

KG

11366

v.914

XXXVIII



1737

1739.

1743.

M. Fowler 14 Prospect Street.

Harvard Lunar Plates

Measures and Reductions

Mary Fowler.

Volume XXXVIII

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1
6
13
m
8
:
24
3
m
6
:
26
20
m
7

MC 1737

1913 Oct. 15.

1

Stars - measures.

	d	⁴	v	d	⁷	v
1	16628		16210	18005		16418
6.3	813040		1473028	11270		13150
15.8	40		20	65	63	5260
mg	44		10	12		20
8.6	<u>15.8505</u>		<u>.8516</u>	<u>6.3256</u>		<u>.3265</u>
2	15910		14895	15978		15111
20.1	13908		692020	7370		1369090
32.3	1.0		11	80	72	91
mg	16		09	81		10
6.3	<u>32.2001</u>		<u>2011</u>	<u>20.1393</u>		<u>.1421</u>
3	19770		19268	14295		14150
26.7	13206		15829	1180300		664040
20.6	1112		30	60		42
mg	74		80	00		70
7.7	<u>20.6561</u>		<u>.6556</u>	<u>26.7505</u>		<u>.7524</u>

Grade 3.

1461737

1913 Oct 15

1

Stars - lucasius.

	d	4	n	d	7	n
1	16628	16200	18008	16418		
6.3	813040	1473020	11270	13150		
158	40	20	6563	5260		
mg	44	10	12	20		
8.6	15.8505	8516	6.3256	3265		
2	15910	14895	15978	15111		
20.1	13908	692020	7370	1369090		
32.3	10	11	8072	91		
mg	16	09	81	10		
63	32.2001	2011	20.1393	1421		
3	19770	19268	14295	14150		
26.7	13206	15829	1180300	664040		
20.6	1112	30	00	42		
mg	74	80	00	70		
77	20.6561	6556	20.7505	7524		

Grade 3.

1737

d

4

Luvon - measures

N

d

N

2.

Scratch

17.5 18950
19.3 1613932
5143

49

19.2809

18855-
1164062
5673
65-

2796

18261
1113552
8952
70

17.2875

18180
1529810
0907
70

2868

2 17500
17.0 12320
19.6 1528
92

19.5175

15714
1096220
10
30

5189

3
16.6
20.0

17280
13620
81
84

16.6386

15976
9520
8981
80

6398

4
16.4
21.0
min
in
70

17222
11035
20
38

16.3796

15016
11210
1208
18

3806

5
16.6
22.0

16170
1229591
00
76

6123

15060
893242
89
68

6126

6
17.0 18962
22.5 1362618
20
72
22.5346

19698
1504030
42
80
5348

1737

lunar - measures

- 2

1 Scratch
 175 18950
 193 1613932
 5143
 49
192809

18261
 18855-
 1164062
 5673
 65-
2796 17.2875

18180
 1529820
 0907
 70
2868

2 17500
 170 12320
 196 1528
 92
195175

15714
 1090200
 10
 30
5189

3
 166
 200

17280
 13670
 81
 84

15976
 9570
 89
 80

16.6386

6398

4
 164
 210
 20

17222
 11035
 20
 38

15016
 11210
 1208
 18

16.3796

3806

5
 166
 220

16170
 1229591
 00
 76
6123

15060
 893242
 29
 68
6126

6
 170 18962
 225 1362618
 20
 72
225346

19698
 1504030
 42
 80
5348

1737 α γ μ ν α x ν

2 scratch.

17.5	18895	18108	18170	17480
22.8	10316	16692	12470	13139
	10	1002	70	5049
	10	09	70	78
	<u>22.8594</u>	<u>.8593</u>	<u>17.4300</u>	<u>.4330</u>

8/

18.0	15983	1366040
23.1	1511190	4030
	0090	12710

blurred
point

23.0885 .0932

max γ = about 23.1470

1737 d y moon - a x w

7 Scratch

17.5	18895	18108	18170	17480
22.8	10316	16692	12470	13139
	10	1002	70	5049
	10	09	70	78
	<u>228894</u>	<u>8593</u>	<u>174300</u>	<u>4330</u>

8

18.0	15983	1366040
23.1	151190	4030
	0090	12710

blurred
print

23.0885 0932

max γ = about 23.1470

MC1737 Standard candles.

Cape No. 888 mag 8.6 Cape No. 908 mag 6.3

Cape No. 916 mag 7.7

C	6 ^h 06 ^m 43 ^s 91 ^v	6 ^h 14 ^m 48 ^s 97 ^v	6 ^h 18 ^m 41 ^s 22 ^v
L		49.01	.18
E		49.00	.21
Mean		6 14 48.99	6 18 41.20
Proc	+45.20 ^v	+45.95 ^v	+45.40 ^v
A	6 07 29.11 ^v	6 15 34.94	6 19 26.80
A	6 14 18.08 ^v	6 14 18.08	6 14 18.08
A-A	- 6 48.97 ^v	+ 1 16.86	+ 5 08.52
sinh(A)	-408.91 ^v	+76.86	+308.49
log ₁₀	2.61163 ^m	1.88570	2.98924
cos	9.94811 ^v	9.93935	9.94562
30	1.06698 ^m	0.33229	0.94210
30	-11.6676 ^v	+2.1492	+8.7518
30	- 49	+ 6	+ 17
30	6.3295	20.1498	26.7535
30	6.3260	20.1407	26.7514
30-3	-0.25	-91	-21
C	+27° 27' 24.2 ^v	+29° 35' 09.2	+28° 05' 06.0
L		09.1	07.1
E		09.2	07.4
Mean		+29 35 09.2	+28 05 06.8
Proc	- 07.5 ^v	- 15.9	- 20.0
S	+27 27 16.7 ^v	+29 34 53.3	+28 04 46.8
D	+28 15 19.3 ^v	+28 15 19.3	+28 15 19.3
S-D	- 48 02.6 ^v	+ 1 19 34.0	- 10 32.5
sinh(S-D)	-2882.8 ^v	+4774.8	-632.5
log ₁₀	3.45981 ^m	3.67895	2.80106 ^m
30	0.79096 ^m	1.01010	0.13221 ^m
30	9.7156 ^v	9.7541	9.7271
30	2.1340 ^v	8.6646	1.8842
30	8.9030 ^v	5.4721	8.6647
30	-6.1796 ^v	+10.2352	-1.3559
30	+ 800 ^v	0	+ 462
30	15.9004	+32.2352	20.6903
30	15.8510	32.2006	20.6558
30-30	-494	-346	-345

M1737

Standard candles

Cape W. 888 mag 8.6 Cape W. 908 mag 13

Cape W. 916 mag 17

C	6	06	43	91	6	14	48	97	6	18	41	22
L								4901				18
E								4900				21
Mean					6	14	48	99	6	18	41	20
Proc				+45.20				+45.95				+45.40
A	6	07	29	11	6	15	34	99	6	19	26	80
A	6	14	18	08	6	14	18	08	6	14	18	08
A-A	-	6	48	97	+1	16	86		+5	08	52	
sim (A)				-408.91				+76.86				+308.99
log..	2	6	1	16	3			1.88570	2	9	8	924
cos	9	9	4	8	1			9.93935	9	9	4	562
3.	1	0	6	6	9	8		9.33229	0	9	4	210
3.	-1	1	6	6	7	6		+2.1498	+8	7	5	18
3.	-			4	9			+			1	7
3	6	3	2	7	5			+20.1498	26	7	5	35
x	6	3	2	6	0			20.1407	26	7	5	14
x-3	-	0	2	5				-91	-	2	1	

C	+27°	27'	24.2"	+29°	35'	09.2"	+28°	05'	06.0"
L						09.1			07.1
E						09.2			07.4
Mean				+29	35	09.2	+28	05	06.8
Proc	-		07.5	-		15.9	-		20.0
S	+27	27	16.7	+29	34	53.3	+28	04	46.8
O	+28	15	19.3	+28	15	19.3	+28	15	19.3
S-O	-48	02.6		+1	19	34.0	-	10	32.5
tan (S-O)			-28828			+47748			-6325
log..	3	4	5981	3	6	7895	2	8	0106
70	0	7	9096	1	0	1010	0	1	3221
tan S	9	7	156	9	7	541	9	7	271
S	2	1	340	8	6	646	1	8	842
71	8	9	030	5	4	721	8	6	647
71	-6	1	796	+10	2	352	-1	3	559
71	+		800			0	+		462
71	1	5	9004	+3	2	2352	2	0	6903
71	1	5	8510	3	2	2006	2	0	6558
71-71	-	4	94	-	3	46	-	3	45

1737

5.

Plate Constants

x	y	R.A.	Decl.
6.3260	15.8510	6 07 29 +27	27 17
20.1407	32.2006	15 35 +29	34 53
26.7514	20.6558	19 27 +28	04 47
31.53.2181	68.7074	41 91	65 117
17.7394	22.9025	6 14 10 +28	22 19
-18	-22	+ 8.08	+ 6 59.7
0.2606	90.25		
31	465		
8.0786	419.662		

Center of Plate $\begin{cases} A = 6^h 14^m 18.508 \\ D = +28^\circ 15' 19.3 \end{cases}$

$$\begin{array}{rcl} x - 3 + 5.64 & -2 & -68 \\ -15 + 89 = +74 & -6 = +68 & = 0 \\ -91 + 180 = +89 & -20 = +69 & = +8 \\ -21 + 116 = +95 & -27 = +68 & = 0 \end{array}$$

$$\begin{array}{rcl} y - 7 & -6.62 & -3.54 & +1x & +590 \\ -494 - 42 = -536 & -55 = -591 & +1 = -590 & = 0 \\ -346 - 133 = -479 & -113 = -592 & +2 = -590 & = 0 \\ -345 - 177 = -522 & -72 = -594 & +3 = -591 & = -1 \end{array}$$

Tables	$a = +0.9$	$e = +1.0$	$a - e = -0.1$	$b + a = +0.0$
Obs	$a = +1.0$	$+3.5$	$a - e = -2.5$	$b + a = +0.9$
C - O			$a - e = +2.4$	$b + a = -0.9$

1737

5

Plate Countants

	1	R. A.	Decl.
6.3260	15.8510	6 07 29	+27 27 17
20.1407	32.2006	15 35	+29 54 53
26.7514	20.6558	19 27	+28 04 47
31.532181	68.7074	41 91	65 117
17.7394	22.9025	6 14 10	+28 22 19
-18	22	+	508 + 6 59.7
0.2606	90.25		
31	465		
80.786	419.662		

Center of Plate { A = 6" 14" 18.508
D = +28" 15" 19.3

$$\begin{array}{rcl}
 x - 3 + 5.64 & -x & -68 \\
 -15 + 89 = +74 & -6 & +68 \\
 -91 + 180 = +89 & -20 & +68 \\
 -21 + 116 = +95 & -27 & +68
 \end{array}$$

$$\begin{array}{rcl}
 y - 11 & -3.54 & +12 & +590 \\
 -494 - 42 = -536 & -55 & = -591 + 1 & = -590 = 0 \\
 -346 - 133 = -479 & -113 & = -592 + 2 & = -590 = 0 \\
 -345 - 177 = -522 & -72 & = -599 + 3 & = -591 = -1
 \end{array}$$

Tables $a = +0.9$ $b = +1.0$ $a - b = -0.1$ $b + a = +0.9$
 Obs $a = +1.0$ $+3.5$ $a - b = -2.5$ $b + a = +0.9$
 C - 0 $-x = +24$ $b + a = -0.9$

	1737	Trines etc.	
expt Stan 1912 man 25	7 ^h 39 ^m	- 7 ^h 51 ^m	
moon	7 45	17.2	7 45 17.6
clock slow	1 45.2		
H Sid T.	7 47	02.6	
H long	4 44	31.05	
G. Sid T.	12 31	33.65	
Sid T. w. moon	0 10	18.23	
Interval	12 21	15.42	
Reduction	2	01.44	
G. M. T.	12 19	13.98	6 - X - H ² 31 ^m 10 ^s

From Kant. Alm. R.A. Decl.

Moon 12^h $6^h 15^m 01.36$ $+28^\circ 24' 14.2''$

Motion in 2.6702 0.062

" 19.233 $+ 51.36$ $+ 1.2$

Tabular place $6 15 52.72$ $+28 24 15.4$

Moon's age 6.6 days.

Moon's parallax $59' 07.5''$

" semidiam $16' 08.3''$

$939 = +14.5$ ✓
 $968 = +15.6$ ✓

R = 968.3 ✓

Augmentation $+15.6$ ✓

Irradiation (3) -0.7 ✓

R = 983.2 ✓

R = 2107.6 ✓

$a = +1.0$ $(1+a)R = 2107.8$ ✓

$R^2 = 4442.8$ ✓

1737	Times etc								
Station 1912 Mar 25	7 ^h 39 ^m				- 7 ^h 51 ^m				
known	7 45	172	- 7 45	176					
clock slow		1 452							
H. Sid. T.	7 47	02.6							
H. hour	4 44	31.05							
G. Sid. T.	12 31	33.65							
Sid. T. in hour	0 10	18.23							
Interval	12 21	15.42							
Reduction		2 01.44							
G. M. T.	12 19	13.98	G - A + H	31 ^m	10 ^s				

from hour Alur	R. A.	Decl.			
known 12 ^m	6 ^h 15 ^m	01.36	+28° 24'	14.2	
known 1 ^m 2 67.02			0.062		
19.233	+ 5 ^m	13.6		+ 1.2	
Tubular plate	6 15	52.72	+28° 24'	15.4	
Unknown age	66 days				
Unknown parallel	59	07.5			
Scindian	16	08.3			
R =		968.3			
Amplitude		+15.6			
Trachid (3)		-0.7			
R =		983.2			
R =		2.1076			
(1 + a) R =		2.1078			
R2 =		444.2			
934 = +14.5					
968 = +15.6					
a = +1.0					

$$- 6.65 - 4.31 = +1.229$$

$$- 4.93 + 6.37 = +1.605$$

$$- 1.79$$

$$+ 1.79$$

$$+ 4.93 + 3.19 = - 9.11$$

$$+ 9.56 = + 69.4$$

$$+ 1.33$$

$$+ 3.12$$

$$b = + 72.6$$

$$b = + 32.6$$

$$- 6.65 = + 1.229 + 3.13 = + 15.42 \quad a = + 23.2$$

$$- 1.79 + 14.1 = - 0.38$$

$$a = + 21.3$$

1737

Moon's Center

7

	x	$(x - X_0)^2$	$(x - X_0)^2$	$(x - X_0)^2 + (y - Y_0)^2$	$O - C$
1	17.2872	-1.2007	1.4417	4.4909	+481
2	17.0000	-1.4879	2.2138	4.4885	+457
3	16.6392	-1.8487	3.4177	4.4712	+284
4	16.3801	-2.1078	4.4428	4.4435	+7
5	16.6124	-1.8755	3.5175	4.4654	+246
6	17.0000	-1.4879	2.2138	4.4888	+460
7	17.4315	-1.0564	1.1159	4.4758	+330
8	18.0000	-0.4879	0.2380	4.4997	+569

Comp $R^2 =$ 4.4428
4.4780

	y	$(y - Y_0)$	$(y - Y_0)^2$
1	19.2802	-1.7462	3.0492
2	19.5182	-1.5082	2.2747
3	20.0000	-1.0264	1.0535
4	21.0000	0.0264	0.0007
5	22.0000	0.9736	0.9479
6	22.5347	+1.5083	2.2750
7	22.8594	+1.8330	3.3599
8	23.0908	+2.0644	4.2617

Approximate center

$$x = 17.0 \quad y = 19.5182$$

$$22.5347$$

$$42.0529$$

$$\text{mean } y = 21.0264$$

$$\text{Comp. } R = 21.078$$

$$\text{max } y = 23.1342$$

$$x - \text{min} = 16.3801$$

$$R = 2.1078$$

$$X_0 = 18.4879$$

$$\text{Center } \begin{cases} X_0 = 18.4879 & Y_0 = 18.4963 \\ Y_0 = 21.0264 & Y_0 = 21.0300 \end{cases}$$

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Moon's Center

7

	x	$(x - x_0)$	$(x - x_0)^2$	$(x - x_0) + (y - y_0)^2$	$O - C$
1	17.2872	-1.2007	1.4417	4.4909	+4.81
2	17.0000	-1.4879	2.2138	4.4885	+4.67
3	16.6392	-1.8487	3.4177	4.4712	+2.84
4	16.3801	-2.1078	4.4428	4.4435	+7
5	16.6124	-1.8755	3.5175	4.4654	+2.46
6	17.0000	-1.4879	2.2138	4.4888	+4.60
7	17.4315	-1.0564	1.1159	4.4758	+3.30
8	18.0000	-0.4879	0.2380	4.4997	+5.69

Comp R^2

4.4428

4.4780

	y	$(y - y_0)$	$(y - y_0)^2$
1	19.2802	-1.7462	3.0492
2	19.5182	-1.5082	2.2747
3	20.0000	-1.0264	1.0535
4	21.0000	0.0264	0.0007
5	22.0000	0.9736	0.9479
6	22.5347	1.5083	2.2750
7	22.8599	1.8330	3.3599
8	23.0908	2.0644	4.2617

Approximate center

$$x = 17.0 \quad y = 19.5182$$

$$\underline{22.5347}$$

$$4.20529$$

$$\text{mean } y = 21.0264$$

$$\text{Comp } R^2 = 21.078$$

$$\text{mean } x = 23.1342$$

$$x - \text{min} = 16.3801$$

$$R = 21.078$$

$$x_0 = 18.4879$$

Center

$$x_0 = 18.4879$$

$$y_0 = 21.0264$$

$$y_0 = 18.4763$$

$$y_0 = 21.0300$$

1737

Moon's Center

8.

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$
1	17.2872	-1.1891	1.4139	4.4757
2	17.0000	-1.4763	2.1795	4.4650
3	16.8392	-1.8371	3.3750	4.4359
4	16.3801	-2.0962	4.3940	4.3949
5	16.6124	-1.8639	3.4741	4.4150
6	17.0000	-1.4763	2.1795	4.4436
7	17.4315	-1.0448	1.0916	4.4383
8	18.0000	-0.4763	0.2269	4.4738

	y	$y - y_0$	$(y - y_0)^2$
1	19.2802	-1.7498	3.0618
2	19.5182	-1.5118	2.2855
3	20.0000	-1.0300	1.0609
4	21.0000	-0.0300	0.0009
5	22.0000	+0.9700	0.9409
6	22.5347	+1.5047	2.2641
7	23.8594	+1.8294	3.3467
8	23.0908	+2.0608	4.2469

1737

Munroe Center

8.

1	172872
2	170000
3	166392
4	163801
5	161124
6	170000
7	174315
8	180000

1	192802
2	195182
3	200000
4	210000
5	220000
6	225347
7	228594
8	230908

3
1
2
1-
3
2
2

MC 1739

1913 Oct 15

12

Stars - measures.

	d	n	d	x	w
↓	15852	17805	16336		14549
3.0	1444040	9215	676653		1413534
16.1	40	15-18	5053		20
	60	05	46		
	<u>16.1413</u>	<u>.1411</u>	<u>3.0410</u>		<u>.0419</u>
<u>2</u>					
17.0	14505	16946	750001		11140
32.3	1142015	1003831	0201		1049594
	18	38	6888		90
	11	48			
	<u>32.3089</u>	<u>.3089</u>	<u>170613</u>		<u>.0647</u>
<u>3</u>					
18850	15060	13753		15400	
23.5	1201920	1191219	897280	10180	8290
20.7	19	20	78	82	
	62	68	68	12	
	<u>20.6839</u>	<u>.6853</u>	<u>23.5217</u>	<u>.5222</u>	

Grade 3.

2 Remeasure (w)

10790
 10180
 65-70

17.0622

MC 1739

1913 Oct 15

12

Stars - measured

	d	v	d	v
↓	15852	17805	16336	14549
3.0	1444040	9215	676653	1413534
16.1	40	15-18	50	20
	60	05	46	
	<u>161413</u>	<u>1411</u>	<u>30410</u>	<u>0419</u>
2				
17.0	14505	16946	750001	11140
32.3	1142015	1003831	0201	1049594
	18	38	6888	90
	11	48		
	<u>323089</u>	<u>3089</u>	<u>170613</u>	<u>0647</u>
3				
18850	15060	13753	15400	
23.5	1208920	1191219	897280	1018090
20.7	19	20	78	82
	62	68	68	12
	<u>206839</u>	<u>6853</u>	<u>235217</u>	<u>5222</u>

Grade 3.

1737. Moon-measures.

13.

16.3 scratch.

19.1 12965

1217574

70

912012

10

8330

18123

11030

2930

21

15352

1247668

80

70

19.0792078416290828892
16.0 17316

19495

19.4 1475020

1205960

25-20

60

10

00

19.25892561

3

15.4

20.0

18436

1216980

72

48

18328

1459099

95-99

30

15.37313734

77354

881001

00

60

15.1445

17390

1591530

20

02

1470

16270

1043835

35

75

15.4163

16470

12309

0199

80

4171

4

15.2

21.0

min

in

26

5

15.4

22.0

6

16.0

22.6

19043

1252830

30

45

22.6515

17660

14190

9184

55

6530

1739

brown measures

✓	a	4	n	d	se	v
16.3	scratched					
19.1	12965	9120	12	18123	15352	
	12175	10		11030	12476	68
	70	8330		2930	60	
				21	70	
	<u>190792</u>	<u>0784</u>		<u>162908</u>	<u>2889</u>	

2	16.0	17316	19495
199	14750	12059	60
	20	60	
	10	00	
	<u>192589</u>	<u>2561</u>	

3	154		18436	18328
200			1216980	1459099
			72	95
			48	30

4	15.2		153731	3734
21.0			17354	17390
mm			881001	1591530
			00	20
			60	02
20			<u>151445</u>	<u>1470</u>

5	15.4		16270	16470
22.0			1043835	1230999
			35	01
			75	80
			<u>154163</u>	<u>4171</u>

6	16.0	19043	17660
22.6		1252830	1919084
		30	91
		45	55
	<u>226515</u>	<u>6530</u>	

1739

a y

Lincoln

n

a y

n

14

2 Scratch.

16.4 19701

16688

1951.7

115755

22.9 1089040

11554023

13520

1178070

80

40

3020

70

14

94

20

60

22.8826.884516.400413984

8

17.0 13848

1095062

23.1 1339080

50

80

10473

possibly on
terminator23.04650481

1739	Lincoln	14
2	2	2
164 19.701	16688 1951.7	15755
22.7 1089090	1554023 13520	1178070
50	40	70
14	94	60
22.8826	8895 164004	3984
8		
170 13848	1095062	
251 1339080	50	
80	10473	
23.0465	0481	

possibly on
annals

1739

Plate Constants

15

	1	2	3
2	3.0414	17.0678	23.5220
3	6.3275	20.1498	26.7535
2-3	-3.2861	-3.0820	-3.2315

4	16.1412	32.3089	20.6846
7	15.9004	32.2352	20.6903
4-7	+2.408	+0.737	-5.7

2-3	-1234	+0.576	+3.4845
-3.2861	-19852	-3.4846	+2 = -3.4844 = +1
-3.0820	-3974	-3.4854	+9 = -3.4845 = 0
-3.2315	-2544	-3.4859	+12 = -3.4847 = -2
17.2490	-2578	+9	= 20.4756

4-7	+120.6x	-1.24	-2756
+2.408	+367	+2775	-19 = +2756 = 0
+737	+2058	+2795	-39 = +2756 = 0
-57	+2837	+2780	-25 = +2755 = -1
20.9554	+2080	-25	= 20.8853

Tables	a = +0.9	e = +0.9	a - e = 0.0	b + a = -0.8
Obs.	a = -0.5	e = +1.2	a - e = -1.7	b + a = +2.4
C-O			+1.7	-3.2

1739

Plate Constants

15

	1	2	3
2	30414	170688	235220
9	63275	201498	267135
2-3	-32861	-30880	-32315

4	161412	323089	206846
7	159004	322352	206903
4-7	+2408	+0737	-57

2-3	-1234	+0.52	+3.4845
-32861	-1985	-3.4846	+2 = -3.4844 = +1
-30880	-3974	-3.4854	+9 = -3.4845 = 0
-32315	-2544	-3.4859	+12 = -3.4847 = -2
172490	-2578	+9	= 20.4758

4-7	+120.62	-1.24	-2756
+2408	+367	+2775	-19 = +2756 = 0
+737	+2058	+2795	-39 = +2756 = 0
-57	+2837	+2780	-25 = +2755 = -1
20.9154	+2080	-25	= 20.8853

Obs	a = +0.9	e = +0.9	a - e = 0.0	b + a = -0.8
	a = -0.5	e = +1.2	a - e = -1.7	b + a = +2.4
	-0		+1.7	-3.2

1739

Times etc.

16.

Expt to stars	1912 Mar 25	8 ^h 16 ^m	- 8 ^h 28 ^m
... Moon		8 21 50.0 ^s	8 21 50.4 ^s
Cloud show		1 45.2 ^s	
H Sid T.		8 23 35.4	
H long		4 44 31.05	
G Sid T.		13 08 06.45	
Sid T. h. moon		0 10 18.23	
Interval		12 57 48.22	
Reduction		2 07.42	
G. M. T.		12 55 40.80	8-2-+2 ^h 06 ^m

From Kant. Alm.		Ra		Decl.
Moon 13 ^h	6 ^h 17 ^m	41 ^s 59 ^s	+ 28°	24° 13' 9"
Motion in 1 ^m	- 2.6711	- 0.095		
... - 4.32		- 11.54		+ 0.4
Tabular place.	6 17	30.05	+ 28 24	14.3

Moon's parallaxes	59' 08.0 ^s
Semi-diameter	16 08.4 ^s
934 = 13.8 ^s	R = 968.4 ^s
968 = 14.8 ^s	Augmentation + 14.8
	Irradiation (3) - 0.7
	R = 982.5 ^s
	R = 2.1061 ^s
a = -0.5	(1+a)R = 2.1060 ^s
	R2 = 4.4352 ^s

1739 Times etc

Exp. 1st Jan 1912 Mar 25	8 ^h 16 ^m	- 8 ^h 28 ^m
moon	8 21 50.0	- 8 21 50.4
clock show	1 45.2	
H.S. id T	8 23 35.4	
H. long	4 44 31.05	
G.S. id T	13 08 06.45	
Sid T 2 h. m.	0 10 18.23	
T. m. m.	12 57 48.22	
Reduction	2 07.42	
G. T. T	12 55 40.80	6-2-+2 ^h 06 ^m

From Kant Allen

moon 13 ^h	6 ^h 17 ^m 41 ^s 59	+ 28° 24' 13" 9
moon 13 ^h - 2.6711	- 11.54	+ 0.4
- 4.32		
Tabular place	6 17 30.05	+ 28 24 14.3

Proton's parallel

59' 08" 0
16 08 4
9684
+ 14.8
- 0.7
982.5
2.1061
2.1060
4.4352

934 = 13.8
964 = 14.8

a = -0.5

(1+a)R =

R =

ϕh	pos. L.	res. val.
1	207 ⁰ 2	+69
2	216.5	+79
3	243.0	-34
4	271.3	-98
5	299.8	+120
6	323.5	+39
7	336.1	+43
8	353.2	+29

1739

Moon's Center

17

	x	y	$x - x_0$	$y - y_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$(y - y_0)^2$	$x - x_0$
1	16.2898	-0.9620	-2	0.9258	4.4452	+1.00		
2	16.0000	-1.2518	-1	1.5672	4.4480	+1.28		
3	15.3732	-1.8786	-1	3.5295	4.4411	+5.9		
4	15.1458	-2.1060	+0	4.4352	4.4372	+2.0		
5	15.4167	-1.8351	+1	3.3672	4.4596	+2.44		
6	16.0000	-1.2518	+1	1.5668	4.4480	+1.28		
7	16.3994	-0.8524	+2	0.7262	4.4464	+1.12		
8	17.0000	-0.2518	+2	0.0633	4.4419	+6.7		

Comp. $R^2 = 4.4352$

	x	y	$x - x_0$	$y - y_0$	$(x - x_0)^2$	$(y - y_0)^2$
1	19.0788	-1.8760	3.5194			
2	19.2575	-1.6973	2.8808			
3	20.0000	-0.9548	0.9116			
4	21.0000	+0.0452	0.0020			
5	22.0000	+1.0452	1.0924			
6	22.6522	+1.6974	2.8812			
7	22.8836	+1.9288	3.7202			
8	23.0473	+2.0925	4.3786			

Approximate Center

$$\bar{x} = 16.0 \quad \bar{y} = 19.2575$$

$$22.6522$$

$$41.9097$$

$$\text{mean } y = 20.9548$$

$$\bar{x} = 15.1458$$

$$R = 2.1060$$

$$\text{mean } x = 17.2518$$

$$\text{Center } \begin{cases} x_0 = 17.2518 \\ y_0 = 20.9548 \end{cases}$$

1739

Involving Center

17

	x	$x - X_0$	Δx	$ x - X_0 $	$(x - X_0)^2 + (y - Y_0)^2$	$O - C$
1	162898	-09620	-2	09258	44452	+100
2	160000	-12518	-1	15672	44480	+128
3	153732	-18786	-1	35295	44411	+59
4	151458	-21060	+0	44352	44372	+20
5	154167	-18351	+1	33672	44596	+244
6	160000	-12518	+1	15668	44480	+128
7	163994	-08524	+2	07262	44464	+112
8	170000	+02518	+2	00633	44419	+67

Comp. $R^2 = 44352$

	y	$y - Y_0$	$(y - Y_0)^2$
1	190788	-18760	35194
2	192575	-16973	28808
3	200000	-09548	09116
4	210000	+00452	00020
5	220000	+10452	10929
6	226522	+16974	28812
7	228836	+19288	37202
8	230473	+20925	43786

Approximate Center

$$x = 160 \quad y = 192575$$

$$226522$$

$$419097$$

$$\text{mean } y = 209548$$

$$x = 151458$$

$$R = 21060$$

$$\text{mean } x = 172518$$

$$\text{Center } \begin{cases} X_0 = 172518 \\ Y_0 = 209548 \end{cases}$$

Formation of Normal

	ab	ban	bn
1	+ 1,80	- 96,0	- 184,0
2	+ 212	- 160,0	- 217,5
3	+ 1,78	- 111,0	- 56,0
4	- 0,11	- 42,2	+ 1,0
5	- 0,48	- 112,0	+ 64,0
6	- 2,12	- 160,0	+ 217,5
7	- 1,64	- 95,2	+ 216,0
8	- 0,52	- 16,8	+ 140,0
	+ 0,83	- 793,2	+ 177,0

Normal Equations

$$\begin{aligned}
 + 14.50 + 0.83 &= -793 \\
 + 0.83 + 19.39 &= +177 \\
 - 0.83 - 0.05 &= +45 \\
 + 19.34 &= +222
 \end{aligned}$$

$$+ 14.50 - 793 - 10 = -803$$

$$b = +11.5$$

$$a = -55.4$$

Residuals

	O	C	O - C
1	+ 100	+ 53 - 22 = + 31	+ 69
2	+ 128	+ 69 - 20 = + 49	+ 79
3	+ 59	+ 104 - 11 = + 93	- 34
4	+ 20	+ 117 + 1 = + 118	- 98
5	+ 244	+ 102 + 12 = + 124	+ 120
6	+ 128	+ 69 + 20 = + 89	+ 39
7	+ 112	+ 47 + 22 = + 69	+ 43
8	+ 67	+ 14 + 24 = + 38	+ 29

Average = 64

1739

Moon's center
Conditional Equations

18.

	0	C	0-C
1	$-0.96 - 1.88 = +100$	$+70 - 51 = +19$	$+81$
2	$-1.25 - 1.70 = +128$	$+91 - 46 = +45$	$+83$
3	$-1.88 - 0.95 = +59$	$+136 - 26 = +110$	-51
4	$-2.11 + 0.05 = +20$	$+153 + 1 = +154$	-134
5	$-1.84 + 1.05 = +244$	$+134 + 29 = +163$	$+81$
6	$-1.25 + 1.70 = +128$	$+91 + 46 = +137$	-9
7	$-0.85 + 1.43 = +112$	$+62 + 53 = +115$	-3
8	$-0.25 + 2.09 = +67$	$+18 + 57 = +75$	-8

Average = 56

Mean Equations

1) $-6.20 - 4.48 = +307$

4) $-3.27 + 6.24 = +429$

$+3.27 + 2.36 = -162$

$+8.60 = +267$

$b = +31.0 +$

$-6.20 = +307 + 139 = +446$

$a = -72.0$

5) $-7.12 - 3.96 = +429$

3) $-23.5 + 5.72 = +307$

$+2.35 + 1.31 = -142$

$+7.03 = +165$

$b = +23.5$

$-7.12 = +429 + 93 = +522$

$a = -73.3$

Mean $b = +27.3$

$a = -72.6$

From Normal Solution $b = +11.5$

$a = -55.4$

1739

Munro's center Conditional Equations

18

	0		C	0-C
1	$-0.96 - 1.88 = +1.00$	$+ 70 - 51 = +19$	$+ 81$	
2	$-1.25 - 1.70 = +1.28$	$+ 91 - 46 = +45$	$+ 83$	
3	$-1.88 - 0.95 = +5.9$	$+ 136 - 26 = +110$	$- 51$	
4	$-2.11 + 0.05 = +20$	$+ 153 + 1 = +154$	$- 134$	
5	$-1.84 + 1.05 = +2.44$	$+ 134 + 29 = +163$	$+ 81$	
6	$-1.25 + 1.70 = +1.28$	$+ 91 + 46 = +137$	$- 9$	
7	$-0.85 + 1.93 = +1.12$	$+ 62 + 53 = +115$	$- 3$	
8	$-0.25 + 2.09 = +67$	$+ 18 + 57 = +75$	$- 8$	

Average = 56

Mean Equations

$$4 \quad -6.20 - 4.48 = +3.07$$

$$4 \quad -3.27 + 6.24 = +4.29$$

$$+3.27 + 2.36 = -1.62$$

$$+8.60 = +2.67$$

$$C = +31.0$$

$$-6.20 = +3.07 + 1.39 = +4.46$$

$$a = -72.0$$

$$5 \quad -7.12 - 3.96 = +4.29$$

$$3 \quad -2.35 + 5.72 = +3.07$$

$$+2.35 + 1.31 = -1.42$$

$$+7.03 = +1.65$$

$$C = +23.5$$

$$-7.12 = +4.29 + 9.3 = +5.22$$

$$a = -73.3$$

$$\text{Mean } C = +27.3$$

$$a = -72.6$$

$$\text{From Normal Solution } C = +11.5$$

$$a = -55.4$$

1739

Red. ad l. aph

$$S = +28 \ 07$$

$$H + \alpha \quad 23^h \ 54^m = 358^\circ 30'$$

$$H \quad 17 \quad 38$$

$$\alpha \quad 6 \quad 16$$

$$G \quad 18 \quad 51$$

$$G + \alpha \quad 1 \quad 07 = 16^\circ 45'$$

$$l \cos S \quad 9.9455$$

$$i \quad 0.9093$$

$$\dots i \quad 0.8548$$

$$l \sin S \quad 9.6733$$

$$\cos(H + \alpha) \quad 9.9998$$

$$h \quad 1.2740$$

$$\sin \dots \quad 8.4179$$

$$\sec S \quad 0.0545$$

$$\frac{1}{h} \quad 8.8239$$

$$l \cos(G + \alpha) \quad 9.9812$$

$$g \quad 0.9589$$

$$\sin \dots \quad 9.4597$$

$$\tan S \quad 9.7278$$

$$\frac{1}{h} \quad 8.8239$$

$$g' \quad 0.9401$$

$$g \quad 8.9703$$

$$h' \quad 0.9471$$

$$h \quad 8.5703$$

$$f \quad +0.31$$

$$g \quad +0.09$$

$$h \quad -0.04$$

$$\hline +0.36 \checkmark$$

$$g' \quad +8.71$$

$$h' \quad +8.85$$

$$i \quad -7.16$$

$$\hline +1.040$$

1739

19.

Moon's Mean Position (1912.0)

$$X_0 = 17.2518$$

$$Y_0 = 20.9548$$

$$\frac{1}{2}a = -28$$

$$\frac{1}{2}b = +16$$

$$17.2490$$

$$20.9554$$

Sun plate constants $X = 20.4766$ $Y = 20.8853$

$$\bar{z} = +2.4766$$

$$\eta = -1.1147$$

$$\log \bar{z} = 0.39386$$

$$\log \tan S = 9.7330 \quad 9.7275$$

$$\cos S = 9.94549$$

$$\bar{z}^2 = 0.7874 \quad 7.874$$

$$\cos \alpha = 8.50724$$

$$\eta_1 = 7.5738 \quad 7.5683$$

$$(\alpha - A) = 194113$$

$$\eta_1 = +39 \quad +37$$

$$\alpha - A = +127.32$$

$$\eta_0 = -1.1184$$

$$A = 61418.08$$

$$\log \eta_0 = 0.04860$$

$$d_0 = 61545.40$$

$$\cos \alpha = 7.33115$$

$$Red = +0.36$$

$$(\alpha - D) = 2.71745$$

$$\alpha = 61545.76$$

$$S - D = -841.7$$

$$D = +281519.3$$

$$S_1 = +280637.6$$

$$Red = +10.4$$

$$S' = +280648.0$$

1739

19

Moon's mean position (1912.0)

$$X_0 = 17.2518$$

$$Y_0 = 20.9548$$

$$\frac{1}{2}a = -28$$

$$\frac{1}{2}b = +16$$

$$17.2492$$

$$20.9554$$

Sun plate constant $X = 20.4768$ $Y = 20.8853$

$$Z = +2.4766$$

$$q = -1.111457$$

$$\log Z = 0.39382$$

$$\cos S = 9.94549$$

$$\sin S = 8.50724$$

$$\log \tan S = 9.7330$$

$$7.7271$$

$$0.7874$$

$$7.874$$

$$\eta_1 = 7.5738$$

$$7.5683$$

$$\eta_2 = +37$$

$$= 37$$

$$X - A = +1.2732$$

$$\eta_0 = -1.11874$$

$$A = 6.141808$$

$$\log \eta_1 = 0.04860$$

$$\log \eta_2 = 7.33115$$

$$A_0 = 6.154540$$

$$(A - B) = 2.7174059$$

$$B - A = +0.30$$

$$S - D = -8.4173$$

$$X = 6.154576$$

$$D = -28.15193$$

$$S_1 = 128.06376$$

$$B - A = +10.4$$

$$S = +28.06480$$

Lunar Parallax

$$\begin{array}{r}
 1739 \\
 \alpha' = 6^h 15^m 45.76^s \\
 \theta = 8 \quad 23 \quad 35.4 \\
 G - \alpha = +2 \quad 07 \quad 49.6 \\
 = +31 \quad 57' \quad 29''
 \end{array}$$

$$\begin{array}{r}
 +13 \quad 10 \\
 +31 \quad 44 \quad 14
 \end{array}$$

$$\begin{array}{r}
 995727 \\
 0.00000 \\
 007034 \\
 \hline
 002761
 \end{array}$$

$$\begin{array}{r}
 \delta = 46 \quad 49 \quad 12 \\
 28 \quad 06 \quad 48 \\
 18 \quad 42 \quad 24
 \end{array}$$

$$\begin{array}{r}
 9.82640 \\
 8.23554 \\
 9.50613 \\
 0.13715 \\
 \hline
 7.70522
 \end{array}$$

$$S - S' = +17 \quad 26.3$$

$$S = T \quad 28 \quad 24 \quad 14.3$$

$$\text{Ann Eph } S = +28 \quad 24 \quad 14.3$$

$$O - C$$

$$0.0$$

$$\delta' = +28^{\circ} 06' 48.0$$

$$IT = 59' \quad 08.0$$

$$\begin{array}{r}
 9.86913 \\
 8.23554 \\
 9.72368 \\
 405571 \\
 \hline
 7.88406
 \end{array}$$

$$\alpha - \alpha' = +26' \quad 19.39$$

$$= +1^m \quad 45.29$$

$$\alpha = 6 \quad 17 \quad 310.5$$

$$\alpha = 6 \quad 17 \quad 30.05$$

$$+1.00$$

$$\begin{array}{r}
 1739 \\
 \alpha = 6^h 15^m 45.76 \\
 \delta = 8^{\circ} 23' 35.4'' \\
 \alpha - \alpha' = +2^h 07^m 49.6'' \\
 \quad \quad \quad + 31^m 57^s 29''
 \end{array}$$

$$\delta = +28^{\circ} 06' 48.0''$$

$$\alpha - \alpha' = +9^h 05^m 00''$$

$$+ 13^m 10^s$$

$$+ 31^m 44^s 14^s$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 0.07039 \\
 \hline
 0.02761
 \end{array}$$

$$9.86913$$

$$8.23554$$

$$9.72368$$

$$0.05571$$

$$\hline 7.88406$$

$$\alpha - \alpha' = +26^h 19.39$$

$$+ 1^h 45^m 29^s$$

$$\delta = 46^{\circ} 49' 12''$$

$$28^{\circ} 06' 48''$$

$$18^{\circ} 42' 24''$$

$$\begin{array}{r}
 9.82640 \\
 8.23554 \\
 9.50613 \\
 0.13715 \\
 \hline
 7.70522
 \end{array}$$

$$S - S' = +17^h 26.3^m$$

$$S = +28^h 24^m 14.3^s$$

$$\alpha = 6^h 17^m 31.05^s$$

$$\text{Circ. Eph. } S = +28^h 24^m 14.3^s$$

$$\alpha = 6^h 17^m 30.05^s$$

$$O - C = 0.0$$

$$+1.00$$

6.
30
2
17.
13.
27
20
6.

MC 1743

Stars - Measures.

1913 Oct 17.

21.

	d	y	z
1	19778		14375
6.0	14919	20	19237
30.5	20		30
mag	76		67
2.4			
	<u>30.4857</u>		<u>.4864</u>

	d	y	z
2	17285		19458
17.7	12210		14530
13.5	011		35
mag	80		48
8.0			
	<u>13.5075</u>		<u>.5082</u>

	d	y	z
3	17467		17797
27.6	10240		15035
20.7	35	34	36
mag	70		95
6.9			
	<u>20.9233</u>		<u>.7241</u>

	d^x	z
	13521	11851
	15	11470
		79
	13142	
	<u>6.0377</u>	<u>.0378</u>

	d^x	z
	18175	19410
	15600	11970
	90	70
	79	97
	<u>17.7420</u>	<u>.7433</u>

	d^x	z
	16860	18029
	12842	12035
	40	40
	60	24
	<u>27.5979</u>	<u>.5990</u>

grade 3.

MC 1743

Stars - Micrometers

1913 Oct 17

21.

	d	n
1	19778	14375
6.0	14919	9237
30.5	20	30
7.4	76	67
	<u>30.4857</u>	<u>4864</u>

	d	n
2	17285	19458
177	12210	14530
15.5	011	35
8.0	80	48
	<u>13.5075</u>	<u>5082</u>

	d	n
3	17467	17797
27.6	10240	15030
20.7	35	36
7.0	70	95
6.9	<u>20.9233</u>	<u>7241</u>

	d	n
1	13521	11851
15	15	11470
131	42	79
	<u>60377</u>	<u>0378</u>

	d	n
1	18175	19410
156	00	11970
90	97	70
79		97
	<u>17.7420</u>	<u>7433</u>

	d	n
1	16860	18029
128	42	12035
40	36	4032
60		24
	<u>27.5979</u>	<u>1990</u>

grade 3.

1
17.
19.
2
17
19
3
16
21
4
16
21
5
16
21
6
17
22

1743 Moon measures.

22.

1 scratch

12.5 16270

15649

16229

16548

19.5 1802137

10900

10755

1199905

30

4500

4250

10

70

39

25

38

19.5241.525517.4522.4538

2

170

11310

9615

19.9

9409

9460

11182

5890

19.9878.9854

3

166

21.0

15175

1136060

60

67

16.6188

15331

912620

4020

30

.6198

4

166

21.2

14120

1022015

10

10

16.6099

15343

922020

20

40

.6121

5

16.7

22.0

18986

1660585

0494

86

16.7611

14410

6785

9883

69

.7620

6

17.0

22.4

17460

19041

17460

1302060

1352118

1302000

19

28

19

65

35

65

22.44494484

1743 known measures.

22

1/ scratch

175 16270

15649

16229

16548

195 1802137

10900

1075550

1199905-

30.37

4800

4250

10

70

39

25

38

195241525517.452245382

170 11310

9615

159 9409

946090

11182

5890

19.987898543

116

110

15175

15331

1136060

912620

60

40

67

30

16.618861984

116

112

14120

15343

1022015

922020

10

20

10

40

16.609961215

117

120

18986

14410

1660585

6785

0494

9883

86

09

16.761176206

170

124

17460

19041

17460

1302060

135215

1302000

19

28

19

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35

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22.44494484

1743

a

y

hiron

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a

7C

23

7
17.5
23.0

8
8

18.5
23.4
max
in
8

15200

11800

87

10

23.3414

19010

12430-10

15

00

3415

9
19.0
23.3

15180

11950

50

92

23.3234

19030

1227088

70

25

3249

17920

1364150

41

27

17.5721

18560

1285020

46

58

5720

possibly a
termination.

reversed remeasure.

17700

1195242

55

95

17.5747

1743

known

23

$$\begin{array}{r} 2 \\ 175 \\ 250 \end{array}$$

$$\begin{array}{r} 17920 \\ 1364150 \\ 41 \end{array}$$

$$\begin{array}{r} 18560 \\ 1285020 \\ 46 \\ 58 \\ 5720 \end{array}$$

$$\begin{array}{r} 27 \\ 175721 \end{array}$$

$$\begin{array}{r} 8 \\ 8 \end{array}$$

$$\begin{array}{r} 155 \\ 234 \\ 8 \end{array} \quad \begin{array}{r} 15200 \\ 11800 \\ 87 \\ 10 \\ 233414 \end{array} \quad \begin{array}{r} 19010 \\ 1243010 \\ 15 \\ 00 \\ 3415 \end{array}$$

$$\begin{array}{r} 9 \\ 190 \\ 253 \end{array} \quad \begin{array}{r} 15180 \\ 1191050 \\ 10 \\ 92 \\ 233234 \end{array} \quad \begin{array}{r} 19030 \\ 1227088 \\ 70 \\ 25 \\ 3249 \end{array}$$
possibly a
termination

2 reversed remeasure

$$\begin{array}{r} 17700 \\ 1195242 \\ 55 \\ 95 \\ 175747 \end{array}$$

1743

Center of Plate etc

29

2	4	R.A.	Decl.
6.0378	30.4860	8 ^h 15 ^m 24 ^s	25° 36' 51"
17.7426	13.5078	22 14	23 26 31
27.5985	20.7232	27 48	24 23 05
51.38	64.72	8 64 86	8 5 87
17.13	21.57	8 21 49	24 28 49
-1.8	22	+ 27	+ 3 20
87	43	8 22 16	24 32 09
31	200		
26.97			

$$A = 8^h 22^m 16^s$$

$$D = +24^\circ 32' 09''$$

$$\begin{aligned}
 2-3 &= -110.84 & -2.2\pi & & -22 & +3653 \\
 -261 - 3378 &= -3639 & -13 &= -3652 & -1 &= -3653 = 0 \\
 -21.14 - 1497 &= -3611 & -39 &= -3650 & -3 &= -3653 = 0 \\
 -1291 - 2296 &= -3587 & -61 &= -3648 & -6 &= -3654 = +1 \\
 18.7326 - 2351 & & -41 & & -4 &= 18.8583
 \end{aligned}$$

$$\begin{aligned}
 4-7 &+ 113.12 & -4 & & -1506 \\
 +854 + 683 &= +1537 & -30 &= +1507 & = +1 \\
 -486 + 2067 &= +1521 & -14 &= +1507 & = +1 \\
 -1595 + 3121 &= +1526 & -21 &= +1505 & = -1 \\
 21.2182 + 2118 & & -21 & & = 21.2783
 \end{aligned}$$

Tables	$a = +0.9$	$e = +0.9$	$c - e = 0.0$	$b + a = 0.0$
Obs	$a = +2.4$	$e = +1.0$	$a - e = +1.4$	$b + a = -2.3$

1743

Center of Plate etc

24

2	4	R.A.	Decl.
6.0378	30.4860	8 15 24	25 36 51
17.7426	13.5078	22 14	23 26 31
27.5985	20.7237	27 48	24 23 05
51.38	64.72	8 64 86	8 5 87
17.13	21.57	8 21 49	24 28 49
-18	22	+ 27	+ 3 20
87	43	8 22 16	24 32 09
31	200		
2697			

$$A = 8^h 22^m 16^s$$

$$D = +24^\circ 32' 09''$$

2-3	-110.84	-222	-22	+3653
-261	-3378	-3639	-13	-3652
-2114	-1497	-3611	-39	-3650
-1291	-2296	-3587	-61	-3648
187326	-2351	-41	-4	-3654
				= 18.8583

4-4	+113.12	-4	-1506
+854	+683	-30	+1507
-486	+2007	-14	+1507
-1595	+3121	-21	+1505
21.2182	+2118	-21	= 21.2773

Tables	a = +0.9	a = +0.9	a - a = 0.0	b + a = 0.0
Obs	a = +24	a = +1.0	a - a = +1.4	b + a = -2.3

1743 Times etc. W⁻
 3h to 1912 Mar 27 7^h 49^m - 8^h 01^m
 ... Moon 7 54 56.95 7 54 57.1^v
 clock 1 45.0

H Sid T. 7 56 42.0^v
 Hump 4 44 31.05^v
 S. Sid T. 12 41 13.05^v
 Sid T. in Moon 0 18 11.34^v
 Intimal 12 23 01.71^v
 Reduction 2 01.73^v
 G. M. T. 12 20 59.98^v 9-X-- 0^h 26^m

From Kant Alm. P. G. Hiccl.
 Moon 12^h 8^h 21^m 30.16^v + 24⁰ 48^m 01.7^v
 Motion in 1^m 2.5444^v 8.870^v
 " 20.9997^v + 53.43^v - 3 06.3^v
 Tabular place 8 22 23.59^v + 24 44 55.4^v

Moon's age = 9.0 days.

Parallax 59' 32.0^v
 Semidiameter 16' 14.9^v
 R = 974.9^v
 Augmentation = +15.3^v
 Irradiation (3) - 0.7^v
 R = 989.5^v
 R = 2.1211^v
 (1+a)/R = 2.1216^v
 R² = 4.5012^v
 934 = 14.8^v
 975 = 15.3^v
 a = +2.4^v
 974.9^v
 +16.1^v
 -0.7^v
 990.3^v
 2.1228^v
 2.1233^v
 4.5084^v

1743	Times etc							25
Exh test 1912 Mar 27	7 ^h 49 ^m					- 8 ^h 01 ^m		
moon	7 54	56.9	- 7	54	57.1			
clock	1	450						
H Sed T.	7 56	42.0						
H Comp	4 44	31.05						
G Sed T.	12 41	13.05						
Sed T. in moon	0 18	11.34						
Intervat	12 23	01.71						
Reduction	2	01.73						
G 2 T.	12 20	59.98	0-X--		0 ^h 26 ^m			

From Kant Alva	R.A.	Decl			
moon 12 ^h	8 ^h 21 ^m	30.16	+ 24° 48'	0 17	
moon 1 ^h	2 5444		8870		
20.9997		+ 53.43	- 3	06.3	
Tabular place	8 22	23.59	+ 24	44	55.4

moon's age 90 days

	59	32.0		
Parallax				
semidiam	16'	14.9		
R =		9749		
Augmentation		+ 15.3		
Irradiation (3)		- 0.7		
R =		989.5		
R =		21211		
(1+a)/R =		21216		
R ² =		45012		
a = + 2.4				

1743 Standard Coordinates

26

Cape No. 1163 mag 7.4				Cape No. 1177 mag 8.0				Cape No. 1189 mag 6.4			
C	8 ^h	14 ^m	41.18	8 ^h	21 ^m	31.91		8 ^h	27 ^m	05.50	
L			23			89				54	
B			16			89				49	
mean	8	14	41.19	8	21	31.90		8	27	05.51	
prec			+ 43.27			+ 42.54				+ 42.60	
α	8	15	24.46	8	22	14.44		8	27	48.11	
Δ	8	22	16	8	22	16		8	22	16	
$\delta - \Delta$	-	6	51.54	-		1.56		+	5	32.11	
$\sin(\delta - \Delta)$	-		41.48	-		1.56		+		332.08	
log			2.61435			0.19312				2.52124	
cos			9.95508			9.96259				9.95942	
$\frac{1}{3}$			1.07667			8.66295				0.98790	
$\frac{1}{3}$	-		11.9301	-		0.0460		+		9.7252	
$\frac{1}{3}$	-		60			0		+		24	
$\frac{1}{3}$			6.0639			17.9540				27.7276	
$\frac{1}{3}$			6.0378			17.7426				27.5985	
$\frac{1}{3}$	-		261	-		21.14		-		1291	

C	+25°	39'	04"6	+23°	28'	50"5	+24°	25'	29"9
L			05.2			50.1			30.3
B			05.1			50.1			30.4
mean	+25	39	05.0	+23	28	50.2	+24	25	30.2
prec	-2		13.7	-2		19.6	-2		24.8
δ	+25	36	51.3	+23	26	30.6	+24	23	05.4
Δ	+24	32	09	+24	32	09	+24	32	09
$\delta - \Delta$	+1	04	42.3	-1	05	38.4	-	9	03.6
$\sin(\delta - \Delta)$			+3882.8			-3938.9			-543.6
log			3.58915			3.59538			2.73528
$\frac{1}{3}$			0.92030			0.92653			0.06643
$\frac{1}{3}$			9.6807			9.6371			9.6564
$\frac{1}{3}$			21533			7.3259			19758
$\frac{1}{3}$			8.8874			4.0164			8.6856
$\frac{1}{3}$	+8.3234			-8.4436			-1.1653		
$\frac{1}{3}$	+7.72			0			+485		
$\frac{1}{3}$	30.4006			13.5564			20.8832		
$\frac{1}{3}$	30.4860			13.5078			20.7237		
$\frac{1}{3}$	+854			-486			-1595		

1743 Standard Coordinates

26.

Cape W. 1163 mag 7.4

Cape W. 1177 mag 8.0

Cape W. 1189 mag 8.4

C	8 ^h	14 ^m	41 ^s	18	8 ^h	21 ^m	31 ^s	91	8 ^h	27 ^m	05 ^s	50
L				23				89				54
E				16				89				49
Mean	8	14	41	19	8	21	31	90	8	27	05	51
Proc			+	43			+	42			+	42
X	8	15	24	46	8	22	14	44	8	27	48	11
A	8	22	16		8	22	16		8	22	16	
S-A	-	6	5	1.54	-		1.56		+	5	32	11
S(A-1)	-	4	5	1.48	-		1.56		+	3	32	08
log	2.6	14	3	5 ^m	0.1	9	3	12 ^m	2.5	2	1	24
WDS	9	9	5	508	9	9	6	259	9	9	5	942
3 ₀	1	0	7	667 ^m	8	6	6	295 ^m	0	9	8	790
3 ₁	-	1	1	9301	-	0	0	460	+	9	7	252
3 ₂	-			60				0	+			24
3 ₃	6	0	6	39	1	7	9	540	2	7	7	276
2	6	0	3	78	1	7	7	426	2	7	5	985
2-3	-	2	6	1	-	2	1	14	-	1	2	91

C	+25°	39'	04"6	+23°	28'	50"5	+24°	25'	29"9
L			05.2			50.1			30.3
E			05.1			50.1			30.4
Mean	+25	39	05.0	+23	28	50.2	+24	25	30.2
Proc	-2	13.7		-2	19.6		-2	24.8	
S	+25	36	51.3	+23	26	30.6	+24	23	05.4
A	+24	32	09	+24	32	09	+24	32	09
S-A	+1	04	42.3	-1	05	38.4	-	9	03.6
S(A-1)	+	3	882.8	-	3	938.9	-	5	43.6
log	3.5	89	1.5	3.5	95	38 ^m	2.7	35	28 ^m
WDS	0	9	2030	0	9	2653 ^m	0	0	6643 ^m
1000	9	6	807	9	6	371	9	6	564
3 ₁	2	1	533	7	3	259	1	9	758
3 ₂	8	8	874	4	0	164	8	6	856
3 ₃	+	8	3234	-	8	4436	-	1	1653
3 ₄	+	7	72			0	+	4	85
3 ₅	3	0	4006	1	3	5564	2	0	8832
3 ₆	3	0	4860	1	3	5078	2	0	7237
3 ₇	+	8	54	-	4	86	-	1	595

pk	mag	residual
1	217.1	-36
2	234.6	+101
3	264.2	+51
4	270.0	-73
5	291.6	-125
6	305.4	+23
7	326.8	+102
8	0.0	-3
9	72	-16

1743

Harris Center

27

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0) + (y - y_0)^2$	$0 - c$
1	17.4530	-1.2828	1.6456	4.5078	-1.6
2	17.0000	-1.7358	3.0130	4.5259	+17.5
3	16.6193	-2.1165	4.4796	4.5265	+18.1
4	16.6110	-2.1248	4.5148	4.5148	+6.4
5	16.7616	-1.9742	3.8975	4.5112	+2.8
6	17.0000	-1.7358	3.0130	4.5259	+17.5
7	17.5734	-1.1624	1.3542	4.5319	+23.3
8	18.7358	0.0000	0.0000	4.5148	+1.64
9	19.0000	+0.2642	0.0698	4.5118	+3.4
			R^2	4.5054	

	y	$y - y_0$	$(y - y_0)^2$
1	19.5248	-1.6918	2.8622
2	19.9866	-1.2300	1.5129
3	21.0000	0.2166	0.0469
4	21.2166	0.0000	0.0000
5	22.0000	+0.7834	0.6137
6	22.4466	+1.2300	1.5129
7	23.0000	+1.7834	3.1805
8	23.3414	+2.1248	4.5148
9	23.3242	+2.1076	4.4420

Approximate Center

$$x = 17.0 \quad y = 19.9866$$

$$22.4466$$

$$4.24332$$

$$\text{mean } y = 21.2166$$

$$y - \text{max} = 23.3414$$

$$R = 21.248$$

$$x - \text{min} = 16.6110$$

$$\text{mean } x = 18.7358$$

$$\text{Center } \begin{cases} x_0 = 18.7358 \\ y_0 = 21.2166 \end{cases}$$

1745

known center

27

		$x - x_0$	$(x - x_0)^2$	$(x - x_0) \cdot (y - y_0)$	$y - y_0$
1	17.4530	-1.2828	1.6456	4.5078	-1.6
2	17.0000	-1.7358	3.0130	4.5259	+1.75
3	16.6193	-2.1165	4.4796	4.5265	+1.81
-4	16.6110	-2.1248	4.5148	4.5148	+1.64
5	16.7616	-1.9742	3.8975	4.5112	+1.28
6	17.0000	-1.7358	3.0130	4.5259	+1.75
7	17.5739	-1.1624	1.3512	4.5349	+2.33
8	18.7358	0.0000	0.0000	4.5148	+1.24
9	19.0000	+0.2642	0.0698	4.5118	+1.36
			$R^2 =$	4.5054	

	y	$y - Y_0$	$(y - Y_0)^2$
1	19.5248	-1.6918	2.8622
2	19.9866	-1.2300	1.5129
3	21.0000	0.2166	0.0469
4	21.2166	0.0000	0.0000
5	22.0000	+0.7834	0.6137
6	22.4466	+1.2300	1.5129
7	23.0000	+1.7834	3.1805
8	23.3414	+2.1248	4.5148
9	23.3242	+2.1076	4.4420

Approximate Center

$x = 17.0$ $y = 19.9866$
 $\quad \quad \quad 22.4466$
 $\quad \quad \quad \hline 42.4332$
 $\text{mean } y = 21.2166$
 $y = \text{max} = 23.3414$
 $\quad \quad \quad R = 21.248$
 $2 = \text{min} = 16.6110$
 $\text{mean } x = 18.7358$

Center $\begin{cases} x = 18.7358 \\ y = 21.2166 \end{cases}$

Formation of Normals

	at	at	bu
1	+ 21.6	+ 7.7	+ 10.2
2	+ 21.4	- 30.40	- 21.50
3	+ 0.47	- 38.40	- 39.8
4	- 0.00	- 13.55	+ 0.0
5	- 1.54	- 55.1	+ 21.8
6	- 21.4	- 30.40	+ 21.50
7	- 20.6	- 27.00	+ 41.50
8	+ 0.00	+ 0.0	+ 13.55
9	+ 0.55	+ 8.8	+ 71.8
	- 0.42	- 143.61	+ 61.45

Normal Equations

$$+ 21.98 - 0.42 = - 143.6$$

$$- 0.42 + 18.69 = + 61.4$$

$$+ 0.42 - 0.01 = - 27$$

$$+ 18.68 = + 587$$

$$b = + 31.4$$

$$+ 21.98 = - 143.6 + 13 = - 142.3 \quad a = - 65.0$$

$$- 0.42 = - 142.3 - 103.5$$

Residuals

		C	G - C
1	+ 143 - 53	+ 30	- 36
2	+ 113 - 39	+ 74	+ 101
3	+ 137 - 7	+ 130	+ 51
4	+ 137 + 0	+ 137	- 73
5	+ 128 + 25	+ 153	- 125
6	+ 113 + 39	+ 152	+ 23
7	+ 175 + 56	+ 131	+ 102
8	- 0 + 67	+ 67	- 3
9	- 17 + 66	+ 49	- 1.6

Average = 59

1743

Conditional Equations

28

	a	b	c	d
1	-1.28	-1.69	+66	-6
2	-1.74	-1.23	+247	+175
3	-2.12	-0.22	+53	+181
4	-2.12	+0.00	+136	+64
5	-1.97	+0.78	+100	+28
6	-1.74	+1.23	+247	+175
7	-1.16	+1.78	+305	+233
8	+0.00	+2.12	+136	+64
9	+0.26	+2.11	+106	+34

$$4) -7.26 - 3.14 = +702$$

$$5) -4.61 + 8.02 = +894$$

$$+4.71 + 1.99 = -445$$

$$+10.04 = +449$$

$$b = +44.8$$

$$-7.26 = +702 + 147 = +843$$

$$a = +116.0$$

$$5) -9.23 - 2.36 = +802$$

$$4) -2.64 + 7.24 = +794$$

$$+2.64 + 0.68 = -229$$

$$+7.92 = +565$$

$$b = +71.5$$

$$-9.23 = +802 + 168 = +970$$

$$a = +105.0$$

Mean

$$b = +58.1$$

$$a = -110.5$$

	a	b	c	d
1	+66	+142	-100	+42
2	+247	+192	-73	+119
3	+253	+234	-13	+221
4	+136	+234	+0	+234
5	+100	+218	+46	+264
6	+247	+192	+73	+265
7	+305	+128	+105	+233
8	+136	-0	+125	+125
9	+106	-29	+120	+96

$$\text{Average} = 62$$

1743

Conditional Equations

28

	a	b	c	d
1	-128	-169	+166	= 6
2	-174	-123	+247	+175
3	-212	+022	-153	+141
4	-212	+000	+136	+64
5	-197	+078	+100	+28
6	-174	+123	+247	+175
7	-116	+178	+305	+233
8	+000	+212	+136	+64
9	+026	-211	+100	+34

$$4) -726 - 314 = +702$$

$$5) -461 + 802 = +894$$

$$+471 - 199 = -945$$

$$+1008 = +949$$

$$b = +448$$

$$-726 = +702 + 141 + 843$$

$$a = +1160$$

$$5) -923 - 236 = +802$$

$$4) -264 + 724 = +794$$

$$+264 + 068 = -229$$

$$+792 = +565$$

$$b = +715$$

$$-923 = +802 + 141 + 170$$

$$a = +1050$$

	0	1	c
1	+66	+142	-100 = +42
2	+247	+192	-73 = +119
3	+253	+234	-13 = +221
4	+136	+234	+0 = +224
5	+106	+218	+46 = +264
6	+247	+192	-73 = +265
7	+136	+234	+105 = +233
8	+136	+0	+125 = +125
9	+106	-29	+125 = +96

$$0 - c$$

$$+24$$

$$+128$$

$$+32$$

$$-98$$

$$-164$$

$$-18$$

$$+72$$

$$+11$$

$$+10$$

Red. ad. l. apph.

$$\begin{array}{rcl}
 H + \alpha & 1 & 52 = 28^\circ \\
 H & 17 & 29 \\
 \alpha & 8 & 23 \\
 G & 18 & 55 \\
 G + \alpha & 3 & 18 = 49^\circ 30'
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(G + \alpha_0) & = & 9.8125 \\
 \log \sin & & 0.9635 \\
 \log \tan & & 9.8810 \\
 \log \sec & & 9.6577 \\
 \log \csc & = & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log (g') & = & 0.7760 \\
 \log (g) & = & 9.3261
 \end{array}$$

$$\begin{array}{rcl}
 f & = & +0.32 \\
 g & = & +0.21 \\
 h & = & +0.65 \\
 & & +1.18
 \end{array}$$

$$S = +24 \quad 27$$

$$\begin{array}{rcl}
 \log \cos S & = & 9.9592 \\
 \log (L) & = & 0.9076 \\
 \log (L) & = & 0.8668
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin S & = & 9.6169 \\
 \log \cos(H + \alpha) & = & 9.9459 \\
 \log \sin & = & 1.2743 \\
 \log \tan & = & 9.6716 \\
 \log \sec & = & 0.0408 \\
 \log \csc & = & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log (h') & = & 0.8371 \\
 \log (h) & = & 9.8106
 \end{array}$$

$$\begin{array}{rcl}
 g' & = & +5.97 \\
 h' & = & +6.87 \\
 L & = & -7.36 \\
 & & +5.48
 \end{array}$$

1743 Moon's Mean Position (1912.0).

29

$$\begin{array}{rcl} X_0 = 18.7358 & Y_0 = 21.2166 & \\ \frac{1}{2}a = \quad \quad 52 & \frac{1}{2}b = \quad \quad +16 & \text{From Least Sq. Sol.} \\ \hline 18.7326 & 21.2182 & \end{array}$$

$$\text{From Plate Constants } X = 18.8583, Y = 21.2773$$

$$\begin{array}{rcl} \xi_0 = +0.8583 & & \\ \log = 9.93364 & & \\ \cos \delta = 9.95922 & & \\ \text{const} = 8.50729 & & \end{array}$$

$$(X-A) = 1.46718$$

$$a-A = +29.32$$

$$A = 8 \ 22 \ 16$$

$$\alpha_0 = 8^h \ 22^m \ 45.32^s$$

$$p.a. = +1.18$$

$$\alpha' = 8 \ 22 \ 46.50$$

$$\eta = -0.7227$$

$$\log \tan = 9.6587$$

$$\log \eta = 9.8653$$

$$\eta_1 = 6.5774$$

$$\eta_1 = +4$$

$$\eta_0 = -0.7232$$

$$\log \eta_0 = 9.85920$$

$$\text{const} = 7.33115$$

$$(\delta-D) = 2.52805$$

$$\delta-D = -5 \ 37.3$$

$$D = +24 \ 32 \ 09$$

$$S_0 = +24^\circ \ 26' \ 31.7''$$

$$p.a. = +5.5$$

$$\delta' = +24 \ 26 \ 37.2$$

1743

hypothesis mean Position (1912.0).

29

$$X_0 = 18\ 73\ 58$$

$$Y_0 = 21\ 21\ 66$$

$$a = \quad \quad 32$$

$$b = \quad \quad 26$$

From Chart Sy. Sol.

$$18\ 73\ 26$$

$$21\ 21\ 82$$

From Plate Constants

$$X = 18\ 85\ 83$$

$$Y = 21\ 27\ 73$$

$$\xi_0 = +0.8583$$

$$\eta = -0.7227$$

$$\log = 9.93364$$

$$\text{const} = 9.95922$$

$$\text{const} = 8.50724$$

$$\log \text{Tail} = 9.6587$$

$$\text{const} = 9.8653$$

$$\eta = 6.5774$$

$$(X-A) = 1.96918$$

$$\eta_0 = + \quad 4$$

$$d-A = + \quad 29\ 32$$

$$\eta_0 = -0.7237$$

$$A = 8\ 22\ 16$$

$$\log \eta_0 = 9.85920$$

$$X_0 = 8\ 22\ 45\ 32$$

$$\text{const} = 7.33115$$

$$\text{Rad} = + \quad 118$$

$$(S-D) = 252\ 885$$

$$X = 8\ 22\ 46\ 50$$

$$S-D = -5\ 373$$

$$D = -24\ 32\ 09$$

$$S_0 = +24\ 26\ 327$$

$$\text{const} = + \quad 55$$

$$S = -24\ 26\ 372$$

1743 Lunar Parallax.

$$\begin{array}{rcl} \alpha' & = & 8 \quad 22 \quad 46.50 \\ \delta & = & 7 \quad 56 \quad 42.0 \\ \theta - \alpha' & = & -28 \quad 04.53 \\ & = & -6 \quad 31' \quad 08'' \end{array}$$

$$\begin{array}{rcl} & - & 2 \quad 45 \\ & - & 6 \quad 28 \quad 23 \end{array}$$

$$\begin{array}{r} 9.95727 \\ 0.00000 \\ 0.00278 \\ \hline \tan f = 996004 \end{array}$$

$$f = 42 \quad 22 \quad 09$$

$$+ 24 \quad 26 \quad 37$$

$$f - \delta = 17 \quad 55 \quad 28$$

$$\begin{array}{r} 9.82640 \\ 8.23846 \\ 9.48822 \\ \hline 0.17140 \\ \hline 7.72448 \end{array}$$

$$\delta - \delta' = +18 \quad 13.7$$

$$\delta = +24 \quad 44 \quad 50.9$$

$$\text{Ann Eph } \delta = +24 \quad 44 \quad 55.4$$

$$O - C$$

$$- 4.5$$

$$\delta' = +24 \quad 26 \quad 27.2$$

$$\pi = 59' \quad 32.0$$

$$\begin{array}{r} 9.86913 \\ 8.23846 \\ 9.05508 \\ \hline 0.04185 \\ \hline 7.20455 \end{array}$$

$$\alpha - \alpha' = -5' \quad 30.35$$

$$= -22.02$$

$$\delta = 8 \quad 22 \quad 24.48$$

$$\alpha = 8 \quad 22 \quad 23.59$$

$$+ 0.89$$

1743

Lunar Parallaxes

$\gamma = 6 \quad 22 \quad 46 \quad 50$
 $\delta = 7 \quad 56 \quad 42 \quad 0$
 $\alpha - \delta = -28 \quad 04 \quad 43$
 $\quad \quad -6 \quad 31 \quad 06$

$- \quad \quad 2 \quad 45$

$-6 \quad 28 \quad 21$

995727

000000

000277

996004

$42 \quad 22 \quad 05$

$-24 \quad 26 \quad 37$

$\gamma - \delta \quad 17 \quad 55 \quad 28$

982640

823846

948822

017140

772448

$\delta - \delta \quad +18 \quad 137$

$\delta \quad -24 \quad 44 \quad 509$

Ann Ephs $\delta \quad +24 \quad 44 \quad 559$

$\alpha - \delta \quad -4.5$

$\delta \quad +24 \quad 26 \quad 37 \checkmark$

$\alpha - \delta \quad 59 \quad 320$

986913

823846

905545

004185

720955

$\alpha - \delta \quad -5 \quad 30.35$

-22.62

$\delta \quad \gamma \quad 22 \quad 24.41$

$\alpha \quad \delta \quad 22 \quad 23.59$

$+0.82$

