>9093</u> ✓

grade 3 or 2.

MC1744

1913 Oct 20

1.

Stars - measures.

α	δ	α	δ
101605-6	11420	16026	18754
3.3	61	9290	15480
310	9926	91	8150
		26	38
<u>30.9767</u>	<u>9781</u>	<u>3.3263</u>	<u>3269</u>
2	10316	9550	11636
150	10075-80	40	10920-28
140	85	8850	20
<u>14.0236</u>	<u>0245</u>	<u>15.0693</u>	<u>0713</u>
3	14733	11908	1081019
249	12110-05	11080	16
213	05	78	9908
	30		
<u>21.2625</u>	<u>2629</u>	<u>249173</u>	<u>9093</u>

grade 3 or 2.

MC 1744 Moon - measures.

2.

	d	n	d	n
1	scratch			
16.7	18700	19035	19120	19580
19.3	1578982	1194046	1518090	1350009
	90	40	84	91
	95	22	20	80
	<u>19.2912</u>	<u>.2917</u>	<u>16.6065</u>	<u>6080</u>

2	17892	18319
16.0	910092	1710000
19.9	20	94
	7893	10
	<u>19.8789</u>	<u>.8784</u>

3	scratch			
15.6	16358	17659	17680	18120
20.5	1123240	1277080	1477070	1102728
	30	70	70	30
	56	58	90	15
	<u>20.5123</u>	<u>.5115</u>	<u>157087</u>	<u>.7089</u>

4				
15.6			16678	18130
21.0			1297870	1182215
min			80	16
in			62	41
26			<u>15.6304</u>	<u>6319</u>

5				
15.8			15620	17187
22.0			1411002	868289
			99	82
			16	79
			<u>15.8489</u>	<u>8497</u>

6		
16.0	14325	16800
22.4	1163026	946080
	21	82
	20	98
	<u>22.2698</u>	<u>.2676</u>

MC 1744 Moon - measures.

2

1 scratch

16.7 18700

19.3 1578982

90

95

19.2912

19035

1194046

40

22

2917

19120

1518090

84

20

16.6065

19580

1350009

91

80

6080

2 17892

16.0 910092

19.9 20

7893

19.8789

18319

1710000

99

10

8784

3 scratch

15.6 16358

W.1 11232

3040

56

20.5123

17659

12770

7080

58

15.115

17680

1477070

70

90

157087

18120

1102728

30

15

7089

4

15.6

710

W.1

W.1

W.1

W.1

W.1

W.1

W.1

16678

1297870

80

62

15.6304

18130

1182215

16

41

6319

15620

1411002

99

16

15.8489

17187

868289

82

79

8497

6

16.0 14325

22.4 1163026

21

20

22.2698

16800

946080

82

98

2676

1744 Moon

3.

γ 9682 γ 9900 00
 17.0 9135 35 - 02
 23.1 27 35 9320

23.0550.0551

γ 17.5 19840 γ 18875
 23.3 17880 75 1084234
 max 76 40
 in 46 65
 γ 23.1964 .1972

γ 18830 γ 18876
 18.0 17015 05 10.71805
 23.2 00 06
 35 76
23.1823 .1834

1744

Moon

3

a 4

N

d¹²

N

<u>7</u>	9682	9900 00
17.0	9135	02
231	2735	9320

230550.0581

<u>8</u>		
17.5	19840	18875
233	17880	10842
max	76	40
"	46	65
Y	<u>231964</u>	<u>1972</u>

<u>9</u>	18830	18876
18.0	17015	10718
232	00	06
	35	76
	<u>231823</u>	<u>1834</u>

MC1744

Plate Constants

4

α	3.3266	15.0703	24.9083
δ	6.0639	17.9540	27.7276
$\alpha - \delta$	-2.7373	-2.8837	-2.8193

η	30.9774	14.0240	21.2627
ζ	30.4006	13.5564	20.8832
$\eta - \zeta$	+5.768	+4.676	+3.795

$\alpha - \delta$	-87.34	-1.12	-22	+3.0081
-2.7373	-2704	-30077	-4	-3.0081
-2.8837	-1224	-30061	-17	-3.0078
-2.8193	-1856	-30049	-27	-3.0076
17.7562	-1840	-20	-4	-20.5779

$\eta - \zeta$	+90.42	-1.24	+0.42	-0.42	-6021
+5.768	+301	+6069	-37	+6032	+1
+4.676	+1362	+6038	-17	+6021	+8
+3.795	+2252	+6047	-26	+6021	+10
21.0736	+1605	-25	+7	-8	-20.629

Tables $a = +0.9$ $e = +0.9$ $a - e = 0.0$ $b + a = 0.0$
 Obs. $a = +1.1$ $e = +1.6$ $a - e = -0.5$ $b + a = -3.5$

M01744

Plate constants

4

x	33266	150703	249083
y	60639	179540	277276
z	-27373	-28837	-28193

u	309774	140240	212627
v	304006	135564	208832
w	+5768	+4676	+3795

-3	-8734	-112	-2x	+30081
-27373	-2704	-30077	-4	-30081
-28837	-1224	-30061	-17	-30078
-28193	-1856	-30049	-27	-30076
177562	-1840	-20	-4	-20.5799

$u-m$	+904x	-12y	+0.4x - 0.4y	-6021
+5768	-301	+6069	-37	+6032
+4676	+1362	+6038	-17	+6021
+3795	+2252	+6047	-26	+6021
210736	+1605	-25	+7	-8

Table	$a = +0.9$	$e = +0.9$	$a - e = 0.0$	$b + a = 0.0$
Obs.	$a = +1.1$	$e = +1.6$	$a - e = -0.5$	$b + a = -3.5$

Ex
C
+
H
G
S
I
K
T
T

1744 Times etc.

Exh. to stars 1912 Mar 27	8 ^h 23 ^m	- 8 ^h 35 ^m
moon	8 29	0 7.8 = 8 29 0 8.1
clock slow.	1	4 5.0
H. Sid T.	8 30	5 2.95
H. long	4 44	3 1.05
G. Sid T.	13 15	2 4.00
Sid T. known	0 18	1 1.34
Interval	12 57	1 2.66
Reduction	2	0 7.33
G. M. T.	12 55	0 5.33

$\theta - \alpha = + 0^{\circ} 7''$

from hant. Alue	R. a.	keel.
moon 13 ^h	8 ^h 24 ^m 0 2.72	+ 24 ^h 39 ^m 0 6.3
motion in $\sim = 2.5400$		8.997
" " 4.9112	- 12 47	+ 44.2
Tabular place	8 23 50.25	+ 24 39 50.5

moon's parallel	59' 32" 1
semidiam.	16' 15" 0
R =	975.0
Augmentation	+ 1.62
Irradiance (3/2)	- 0.6
R =	990.6
R =	2,123.5
(1+a) R =	2,123.7
R ² =	4,510.1

a = + 1.1

1744 Times etc

Exh. station 1912 Mar 27	8 ^h 23 ^m	- 8 ^h 35 ^m
moon	8 29	0 7.8 - 8 29 0 8.1
clock slow	1	4 50
ti. Sid T.	8 30	5 29.5
H. hour	4 44	31.05
G Sid T.	13 15	24.00
Sid. T. in moon	0 18	11.34
Interval	12 57	12 6 6
Reduction	2	07.33
G. T. T.	12 55	0 533 $\Theta - X = + 0^h 7^m$

from Kant. Alms	R. a.	Decl.
moon 13 ^h	8 ^h 29 ^m 02.72	+ 24° 39' 06.3
motion 1 ^m = 2.5400	8 9 97	
4.9112	- 12 47	+ 44 2
Tabular place	8 23 50.25	+ 24 39 50.5

moon's parallax	59' 32.8
semidiameter	16' 15.0
R =	975.0
Augmentation	+ 16.2
Immersion (13 or 2)	- 0.6
R =	990.6
R =	2.1235
(1 + a) R =	2.1237
R ² =	4.5101
a = +1.1	
a 24 = 14.9	
a 75 = 16.2	

rat.	hus L	resid.
1	212 ⁰ 7	-137
2	235.8	+21
3	254.9	-29
4	268.0	+108
5	295.9	-159
6	304.2	+21
7	339.2	-32
8	0.0	-22
9	6.7	-21

1744

Moon's Center.

6

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$y - c$
1	16.6072	-1.1472	1.3161	4.4923	-178
2	16.0000	-1.7544	3.0779	4.5059	-42
3	15.7088	-2.0456	4.1845	4.5000	-101
4	15.6312	-2.1232	4.5080	4.5134	+33
5	15.8493	-1.9051	3.6294	4.4876	-225
6	16.0000	-1.7544	3.0779	4.5061	-40
7	17.0000	-0.7544	0.5691	4.5014	-87
8	17.7544	0.0000	0.0000	4.5080	-21
9	18.0000	+0.2456	0.0603	4.5090	-11

Comp. R^2 4.5101

	y	$y - y_0$	$(y - y_0)^2$
1	19.2914	-1.7822	3.1762
2	19.8786	-1.1950	1.4280
3	20.5119	-0.5617	0.3155
4	21.0000	-0.0736	0.0054
5	22.0000	+0.9264	0.8582
6	22.2687	+1.1951	1.4282
7	23.0566	+1.9830	3.9323
8	23.1968	+2.1232	4.5080
9	23.1828	+2.1092	4.4487

Approximate Center.

$$x = 16.0 \quad y = 19.8786$$

$$22.2687$$

$$42.1473$$

$$\text{mean } y = 21.0736$$

$$y = \text{max} = 23.1968$$

$$R = 21232$$

$$x = \text{min} = 15.6312$$

$$x_0 = 17.7544$$

$$\text{Center } \begin{cases} x_0 = 17.7544 \\ y_0 = 21.0736 \end{cases}$$

1744

Moon's Center

-6.

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - C$
1	16.6072	-1.1472	1.3161	4.4923	-178
2	16.0000	-1.7544	3.0779	4.5059	-42
3	15.7088	-2.0456	4.1845	4.5000	-101
4	15.6312	-2.1232	4.5080	4.5134	+33
5	15.8493	-1.9051	3.6294	4.4876	-225
6	16.0000	-1.7544	3.0779	4.5061	-40
7	17.0000	-0.7544	0.5691	4.5014	-87
8	17.7544	0.0000	0.0000	4.5080	-21
9	18.0000	+0.2456	0.0603	4.5090	-11
Comp. R^2				4.5101	

	y	$y - y_0$	$(y - y_0)^2$
1	19.2914	-1.7822	3.1762
2	19.8786	-1.1950	1.4280
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$$\text{Center } \begin{cases} x = 17.7544 \\ y = 21.0736 \end{cases}$$

Formation of Normals.

	ab	an	bn
1	+ 205	+ 2048	+ 316.8
2	+ 210	+ 73.5	+ 50.5
3	+ 115	+ 207.2	+ 56.5
4	+ 015	- 70.0	- 2.3
5	- 044	+ 107.5	- 52.4
6	- 210	+ 70.0	- 48.0
7	- 148	+ 65.2	- 172.2
8	+ 000	- 0.0	- 44.5
9	+ 053	- 2.7	- 23.2
	+ 196	+ 655.5	+ 81.2

Residuals.

	O		C		O - C
1	- 178	- 40 - 1 =	- 41		- 137
2	- 42	- 62 - 1 =	- 63		+ 21
3	- 101	- 72 - 0 =	- 72		- 29
4	+ 33	- 75 - 0 =	- 75		+ 108
5	- 225	- 67 + 1 =	- 66		- 159
6	- 40	- 62 + 1 =	- 61		+ 21
7	- 87	- 26 + 1 =	- 25		- 32
8	- 21	+ 0 + 1 =	+ 1		- 22
9	- 11	+ 9 + 1 =	+ 10		- 21
					Average = 61

1744

Conditional Equations.

7.

	a	b	c		c	0-c
1	-1.15	-1.78	= -178	-	67 + 7 = -60	-118
2	-1.75	-1.20	= -42	-	102 + 4 = -98	+56
3	-2.05	-0.56	= -101	-	120 + 2 = -118	+17
4	-2.12	-0.07	= +33	-	124 + 0 = -124	+157
5	-1.91	+0.93	= -225	-	111 - 3 = -114	-111
6	-1.75	+1.20	= -40	-	102 - 4 = -106	+66
7	-0.75	+1.98	= -87	-	44 - 7 = -51	-36
8	+0.00	+2.12	= -21	+	0 - 8 = -8	-13
9	+0.25	+2.11	= -11	+	15 - 8 = +7	-18

Average = 6.6

Mean Equations.

$$\begin{aligned} 5) & -898 - 268 = -513 \\ 4) & -225 + 741 = -159 \end{aligned}$$

$$\begin{aligned} +225 + 067 &= +129 \\ +808 &= -30 \end{aligned}$$

$$b = -3.7$$

$$-898 - 513 = -10 - 523$$

$$a = +58.3$$

Normal Equations.

$$\begin{aligned} +18.61 + 1.96 &= +656 \\ +1.96 + 19.67 &= +81 \end{aligned}$$

$$\begin{aligned} -1.96 - 0.21 &= -69 \\ +19.46 &= +12 \end{aligned}$$

$$b = +0.6$$

$$+18.61 = +656 - 1 = +655$$

$$a = +35.2$$

1744

Conditional Equations

J.

	a	b	c		c	0-c
1	-1.15	-1.78	-1.78	-67+7	-60	-118
2	-1.75	-1.20	-42	-102+4	-98	+56
3	-2.05	-0.56	-101	-120+2	-118	+17
4	-2.12	-0.07	+33	-124+0	-124	+157
5	-1.41	+0.93	-225	-111-3	-114	-111
6	-1.75	+1.20	-40	-102-4	-106	+66
7	-0.75	+1.98	-87	-44-7	-51	-36
8	+0.00	+2.12	-21	+0-8	-8	-13
9	+0.25	+2.11	-11	+15-8	+7	-18

Average = 6.6

Mean Equations

$$5) -898 - 2.68 = -513$$

$$+ -2.25 + 7.41 = -159$$

$$+2.25 + 0.67 = +129$$

$$+808 = -30$$

$$-8.98 - 2.513 = -10.493$$

$$b = -3.7$$

$$a = +583$$

Normal Equations

$$+18.61 + 196 = +656$$

$$+196 + 1967 = +81$$

$$-196 - 0.21 = -69$$

$$+1946 = +12$$

$$+18.61 = +656 - 1 = +655$$

$$b = +0.6$$

$$a = +352$$

1744 Moon's Mean Position (1912.0)

8.

$$\begin{array}{r}
 X_0 = 17.7549 \\
 \hline
 + 1.8 \\
 \hline
 17.7562
 \end{array}
 \quad
 \begin{array}{r}
 Y_0 = 21.0736 \\
 \hline
 0 \\
 \hline
 21.0736
 \end{array}$$

From Plate Constants $X = 20.5779$ $Y = 20.6294$

$$\begin{array}{r}
 Z = +2.5779 \\
 \log \xi_0 = 0.41126 \\
 \log S = 9.95951 \\
 \text{const.} = 8.50724
 \end{array}$$

$$(A - A_0) = 1.94451$$

$$A - A_0 = + 1 28.01$$

$$A = 8 22 16$$

$$\alpha_0 = 8^h 23^m 44.01^s$$

$$\text{Red.} = + 1.18$$

$$\alpha' = 8 23 45.19$$

$$\eta = -1.3706$$

$$\begin{array}{r}
 \log \tan S = 7.0530 \\
 \log S = 9.6557
 \end{array}$$

$$\log \xi_2 = 0.8225$$

$$\eta_1 = 7.5316$$

$$\eta_2 = + 34$$

$$\eta_0 = -1.3740$$

$$\log \eta_0 = 0.13799$$

$$\text{const.} = 7.33115$$

$$(D - D_0) = 2.80684$$

$$\delta - D = - 10 41.0$$

$$D = + 24 32 09$$

$$\delta_0 = + 24^\circ 21' 28.0''$$

$$\text{Red.} = + 5.4$$

$$\delta' = + 24 21 33.4$$

1744 known mean Position (1912.0)

8.

$$\begin{array}{r}
 X_0 = 177544 \\
 \hline
 + 29 \\
 \hline
 177573
 \end{array}
 \qquad
 \begin{array}{r}
 Y_0 = 210736 \\
 \hline
 - 2 \\
 \hline
 210734
 \end{array}$$

From plate constant $X = 20.5799$ $Y = 20.6294$

$$\begin{array}{r}
 \bar{z} = +2.5799 \\
 \log \bar{z} = 0.411256 \\
 \cos \bar{z} = 9.95951 \\
 \text{const.} = 8.50724
 \end{array}$$

$$(a - A) = 1.94459$$

$$A - A = + 1 \quad 28.09$$

$$A = 8 \quad 22 \quad 16$$

$$X_0 = 8 \quad 23 \quad 44.09$$

$$\text{Red.} = + 1.14$$

$$X = 8 \quad 23 \quad 45.19$$

$$\eta = -1.3708$$

$$\log \tan S = 9.6587$$

$$S^2 = 0.8229$$

$$\eta_1 = 7.5350$$

$$\eta = +34$$

$$\eta_0 = -1.3742$$

$$\log \eta_0 = 0.13999$$

$$\text{const.} = 7.33115$$

$$(d - D) = 2.80684$$

$$S - D = -10 \quad 410$$

$$D = 1 \quad 24 \quad 32 \quad 09$$

$$S_0 = 124^\circ \quad 21' \quad 28''$$

$$\text{Red.} = 5.4$$

$$S = +24 \quad 21 \quad 33.4$$

1744

Red. ad. l. app.

S

+ 24° 21'

$$H + \alpha_0 \quad 1 \quad 53 = 28^\circ 15'$$

$$H \quad 17 \quad 29$$

$$\alpha_0 \quad 8 \quad 24$$

$$G \quad 18 \quad 55$$

$$G + \alpha_0 \quad 3 \quad 19 = 49 + 5$$

$$l \cos S \quad 9.9595$$

$$i \quad 0.9076$$

$$(i) \quad 0.8671$$

$$l \sin S \quad 9.6152$$

$$l \cos(H + \alpha) \quad 9.9449$$

$$h \quad 1.2743$$

$$\sin \quad 9.6752$$

$$\sec S \quad 0.0405$$

$$t_r \quad 8.8239$$

$$l \cos(G + \alpha) \quad 9.8103$$

$$q \quad 0.9636$$

$$\sin \quad 9.8827$$

$$\tan S \quad 9.6557$$

$$t_r \quad 8.8239$$

$$q' \quad 0.7739$$

$$g \quad 9.3259$$

$$f \quad + 0.32$$

$$g \quad + 0.21$$

$$h \quad + 0.65$$

$$+ 1.18$$

$$h' \quad 0.8344$$

$$h \quad 9.8139$$

$$g' \quad + 5.94$$

$$h' \quad + 6.83$$

$$i \quad - 7.36$$

$$+ 5.41$$

1744

Red. ad. l. app.

S

+ 24° 21'

$$H + \alpha_0 \quad 1 \quad 53 = 28^\circ 15'$$

$$H \quad 17 \quad 29$$

$$\alpha_0 \quad 8 \quad 29$$

$$G \quad 15 \quad 55$$

$$G + \alpha_0 \quad 3 \quad 19 = 49^\circ 45'$$

$$L \cos(H + \alpha) \quad 9 \quad 8 \quad 1 \quad 0 \quad 3$$

$$q \quad 0 \quad 9 \quad 6 \quad 3 \quad 6$$

$$\sin \quad 9 \quad 8 \quad 8 \quad 2 \quad 7$$

$$\tan S \quad 9 \quad 6 \quad 5 \quad 5 \quad 7$$

$$\frac{1}{\sin} \quad 8 \quad 8 \quad 2 \quad 3 \quad 9$$

$$q' \quad 0 \quad 7 \quad 7 \quad 3 \quad 9$$

$$s \quad 9 \quad 3 \quad 2 \quad 5 \quad 9$$

$$f \quad + 0 \quad 3 \quad 2$$

$$s \quad + 0 \quad 2 \quad 1$$

$$L \quad + 0 \quad 6 \quad 5$$

$$+ 1 \quad 7 \quad 8$$

$$L \cos S \quad 9 \quad 9 \quad 5 \quad 9 \quad 5$$

$$L \quad 0 \quad 9 \quad 0 \quad 7 \quad 6$$

$$(L) \quad 0 \quad 8 \quad 6 \quad 7 \quad 1$$

$$L \sin S \quad 9 \quad 6 \quad 1 \quad 5 \quad 2$$

$$L \cos(H + \alpha) \quad 9 \quad 9 \quad 4 \quad 4 \quad 9$$

$$L \quad 1 \quad 2 \quad 7 \quad 4 \quad 3$$

$$\sin \quad 9 \quad 6 \quad 7 \quad 5 \quad 2$$

$$\cos S \quad 0 \quad 0 \quad 4 \quad 0 \quad 5$$

$$\frac{1}{\sin} \quad 8 \quad 8 \quad 2 \quad 3 \quad 9$$

$$L' \quad 0 \quad 8 \quad 3 \quad 4 \quad 4$$

$$L \quad 9 \quad 8 \quad 1 \quad 3 \quad 9$$

$$s' \quad + 5 \quad 9 \quad 4$$

$$L' \quad + 6 \quad 8 \quad 3$$

$$L \quad - 7 \quad 3 \quad 6$$

$$+ 5 \quad 4 \quad 1$$

Lunar Parallax.

$$\begin{array}{r}
 1744 \\
 \psi = 8^h 23^m 45.19^s \\
 \theta = 8 \quad 30 \quad 52.95 \\
 \alpha - \alpha' = + \quad 7 \quad 07.76 \\
 = + \quad 10 \quad 46' \quad 56''
 \end{array}$$

$$+ \quad 0 \quad 44''$$

$$+ \quad 1 \quad 46''$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 0.00021 \\
 \hline
 9.95748
 \end{array}$$

$$\gamma = 42 \quad 12 \quad 00''$$

$$24 \quad 21 \quad 33$$

$$17 \quad 50 \quad 27''$$

$$\begin{array}{r}
 9.82640 \\
 8.23847 \\
 9.48620 \\
 0.17281 \\
 \hline
 7.72393
 \end{array}$$

$$\delta - \delta' = + 18 \quad 12.3''$$

$$\delta = +24 \quad 39 \quad 45.7''$$

$$\text{Nautical } \delta = +24 \quad 39 \quad 50.5''$$

$$\text{G-C} \quad - \quad 4.8''$$

$$\delta = +24^{\circ} 21' 33.4'' \quad -10$$

$$\Delta = 59' 32.1''$$

$$\begin{array}{r}
 9.86913 \\
 8.23847 \\
 8.49280 \\
 0.04155 \\
 \hline
 6.64195
 \end{array}$$

$$\psi - \psi' = + 1' 30.44''$$

$$= + \quad 06.03''$$

$$\alpha = 8 \quad 23 \quad 51.22''$$

$$\kappa = 8 \quad 23 \quad 50.25''$$

$$+ 0.97''$$

Human Parallels

$$\begin{array}{r}
 .44 \\
 4' = 8'' 23'' 41'' 29'' \\
 0 = 8 \quad 30 \quad 5295 \\
 0 - 4 - + \quad 7 \quad 0773 \\
 \quad \quad + 1' 46' 56''
 \end{array}$$

$$+ \quad 0 \quad 44$$

$$+ \quad 1 \quad 46$$

$$\begin{array}{r}
 995727 \\
 000000 \\
 000021 \\
 \hline
 995748
 \end{array}$$

$$r = 42 \quad 12 \quad 00$$

$$24 \quad 21 \quad 33$$

$$17 \quad 50 \quad 27$$

$$9.82640$$

$$823847$$

$$948625$$

$$017281$$

$$772393$$

$$\delta - \delta' = + 18 \quad 12.3$$

$$\delta = + 24 \quad 39 \quad 45.7$$

$$\text{Hamblin } \delta = + 24 \quad 39 \quad 50.5$$

$$G-C \quad - \quad 4.8$$

$$\delta = + 24' 21'' 33.4 \quad 10$$

$$\alpha = 59' 32.1$$

$$986913$$

$$823847$$

$$849280$$

$$004155$$

$$664195$$

$$x - x' = + 1 \quad 30.44$$

$$= + \quad 06.03$$

$$\alpha = 8 \quad 23 \quad 51.22$$

$$x = 8 \quad 23 \quad 50.25$$

$$+ 0.97$$

1747	α	γ	Stars - measures	α	γ	1913 Oct 20.	11
$\sqrt{10.0+}$	16255		19230			13089 92	13802
73.5	11210	05-05	1430100			89 92	1348788
	57		90			12779	9088
	235046		42			<u>10.0311</u>	<u>.0314</u>
			5061				
$\frac{2}{12.9}$	19019		17100			19245	19170
14.5	1489000		1122524			1812018	1027279
	91		30			21	78
	20		98			39	63
	<u>14.4125</u>		<u>4127</u>			<u>128876</u>	<u>.8888</u>
$\frac{3}{26.5}$	18260		16340			19930	16582
25.3	1593534		867080			1456160	1193032
	3534		75			62	3532
	52		48			30	90
	<u>25.2323</u>		<u>2329</u>			<u>26.4631</u>	<u>4654</u>
$\frac{4}{26.6}$	17787		14309			17758	15017
158	945150		1265047			1419090	856060
	60		5047			90	6060
	90		20			50	14
	<u>158335</u>		<u>8338</u>			<u>26.6435</u>	<u>.6455</u>
$\frac{5}{28.9}$	11260		727077			15357	1040200
31.1	1020010		7177			1430103	05
	9305		6200			03	9370
	<u>31.1058</u>		<u>1073</u>			<u>28.8951</u>	<u>.8968</u>

Grade 1 or 2.

Extra stars measured to compare with plates 1092 etc.

1747	Stars - measured	1913 Oct 20.	12
α	γ	α	γ
✓			
10.0- 16255-	19230	13039 92	13802
23.5 11210	1430100	89 92	13487
05-05-	90		9088
51	42	10.0311	0314
<u>235-046</u>	<u>15061</u>		
<u>2</u>			
12.9 19019	17100	19245-	19170
14.5 1489000	1122524	1812018	1027279
91	30	21	7879
20	98	39	63
<u>14.4125</u>	<u>4127</u>	<u>128876</u>	<u>8888</u>
<u>3</u>			
26.5 18260	16340	19930	16582
21.3 1593534	867080	1456160	1193032
35-34	75	62	31-32
52	48	30	90
<u>25.2323</u>	<u>2329</u>	<u>264631</u>	<u>4654</u>
<u>4</u>			
26.6 17787	14309	17758	11017
15.8 945150	12650	1419090	856060
60	5047	90	6060
90	20	50	14
<u>158335</u>	<u>8338</u>	<u>266435</u>	<u>6455</u>
<u>5</u>			
28.9 11260	7270	15351	1040200
31.1 1020010	7177	1430103	05
9305-	6200	03	9370
<u>31.1058</u>	<u>1073</u>	<u>288951</u>	<u>8968</u>

Grade 152.

Extra stars measured to compare with plates 1092 etc.

1747	1747	1747	1747
α	α	α	α
μ	μ	μ	μ
Scratch.	Scratch.	Scratch.	Scratch.
17.6 16050	19220	16060	18770
176 10440	14860	12350	12480
45-50	65-	5058	9087
44	51	62	68
44	25-		
<u>175602</u>	<u>1736</u>	<u>17.6292</u>	<u>16283</u>
2 14738	18370		
17.0 12560	10510		
18.3 60	11		
35-	80		
<u>18.2179</u>	<u>2139</u>		
3		14923	17710
16.7		11990	10610
19.0		9087	0410
		10	20
		<u>16.7070</u>	<u>7109</u>
4		14870	16710
16.7		11690	987680
19.2		70	8080
min		75-	10
2		<u>16.6808</u>	<u>6831</u>
26		13825	16720
5-		11758	879090
16.8		5147	9290
20.0		30	35-
		<u>167926</u>	<u>7941</u>
6			
17.0 19779	15480	Remeasure 6(d)	
20.5 15429	9882	16890	
11	9090	12500	
96	84	0198	
<u>20.4369</u>	<u>4405</u>	00	
		<u>20.4394</u>	

1747

d u

known - measures

17

✓ Scratch

17.6 16050

17.6 10440

45-50

44

17.5602

19220

1486065-

51

25-

17.36

16060

1235058

5058

62

17.6292

N

18770

1248087

90

68

16283

2 14738

17.0 1256055-

183 60

35-

18.2179

18370

1051030

11

80

2139

14923

1199087

90

10

167070

17710

1061010

04

20

7109

3

167

190

4

167

192

mm

-

2

5-

168

200

14870

1169080

70

75-

16.6808

16710

987680

80

10

6831

13825

11758

5147

30

167926

16720

879090

9290

35-

7941

6

17.0

205

19779

1542911

11

96

204369

15480

988290

90

84

4905-

Remeasure 6(d)

16890

12500

0198

00

20.4394

1747

moon

13

2
17.5
21.0

18580
13500 10
91
80

15780
10830 28
20
80
4954

174920

8

15.0 15910
21.3 1298080
80
25

14400
737060
60
00

212934

2965

9

18.8 14900
21.4 1037462
max 60
2 90

19428
1395960
51
18

8 214530

4534

10 scratch possibly on terminator

19.5 15181
21.4 1160021
62
89

18468
1204040
49
60

213576

3580

15210
9460
7876
18
194256

19128
14858
7070
28
4262

1747

moon

13

2
17.5
21.0

18580
13500, 10
91
80

15780
1083028
2028
80
4954

174920

8
18.0 15910
21.3 1298080
80
25
212934

14400
737060
60
00
2965

9
18.8 14900
21.4 1037962
max 60
in 90
8 214530

19428
1395960
51
18
4534

10 scratch - possibly on terminator

19.5 15181
21.4 1160021
62
89
213576

18468
1204040
49
60
3580

15210
9460
7876
18
194256

19128
14858
7070
28
4262

Center of Plate.

14

	x	y	R. A.	Decl.
1	10.0312	23.5054	10 18 43	+14 21 02
2	12.8882	14.4126	20 17 13	10 36
3	26.4642	25.2326	27 30 14	35 21
4	26.6445	15.8336	27 36 43	22 19
5	28.8960	31.1066	28 48 15	21 01
5	104.92	110.09	120 174	69 109 79
	20.98	22.02	10 24 35	14 10 04
	-18	-22	- 1 32	- 9
	2.98	02	10 23 03	+14 09 55
	31	465		
	72.38	9.30		

Center of A = $10^h 23^m 03^s$
 D = $+14^\circ 09' 55''$

Plate Constants

-7284	-0.32	+299
1 + 1414 - 1711 = -297 - 3 = -300 = -1		
2 + 755 - 1049 = -294 - 4 = -298 = +1		
3 + 1547 - 1837 = -290 - 8 = -298 = +1		
4 + 860 - 1153 = -293 - 8 = -301 = -2		
18.8013 - 1407 = -6 = 18.6899		
+70.82	-1.54	-1239
+ 557 + 710 = +1267 - 35 = +1232 = -7		
+ 357 + 912 = +1269 - 22 = +1247 = +8		
- 589 + 1874 = +1285 - 38 = +1247 = +8		
- 630 + 1886 = +1256 - 24 = +1232 = -7		
19.3321 + 1331 = -29 = 19.3384		

Tables $a = +0.7$ $e = -0.3$ $a - e = +1.0$ $b + d = 0.0$
 obs. $a = +0.3$ $e = +1.5$ $a - e = -1.2$ $b + d = +2.0$
 $c - 0$ $+0.4$ -1.8 $+2.2$ -2.0

Center of Plate

14

	x	y	R	a	b	c	d
1	10.0312	23.5054	10	18	43	+14	21 02
2	12.8882	14.4126	20	17	13	10	36
3	26.4642	25.2326	27	30	14	35	21
4	26.6445	15.8336	27	36	13	22	19
5	28.8960	31.1066	28	48	15	21	01
	<u>104.92</u>	<u>110.09</u>	<u>120</u>	<u>174</u>	<u>69</u>	<u>109</u>	<u>79</u>
	2098	22.02	10	24	35	14	10 04
	-18	22	-1	32	-	-	9
	<u>2.98</u>	<u>02</u>	<u>10</u>	<u>23</u>	<u>03</u>	<u>+14</u>	<u>09 55</u>
	31	46.5					
	<u>72.38</u>	<u>9.30</u>					

Center $\left\{ \begin{array}{l} A = 10^h 23^m 03^s \\ D = +14^\circ 09' 55'' \end{array} \right.$

Plate Constant

-7284	-0.32	+299
+1414 - 1711 = -297 - 3 = -300 = -1		
-755 - 10.49 = -294 - 4 = -298 = +1		
+1547 - 1837 = -290 - 8 = -298 = +1		
+860 - 1153 = -293 - 8 = -301 = -2		
18.8013 - 1407 = -6 = 186899		
+70.82	-1.54	+1239
+557 + 710 = +1267 - 35 = +1232 = -7		
+357 + 912 = +1269 - 22 = +1247 = +8		
-589 + 1874 = +1285 - 38 = +1247 = +8		
-630 + 1886 = +1256 - 24 = +1232 = -7		
19.3321 + 1331 = 29 = 193384		

after $a = +0.7$ $b = -0.3$ $c = +1.0$ $b+d = 0.0$
 obs. $a = +0.3$ $b = +1.5$ $c = -1.2$ $b+d = +2.0$
 $C = 0$ $+0.4$ -1.8 $+2.2$ -2.0

1747 Times etc. 15
 Ephemeris 1912 Mar 29 10^h 48^m ✓ - 11^h 00^m ✓
 " Moon 10 53 49.8 ✓ 10 53 50.1 ✓
 clock slow. 1 44.8 ✓

H. Sid T. 10 55 34.75 ✓
 H. Lamp 4 44 31.05 ✓
 G. Sid T. 15 40 05.80 ✓
 Sid T. in Moon 0 26 04.45 ✓
 Interval 15 14 01.35 ✓
 Reduction 2 29.74 ✓
 G. M. T. 15 11 31.61 0-X-+0^h 31^m 43^s ✓

From Kant. Alue. R. G. Decl.
 Moon 15^h 10^h 23^m 25.72 ✓ + 14° 20' 24"3 ✓
 Motion in 1^m = 2.2371 ✓ 15.025 ✓
 " 11.5268 ✓ + 25.79 ✓ - 2 53.2 ✓
 Tabular place. 10 23 51.51 ✓ + 14 17 31.1 ✓

Moon's age 11.0 days
 parallax 59' 28.0 ✓
 semidiameter 16' 13.7 ✓
 734 = 13.7 ✓
 773749.9 ✓
 R = 9737 ✓
 Augmentation + 14.9 ✓
 Irradiation (1) or (2) - 0.4 ✓
 R = 988.2 ✓
 R = 2.1183 ✓
 (1+a)R = 2.1184 ✓
 R² = 44876 ✓
 a = + 0.3

1747

Times etc

157

Exhibitors 1912 Mar 29	10 ^h 48 ^m	- 11 ^h 00 ^m
" - Moon	10 53	49.8 - 10 53 50.1
clock slow	1	49.8
H. Ind T.	10 55	39.75
H. temp	4	44 31.05
G. Ind T.	15	40 05.80
Ind T. in Moon	0	26 04.45
Futival	15	14 01.35
Reduction		2 29.74
G. M. T.	15	11 31.61
		0-X-+0 ^m 31 ^m +3 ^s

From Kant Alman.

R. G.

Black.

Moon 15 ^h	10 ^h 23 ^m	25.72	+ 14° 20' 24"3
Moon in 1 ^m = 2.2371			15° 02' 5"
11.5268		+ 25.79	- 2 53.2
Tabular place	10 23	51.51	+ 14 17 31.1

Moon's age 11.0 days

parallax

59' 28.0

semidiam

16' 13.7

 $\frac{13.7}{13.7 + 59.5} = .199$

R:

97.37

Argumentum

+ 14.9

Inequality (1-2)

- 0.4

R:

98.82

R:

2.1183

a = + 0.3

(1+a)R = 2.1189

R² = 44.876



Standard Coords

5 16

Cape W. 1419 mag 8.9 Cape W. 1420 mag 8.0 Cape W. 1438 mag 5.8

C	10	18	04.06	10	19	38.89	10	26	51.54
L			10			89			52
Z			02			88			54
mean	10	18	04.06	10	19	38.89	10	26	51.53
Proc			+ 38.63			+ 38.46			+ 38.47
A	10	18	42.69	10	20	17.35	10	27	30.00
A	10	23	03	10	23	03	10	23	03
A-A	-	4	20.31	-	2	45.65	+ 4		27.00
sin(A-A)	-		260.29	-		165.65	+ 26		6.98
log	2.41545			2.21919			2.42648		
mag	9.98623			9.98841			9.98577		
30	0.90892			0.71484			0.91949		
30	- 8.1088			- 5.1861			+ 8.3078		
31	-	14		-	12		+ 17		
3	9.8898			12.8127			26.3095		
x	10.0312			12.8882			26.4642		
x-3	+ 14.14			+ 7.55			+ 15.47		

C	+ 14°	24'	39.6"	+ 13°	14'	14.1"	+ 14°	39'	02.1"
L			39.8			13.7			02.0
Z			39.7			14.0			01.4
mean	+ 14	24	39.7	+ 13	14	13.9	+ 14	39	01.8
Proc		- 3	37.3		- 3	38.0		- 3	40.8
S	+ 14	21	02.4	+ 13	10	35.9	+ 14	35	21.0
D	+ 14	09	55	+ 14	09	55	+ 14	09	55
S-D	+ 11	07.4		- 59	19.1		+ 25	26.0	
tan(A-A)		+ 6674		- 3559.5			+ 1526.0		
log	2.82439			3.55138			3.18355		
mag	0.15554			0.88253			0.51470		
mag	9.4080			9.3694			9.4154		
32	18178			14297			18390		
31	82792			78525			83078		
30	+ 1.4307			- 7.6302			+ 3.2712		
31	+ 190			+ 71			+ 203		
32	23.9497			14.3769			25.2915		
33	23.5054			14.4126			25.2326		
34	+ 557			+ 357			- 589		

Standard Counts

S 16

Capitula 1419 mag 8.9 Capitula 1420 mag 8.0 Capitula 1438 mag 5.8

C	10	18	04	06	10	19	38	89	10	26	51	54
L				10				89				52
Z				02				88				54
mean	10	18	04	06	10	19	38	89	10	26	51	53
Pave				+ 38				+ 38				+ 38
A	10	18	42	69	10	20	17	35	10	27	30	00
A	10	23	03		10	23	03		10	23	03	
A-A		- 4	20	31		- 2	45	65		+ 4	27	00
mean-A			- 26	02		- 16	56	65			+ 26	09
log			2.41	545			2.21	919			2.42	648
WTS			998	623			998	841			998	577
S ₀			0.90	892			0.71	484			0.91	949
S ₀		- 8	10	88		- 5	18	61		+ 8	30	78
S ₁		-		14		-		12		+ 1		17
S ₂			98	898			12	8127			26	3095
S ₃			10	0312			12	8882			26	4642
S ₄			+ 14	14			+ 7	55			+ 15	47

C	+ 14°	24'	39.6	+ 13°	14'	14.1	+ 14°	39'	02.1
L			39.8			13.7			02.0
Z			39.7			14.0			01.4
mean	+ 14	24	39.7	+ 13	14	13.9	+ 14	39	01.8
Pave		- 3	37.3		- 3	38.0		- 3	40.8
S	+ 14	21	02.4	+ 13	10	35.9	+ 14	35	21.0
D	+ 14	09	55	+ 14	09	55	+ 14	09	55
S-D		+ 11	07.4		- 59	19.1		+ 25	26.0
mean-D			+ 66		- 35	59.5		+ 15	26.0
log			2.82			3.55			3.18
S ₀			0.15			0.88			0.51
WTS			940			936			941
S ₁			181			142			183
S ₂			827			785			830
S ₃			+ 14			- 7.6			+ 3.2
S ₄			+ 19			+ 7.1			+ 2.0
S ₅			23.9			14.3			25.2
S ₆			23.5			14.4			25.2
S ₇			+ 55			+ 35			- 58

1747

Standard Coords.

17

Cape No. 1439 mag 8.0

Cape No. 1441 mag 8.9

C	10 ^h	26 ^m	58.15
L			17
B			15
mean	10	26	58.16
Proc		+	38.37
d	10	27	36.53
A	10	23	03
A-A		+	4 33.53
sin($\alpha - \delta$)			+ 273.51
log...			3.43698
cos...			9.98806
-30			0.93228
Σ			+ 8.5562
Σ			+ 23
Σ			26.5585
Σ			26.6445
$\Sigma - \Sigma$			+ 860

	10 ^h	28 ^m	09.30
			33
	10	28	09.32
		+	38.58
	10	28	47.90
	10	23	03
	11	+	5 44.90
			+ 344.86
			2.53764
			9.98422
			1.02910
			+ 10.6930
			+ 51
			28.6981
			28.8960
			+ 1979

C	+ 13°	25'	59.8"
L			00.2
B			59.0
mean	+ 13	25	59.7
Proc	-	3	41.1"
d	+ 13	22	18.6"
D	+ 14	09	55"
$\delta - \delta$		- 47	36.4"
sin...		- 28	56.6"
log...			3.45582
log...			0.78697
tan...			9.3761
Σ			18646
Σ			8.2941
η_0			- 6.1231
η_1			+ 197
η			15.8966
η			15.8336
$\eta - \eta$			- 0630

	+ 15°	24'	42.9"
			42.6
	+ 15	24	42.8
	-	3	41.6
	+ 15	21	01.2
	+ 14	09	55"
	+ 1	11	06.2
			+ 4266.8
			3.63010
			0.96125
			9.4386
			2.0582
			8.5502
			+ 9.1464
			+ 355
			31.1819
			31.1066
			- 753

1747

Standard Coords

27.

Cape W. 1439 m 98.0

Cape W. 1441 m 98.9

C	10	26	58.15
L			17
B			15
mean	10	26	58.16
Proc		7	38.37
d	10	27	36.53
A	10	23	03
A-A		4	33.53
sin(A-A)			+273.51
log			243698
cos			998806
S			093228
S ₁			+8.5562
S ₂			+23
S ₃			26.5585
S ₄			26.6445
S-S			+860

C	10	28	09.30
L			33
B			33
mean	10	28	09.32
Proc			+38.58
d	10	28	47.90
A	10	23	03
A-A		5	44.90
sin(A-A)			+344.86
log			253764
cos			998422
S			102910
S ₁			+10.6930
S ₂			+51
S ₃			28.6981
S ₄			28.8960
S-S			+1979

C	+13°	25'	59.8"
L			00.2
B			59.0
mean	+13	25	59.7
Proc	-	3	41.1"
d	+13	22	18.6"
D	+14	09	55"
d-D		-47	36.4"
sin			-2856.6"
log			3.45582-
log			0.78697-
tan S			9.3761
S ₁			18646
S ₂			8.2941
S ₃			-61281
S ₄			+197
S ₅			158966
S ₆			15.8336
S-S			-0630

C	+15°	24'	42.9"
L			42.6
B			42.8
mean	+15	24	42.8
Proc	-	3	41.6
d	+15	21	01.2
D	+14	09	55"
d-D		+1	11.06.2
sin			+4266.8
log			3.63010
log			0.96125
tan S			9.4386
S ₁			20582
S ₂			8.5502
S ₃			+91464
S ₄			+355
S ₅			31.1819
S ₆			31.1066
S-S			-753

		C	O	O - C
-	2 -	4 + 8 = + 2	0	+ 2
-	3 -	3 + 8 = + 2	+ 4	+ 2
-	6 -	5 + 8 = - 3	- 1	+ 2
-	6 -	3 + 8 = - 1	- 2	- 3

+	2 -	11 + 5 = - 4	- 1 2	- 8
+	3 -	7 + 5 = + 1	+ 9	+ 8
+	6 -	12 + 5 = - 1	+ 7	+ 8
+	6 -	7 + 5 = + 4	- 5	- 9

+	13 -	11 = + 2	- 9	- 1 1
+	8 -	11 = - 3	+ 8	+ 1 1
+	14 -	11 = + 3	+ 14	+ 1 1
+	9 -	11 = - 2	- 1 3	- 1 1

-	2 -	10 + 13 = + 1	- 3	- 4
-	3 -	6 + 13 = + 4	+ 7	+ 3
-	7 -	10 + 13 = - 4	- 1	+ 3
-	7 -	6 + 13 = 0	- 4	- 4

Plate Constants

(18.

Conditional Equations - rejecting 17

x	y	$x-3$	$y-4$	$x-3$	$y-4$
$9.89 + 23.45 + 1 =$		6	-12	-9	-3
$12.81 + 14.38 + 1 =$		+4	+9	+8	+7
$26.31 + 25.29 + 1 =$		-1	+7	+14	-1
$26.56 + 15.90 + 1 =$		-2	-5	-13	-4
$28.70 + 31.18 + 1 =$					

Mean Equations

$+11.35 + 18.92 + 1 =$	$+2.00$	-1.50	-0.50	$+2.00$
$+26.44 + 20.60 + 1 =$	-1.50	$+1.00$	$+0.50$	-2.50
$+19.18 + 15.14 + 1 =$	$+1.00$	$+2.00$	-2.50	$+1.50$
$+18.10 + 24.37 + 1 =$	-0.50	-2.50	$+2.50$	-2.00
$-15.09 - 1.68 =$	$+3.50$	-2.50	-1.00	$+4.50$
$+1.08 - 9.23 =$	$+1.50$	$+4.50$	-5.00	$+3.50$
$-1.08 - 0.12 =$	$+0.25$	-0.18	-0.07	$+0.32$
$-9.35 =$	$+1.75$	$+4.32$	-5.07	$+3.82$
$b =$	-0.19	-0.46	$+0.54$	-0.41
$a =$	-0.21	$+0.22$	0.00	-0.25

$+2.0$	-1.5	$+1.0$	-0.5	-1.5	$+1.0$	$+2.0$	-2.5
$+2.4$	$+5.6$	$+4.0$	$+3.8$	-2.5	-5.7	-4.2	-3.9
$+3.5$	$+3.8$	$+2.7$	$+4.6$	$+8.7$	$+9.5$	$+7.0$	$+11.3$
$+7.9$	$+7.9$	$+7.7$	$+7.9$	$+4.7$	$+4.8$	$+4.8$	$+4.9$

-0.5	$+0.5$	-2.5	$+2.5$	$+2.0$	-2.5	$+1.5$	-2.0
-10.2	-11.1	-8.2	-13.1	$+2.8$	$+6.7$	$+4.8$	$+4.6$
-10.7	-10.6	-10.7	-10.6	$+7.7$	$+8.4$	$+6.2$	$+10.0$
				$+12.5$	$+12.6$	$+12.5$	$+12.6$

Plate Constants

18.

Conditional Equations - residuals

x	y	$2-3$	$4-7$	$2+3$	$7-4$
$9.89 + 23.45 + 1 =$		0	-12	-9	-3
$12.81 + 14.38 + 1 =$		+4	+9	+8	+7
$26.31 + 25.29 + 1 =$		-1	+7	+14	-1
$26.56 + 15.90 + 1 =$		-2	-5	-13	-4
$28.70 + 31.18 + 1 =$					

mean Equations

$+11.35 + 18.92 + 1 =$	$+2.00$	-1.50	-0.50	$+2.00$
$+26.44 + 20.60 + 1 =$	-1.50	$+1.00$	$+0.50$	-2.50
$+19.18 + 15.14 + 1 =$	$+1.00$	$+2.00$	-2.50	$+1.50$
$+18.10 + 24.37 + 1 =$	-0.50	-2.50	$+2.50$	-2.00
$-15.09 - 1.68 =$	$+3.50$	-2.50	-1.00	$+4.50$
$+1.08 - 9.23 =$	$+1.50$	$+4.50$	-5.00	$+3.50$
$-1.08 - 0.12 =$	$+0.25$	-0.18	-0.07	$+0.32$
$-9.35 =$	$+1.75$	$+4.32$	-5.07	$+3.82$
$b =$	-0.19	-0.46	$+0.54$	-0.41
$a =$	-0.21	$+0.22$	0.00	-0.25

$+2.0$	-1.5	$+1.0$	-0.5	-1.5	$+1.0$	$+2.0$	-2.5
$+2.4$	$+5.6$	$+4.0$	$+3.8$	-2.5	-5.7	-4.2	-3.9
$+3.5$	$+3.8$	$+2.7$	$+4.6$	$+8.7$	$+9.5$	$+7.0$	$+11.3$
$+7.9$	$+7.9$	$+7.7$	$+7.9$	$+4.7$	$+4.8$	$+4.8$	$+7.9$

-0.5	$+0.5$	-2.5	$+2.5$	$+2.0$	-2.5	$+1.5$	-2.0
-10.2	-11.1	-8.2	-13.1	$+2.8$	$+6.7$	$+4.8$	$+4.6$
-10.7	-10.6	-10.7	-10.6	$+7.7$	$+8.4$	$+6.2$	$+10.0$
				$+12.5$	$+12.6$	$+12.5$	$+12.6$

det.	mag	resid.
1	21 3.5	+ 21 0
2	23 8.5	+ 29
3	26 1.2	+ 3
4	27 0.0	+ 38
5	28 8.5	- 97
6	30 1.5	- 154
7	32 1.9	+ 45
8	33 7.7	+ 81
9	0.0	+ 123
10	16.9	+ 68

1747

Moon's Center

17

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - C$
1	17.6288	-1.1784	1.3886	4.5081	+20.5
2	17.0000	-1.8072	3.2659	4.5029	+1.53
3	16.7090	-2.0982	4.4024	4.5100	+2.24
4	16.6820	-2.1252	4.5165	4.5165	+2.89
5	16.7934	-2.0138	4.0554	4.5071	+1.95
6	17.0000	-1.8072	3.2659	4.5026	+1.50
7	17.4937	-1.3135	1.7253	4.5212	+3.36
8	18.0000	-0.8072	0.6515	4.5214	+3.38
9	18.8072	0.0000	0.0000	4.5173	+2.97
10	19.4259	+0.6187	0.3828	4.5037	+1.61

$$\text{Comp. } K^2 = 44876$$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	17.5619	-1.7661	-1	3.1195
2	18.2159	-1.1121	-1	1.2370
3	19.0000	-0.3280	0	0.1076
4	19.3280	0.0000	0	0.0000
5	20.0000	+0.6720	+1	0.4517
6	20.4400	+1.1120	+1	1.2367
7	21.0000	+1.6720	+1	2.7959
8	21.2950	+1.9670	+2	3.8699
9	21.4532	+2.1252	+2	4.5173
10	21.3578	+2.0298	+2	4.1209

Approximate Center

$$x_0 = 17.0 \quad y_0 = 18.2159$$

$$20.4400$$

$$38.6559$$

$$\text{mean } y = 19.3280$$

$$y - \text{max} = 21.4532$$

$$K = 2.1252$$

$$x - \text{min} = 16.6820$$

$$\text{mean } x = 18.8072$$

$$\text{Center } \begin{cases} x_0 = 18.8072 \\ y_0 = 19.3280 \end{cases}$$

1747

Inoons Center

17

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$y - y_0$
1	17.6288	-1.1784	1.3886	4.5081	+2.05
2	17.0000	-1.8072	3.2659	4.5029	+1.53
3	16.7090	-2.0982	4.4024	4.5100	+2.24
4	16.6820	-2.1252	4.5165	4.5165	+2.89
5	16.7934	-2.0138	4.0554	4.5071	+1.95
6	17.0000	-1.8072	3.2659	4.5026	+1.50
7	17.4937	-1.3135	1.7253	4.5212	+3.36
8	18.0000	-0.8072	0.6515	4.5214	+3.38
9	18.8072	0.0000	0.0000	4.5173	+2.97
10	19.4259	+0.6187	0.3828	4.5037	+1.61

$$\text{Const. } K^2 = 4.4876$$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	17.5619	-1.7661	-1	3.1195
2	18.2159	-1.1121	-1	1.2370
3	19.0000	-0.3280	0	0.1076
4	19.3280	0.0000	0	0.0000
5	20.0000	+0.6720	+1	0.4517
6	20.4400	+1.1120	+1	1.2367
7	21.0000	+1.6720	+1	2.7959
8	21.2950	+1.9670	+2	3.8699
9	21.4532	+2.1252	+2	4.5173
10	21.3578	+2.0298	+2	4.1209

Approximate Center

$$x = 17.0 \quad y = 18.2159$$

$$20.4400$$

$$38.6559$$

$$\text{mean } y = 19.3280$$

$$y - \text{max} = 21.4132$$

$$K = 2.1252$$

$$x - \text{min} = 16.6820$$

$$\text{mean } x = 18.8072$$

$$\text{Center } \begin{cases} X = 18.8072 \\ Y = 19.3280 \end{cases}$$

Formation of Normals

	ab	an	bn
1	+ 2.09 [✓]	- 241.9 [✓]	- 362.8 [✓]
2	+ 2.01 [✓]	- 276.9 [✓]	- 169.8 [✓]
3	+ 0.69 [✓]	- 470.4 [✓]	- 73.9 [✓]
4	- 0.00 [✓]	- 615.6 [✓]	+ 0.0 [✓]
5	- 1.35 [✓]	- 392.0 [✓]	+ 130.6 [✓]
6	- 2.01 [✓]	- 271.5 [✓]	+ 166.5 [✓]
7	- 2.19 [✓]	- 440.2 [✓]	+ 561.1 [✓]
8	- 1.60 [✓]	- 273.8 [✓]	+ 665.9 [✓]
9	+ 0.00 [✓]	+ 0.0 [✓]	+ 632.6 [✓]
10	+ 1.26 [✓]	+ 99.8 [✓]	+ 326.8 [✓]
	- 1.10 [✓]	- 2882.5 [✓]	+ 1877.0 [✓]

+6.05
-7.15

1747

Lagoon's Center

20

Conditional Equations

	a	b	c		c	b-c	
1	-1.18	-1.77	= +205	+139	-144	= -5	+240
2	-1.81	-1.11	= +153	+214	-90	= +124	+29
3	-2.10	-0.33	= +224	+248	-27	= +221	+3
4	-2.18	+0.00	= +289	+251	0	= +251	+38
5	-2.01	+0.67	= +195	+237	+55	= +292	-97
6	-1.81	+1.11	= +150	+214	+90	= +304	-154
7	-1.31	+1.67	= +336	+155	+136	= +291	+45
8	-0.81	+1.97	= +338	+96	+161	= +257	+81
9	+0.00	+2.13	= +297	0	+174	= +174	+123
10	+0.62	+2.03	= +161	-73	+166	= +93	+68

Average = 85

Normal Equations

$$+23.65 - 1.10 = -2882$$

$$- 1.10 + 21.46 = +1877$$

$$+ 1.10 - 0.05 = -134$$

$$+ 21.41 = +1743$$

$$b = +81.5$$

$$- 0.06 + 1.10 = +96$$

$$+ 23.59 = -2786$$

$$a = -118.0$$

1747

Lagoon Center

Conditional Equations

20

	a	b	0	c	0-c	
1	-1.18	-1.77	= +205	+139	-144 = -5	+240
2	-1.81	-1.11	= +153	+214	-90 = +124	+29
3	-2.10	-0.33	= +224	+248	-27 = +221	+3
4	-2.18	+0.00	= +289	+251	-0 = +251	+38
5	-2.01	+0.67	= +195	+237	+55 = +292	-47
6	-1.81	+1.11	= +150	+214	+90 = +304	-154
7	-1.31	+1.67	= +336	+155	+136 = +291	+45
8	-0.81	+1.97	= +338	+96	+161 = +257	+81
9	+0.00	+2.13	= +297	-0	+174 = +174	+123
10	+0.62	+2.03	= +161	-73	+166 = +93	+78

Average = 86

Normal Equations

$$+23.65 - 1.10 = -2882$$

$$- 1.10 + 21.46 = +1877$$

$$+ 1.10 - 0.05 = -134$$

$$+ 21.91 = +1743$$

$$b = +81.5$$

$$- 0.06 + 1.10 = +96$$

$$+23.59 = 2786$$

$$a = -1180$$

1247 Moon's Mean Position (1912.0)

21

$$\begin{array}{r} X_0 = 18.8072 \\ \frac{1}{2}a = -0.59 \\ \hline 18.8013 \end{array}$$

$$\begin{array}{r} Y_0 = 19.3280 \\ \frac{1}{2}b = +0.41 \\ \hline 19.3321 \end{array}$$

From Plate Constants $X = 18.6899$ $Y = 19.3384$

$$\begin{array}{r} z = +0.6899 \\ \log z = 9.83879 \\ \text{wss} = 9.98724 \\ \text{const} = 8.50724 \\ \text{"(X-A)} = 1.34431 \end{array}$$

$$X - A = +22.10$$

$$A = 10 \quad 23 \quad 03$$

$$V_0 = 10^h \quad 23^m \quad 25.10^s$$

$$\text{Red} = +1.56$$

$$X' = 10 \quad 23 \quad 26.66$$

$$\begin{array}{r} \eta = -2.6616 \\ \log \tan S = 9.3967 \\ \text{" } z = 9.6776 \\ \text{" } \eta_1 = 6.1277 \end{array}$$

$$\eta_1 = +1$$

$$\eta_0 = -2.6617$$

$$\begin{array}{r} \log m_0 = 0.42516 \\ \text{const} = 7.33115 \end{array}$$

$$\text{"(z-D)} = 3.09401$$

$$S - D = -20 \quad 41.7$$

$$D = +14 \quad 09 \quad 55$$

$$S_0 = +13^\circ \quad 49' \quad 13.3''$$

$$\text{Red} = -3.7$$

$$S' = +13 \quad 49 \quad 09.6$$

1247 Inverse Mean Position (1912.0)

21

$$X_0 = 18.8072$$

$$\frac{1}{2} \Delta = \frac{-59}{18.8013}$$

$$Y_0 = 19.3280$$

$$\frac{1}{2} \Delta = \frac{+41}{19.3321}$$

From Plate Constants $X = 18.6899$ $Y = 19.3384$

$$z = +0.6899$$

$$\eta = +2.6616$$

$$\log s = 9.83879$$

$$\log S = 9.98724$$

$$\log \text{const} = 8.50724$$

$$\log \tan S = 9.3967$$

$$z = 9.6776$$

$$\eta_1 = 6.1277$$

$$(x - X) = 1.34431$$

$$\eta_1 = +1$$

$$\alpha - A = +22.10$$

$$\eta_0 = +2.6617$$

$$A = 10^h 23^m 03^s$$

$$\log \eta_0 = 0.42516$$

$$d_0 = 10^h 23^m 25^s.10$$

$$\log \eta = 7.33115$$

$$\text{Red.} = +1.56$$

$$(d - D) = 3.09401$$

$$\alpha' = 10^h 23^m 26.66^s$$

$$S - D = -20.41.7$$

$$D = +14.09.55$$

$$S = 713^\circ 49' 13.3''$$

$$\text{Red.} = -3.7$$

$$S = 713.49.09.6$$

1747

Red. ad l. aph.

22

$$\begin{array}{rcl}
 H + \alpha & 3 & 43 = 55^\circ 45' \\
 H & 17 & 20 \\
 \alpha & 10 & 23 \\
 G & 18 & 57 \\
 G + \alpha & 5 & 20 = 80^\circ
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(G + \alpha) & = & 9.2397 \\
 \dots \quad \alpha & = & 0.9695 \\
 \dots \sin \alpha & = & 9.9934 \\
 \dots \tan \alpha & = & 9.3908 \\
 \dots \quad \alpha & = & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log(g') & 0.2092 \\
 \dots (g) & 9.1776
 \end{array}$$

$$\begin{array}{rcl}
 f & + & 0.34 \\
 g & + & 0.15 \\
 h & + & 1.07 \\
 \hline
 & + & 1.56
 \end{array}$$

$$S_0' = +13 \quad 49$$

$$\begin{array}{rcl}
 \log \cos S & = & 9.9872 \\
 \dots \quad L & = & 0.9054 \\
 \dots (L) & = & 0.8926
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin S & = & 9.3781 \\
 \dots \cos(H + \alpha) & = & 9.7504 \\
 \dots \quad L & = & 1.2747 \\
 \dots \sin \alpha & = & 9.9173 \\
 \dots \sec S & = & 0.0128 \\
 \dots \quad L & = & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log(h') & 0.4032 \\
 \dots \quad h & 0.0287
 \end{array}$$

$$\begin{array}{rcl}
 g' & + & 1.62 \\
 h' & + & 2.53 \\
 i & - & 7.81 \\
 \hline
 & - & 3.66
 \end{array}$$

1747

Read ad 2 when

$$\begin{aligned}
 H+A & 3 \quad 43 = 55^\circ 45' \\
 H & 17 \quad 20 \\
 a & 10 \quad 23 \\
 G & 18 \quad 57 \\
 G+L & 5 \quad 20 = 80^\circ
 \end{aligned}$$

$$\begin{aligned}
 \log \cos(G+L) & 9.2397 \\
 \log \cos H & 0.9695 \\
 \log \cos a & 9.9934 \\
 \log \cos H & 9.3908 \\
 \log \cos a & 8.8239
 \end{aligned}$$

$$\begin{aligned}
 \log g' & 0.2092 \\
 \log g & 9.1776
 \end{aligned}$$

$$\begin{aligned}
 f & +0.34 \\
 g & +0.15 \\
 h & +1.07 \\
 \hline
 & +1.56
 \end{aligned}$$

$$S' = +1.3 \quad 49$$

$$\begin{aligned}
 \log \cos S & 9.9872 \\
 \log \cos L & 0.9054 \\
 \hline
 (L) & 0.8926
 \end{aligned}$$

$$\begin{aligned}
 \log \sin S & 9.3781 \\
 \log \sin(G+L) & 9.7504 \\
 \log L & 1.2797 \\
 \log \sin a & 9.9173 \\
 \log \sin S & 0.0128 \\
 \log L & 8.8239
 \end{aligned}$$

$$\begin{aligned}
 \log h' & 0.4032 \\
 \log h & 0.0287
 \end{aligned}$$

$$\begin{aligned}
 d' & +1.62 \\
 L & +2.53 \\
 \hline
 & -7.81 \\
 & -3.66
 \end{aligned}$$

1747

Linear Parallax.

$$\begin{aligned}
 \alpha' &= 10 \quad 23 \quad 26.66 \\
 \delta &= 10 \quad 55 \quad 34.75 \\
 \delta - \alpha' &= + 32 \quad 08.09 \\
 &= + 80 \quad 02' 01.4'' \\
 &+ 3 \quad 10 \\
 &+ 7 \quad 59 \quad 00.4
 \end{aligned}$$

$$\begin{aligned}
 9.95727 \\
 0.00000 \\
 \hline
 000423 \\
 9.96150
 \end{aligned}$$

$$\begin{aligned}
 \gamma &= 42 \quad 27 \quad 50 \\
 &+ 13 \quad 49 \quad 10
 \end{aligned}$$

$$\delta - \delta' = 28 \quad 38 \quad 40$$

$$\begin{aligned}
 9.82640 \\
 8.23798 \\
 9.68067 \\
 0.17061 \\
 \hline
 7.91566
 \end{aligned}$$

$$\delta - \delta' = + 28 \quad 18.6$$

$$\delta = + 14 \quad 17 \quad 28.2$$

$$\text{Ann Eph } \delta = + 14 \quad 17 \quad 31.1$$

$$\delta - \epsilon = - 2.9$$

$$\delta' = + 13 \quad 49 \quad 09.6$$

$$\pi = 59' \quad 28.0''$$

$$\begin{aligned}
 9.86913 \\
 8.23798 \\
 9.14586 \\
 0.01366 \\
 \hline
 7.26613
 \end{aligned}$$

$$\begin{aligned}
 \alpha - \alpha' &= + 6' \quad 20.68'' \\
 &= + 25.38
 \end{aligned}$$

$$\alpha \quad 10 \quad 23 \quad 52.04$$

$$\alpha \quad 10 \quad 23 \quad 51.51$$

$$+ 0.53$$

1747

Lunar Parallax

$$\alpha' = 10 \quad 23 \quad 26.66$$

$$\delta = 10 \quad 55 \quad 34.75$$

$$G - \alpha = +32 \quad 08.09$$

$$= +8 \quad 02 \quad 14$$

$$+ \quad \quad \quad 3 \quad 10$$

$$+ \quad 7 \quad 59 \quad 04$$

$$995727$$

$$000000$$

$$000423$$

$$996150$$

$$\gamma = 42 \quad 27 \quad 50$$

$$+13 \quad 49 \quad 10$$

$$\delta - \delta = 28 \quad 38 \quad 40$$

$$982690$$

$$823798$$

$$968067$$

$$017061$$

$$791566$$

$$S - S' = +28 \quad 18.6$$

$$S = +14 \quad 17 \quad 28.2$$

$$\text{Circ. Eph. } S = +14 \quad 17 \quad 31.1$$

$$O - C = -2.9$$

$$\delta' = +13 \quad 49 \quad 09.6$$

$$\pi = 59' \quad 28.0$$

$$9.86913$$

$$8.23798$$

$$919556$$

$$001366$$

$$726613$$

$$\alpha - \alpha' = +6 \quad 20.88$$

$$= +25.38$$

$$\alpha \quad 10 \quad 23 \quad 52.04$$

$$\alpha \quad 10 \quad 23 \quad 51.51$$

$$+0.53$$

