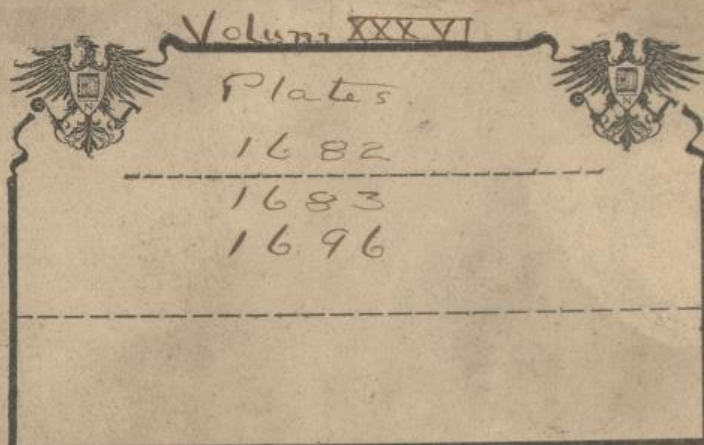


KG
11366
v.912



1912phae.pr6j.19

Harvard Lunar Plates

Measures and Reductions

Mary Fowler.

Volume XXXVI

Plate	Date	Page
1682	1912 Feb. 29	1.
1683	1912 Feb 29	13
1696.	1912 Mar. 2	23

MC 1682

1913 Oct 7.

1.

Stars Measures.

	d	μ	ν	d	ν
1/	16945		18857	16605	
16.2	785048		1794040	847272	
18.9	44		40	70	
mag	48		50	96	
8.3	<u>18.9101</u>		<u>9089</u>	<u>12.1873</u>	
2/	15309		19071	16600	
14.4	736567		1702020	1058080	
31.8	65		20	84	
mag	12		78	00	
9.0	<u>31.7945</u>		<u>7948</u>	<u>14.3981</u>	
3/	16737		17505	18550	
25.4	1343530		1082020	1248080	
32.4	30		10	80	
mag	48		10	50	
6.8	<u>32.3309</u>		<u>3309</u>	<u>25.3930</u>	
4/	15620		16585	16384	
26.2	705050		1515550	813030	
17.8	51		60	31	
	17		82	86	
	<u>17.8567</u>		<u>8570</u>	<u>26.1744</u>	

Grade 3.

MC 1682

1913 Oct 7

1

Stars Measures

	α	δ	α	δ	α	δ	α	δ
1	16945		18857		16605		16411	
122	785048		1794040		847272		1452012	
189	44		40		70		10	
29	48		50		96		10	
85	<u>189101</u>		<u>9089</u>		<u>121873</u>		<u>1895</u>	
2	15309		19071		16600		19000	
14.4	736567		1702020		1058080		1501928	
31.8	65		20		84		10	
29	12		78		00		00	
90	<u>317945</u>		<u>7948</u>		<u>143981</u>		<u>3984</u>	
3	16737		17505		18550		17520	
25.4	1343530		1082020		1248080		1357880	
32.4	30		10		80		70	
29	48		10		50		20	
88	<u>323309</u>		<u>3309</u>		<u>253930</u>		<u>3944</u>	
4	15620		16585		16384		16480	
26.2	705050		1515550		813030		1471616	
17.8	51		60		31		10	
	17		82		86		80	
	<u>178567</u>		<u>8570</u>		<u>261744</u>		<u>1766</u>	

Grade 3

MC1682 Moon measures

1913 Oct 7

2

d	4	N	d	N
1 Seraph				
18.5 14225	14852	15128	17030	
18.9 639085	12700	1006057	121058	
92	6909	60	68	
22	50	18	30	
18.7833	7854	18.4936	4920	

2		
18.0 19155	15140	
19.3 1641010	787365	
92	60	
52	49	
19.2750	2719	

3		
17.7	19383	15810
20.0	1605040	913235
	40	50
	80	09
	17.6661	6677

4		
17.6	18320	14800
20.5	1428083	876369
min	78	88
in	20	62
4	17.5960	6029

5		
17.7	18304	13820
21.0	1489072	717900
	7999	00
	08	20
	17.6579	6627

6		
18.0 17497	19300	
21.8 972826	1709690	
35	9090	
00	05	
21.7769	7791	

VIC 1652 *Ammonia lucasensis*

1913 Oct 7

2

d		N		d		N	
1 Seratch				15128		17030	
185	14225	14852		1006057		121058	
189	639085	12700		60		68	8
	92	0909		18		30	
	22	50		184936		4920	
<u>187833</u>		<u>7854</u>					

2		15140	
180	19155	787365	
193	1641010	60	
	92	49	
	52		
<u>192750</u>		<u>2719</u>	

3
177
200

19383	15810
1605040	9182
40	30
80	09
176661	6677

4
176
205
200
200

18320	14800
1428083	876369
78	8369
20	62
175960	6029

5
177
210

18309	13820
1489072	717900
7999	00
08	20
176579	6627

6	180	17497	19300
	218	972826	1709690
		31	9090
		00	05
		<u>21.7769</u>	<u>7791</u>

1912phae.proj.15

1913 Oct 7.

3

2
183
220

19780
1161004
05
70
18.1834

18781
1691035
3130
69
18.1834

8
19.0
225
16426
1101210
10
26
22.5415
16654
12080
7876
56
5423

9
19.6
22.6
max
in
8
16415
959088
88
10
22.6823
16695
1352018
18
94
6824

blurry image of moon.

M101682 moon-misruns

1913 Oct 7

3

7
183
220

19780
11610.04
0.5
70.
181834

18781
1691036
3130
69
1852

8
15.0 16426 16659
225 1101210 12080
10 7876
26 56
225411 5423

9
19.6 16415 16695
22.6 959088 1352018
max 88 18
10 94
8 226823 6824

blurring image of moon.

MC1682 Flam. star words.

1913 Oct 8.

4.

Q.G. (Berlin 1875) No. 3542 mag 9.0

Q.G. No. 3377 mag 8.8

Q.G. 8^h 40^m 20^s.59

8 46 36.08

Prec +2 10.80

+2 10.45

 α 8 42 31.39

8 48 46.53

 A 8 44 40

8 44 40

 $\alpha - A$ - 2 08.61

+ 4 06.53

 $\sin(\alpha - A)$ - 128.61

+ 246.52

log... 2 10.927 m

2 391.85

cos 8 995955

9.95928

3₀ 057606 m

0.85837

3₁ - 3.7675

+ 7.2172

3₁ - 10

+ 29

3 14.2315

25.2201

 α 14.3982

25.3937

 $\alpha - 3$ + 1.667

+ 1.736

Q.G. + 24° 28' 49".1

+ 24° 33' 48".3

Prec - 8 00.5

- 8 15.7

 δ + 24 20 48.6

+ 24 25 32.6

 D + 23 04 57

+ 23 04 57

 $\delta - D$ + 1 15 51.6

+ 1 20 35.6

 $\tan(\delta - D)$ + 4552.3

+ 4836.4

log... 3.65823

3.68453

" γ_0 0.98938

1.01568

tan 5 9.6556

9.6572

3² 11521

17167

 γ_1 7.8611

8.4273

 γ_0 + 9.7584

+ 10.3676

 γ_1 + 73

+ 267

 γ 31.7657

323943

 γ 31.7946

323309

 $\gamma - \gamma$ + 289

- 634

MC1682 *Signatoid Cordas*

1913 Oct 7.

A 9 (Berlin 1875) μ 35 42 mag 9.0A 9 μ 35 77 mag 8.8

C 9 8 40 20 59

8 46 36 08

Proc + 2 10 80

+ 2 10 45

 α 8 42 31 39

8 48 46 53

A 8 44 40

8 44 40

 $\alpha - A$ - 2 08 61

+ 4 06 53

 $\alpha(A-A)$ - 1 28 61

+ 2 46 52

mag 2 10 92 7

2 39 18 5

mag 9 9 59 55

9 9 59 28

 $\bar{s}_0$ 05 76 06

0 85 83 7

 $\bar{s}_0$ - 3 76 75

+ 7 21 72

 $\bar{s}_1$ - 10

+ 29

 $\bar{z}$ 14 23 15

25 22 01

 $\bar{z}$ 14 39 82

25 39 37

 $\bar{z} - \bar{z}$ + 1 66 7

+ 1 73 6

A 9 + 24° 28' 49" 1

+ 24° 33' 48" 3

Proc - 8 00 5

- 8 15 7

 δ + 24 20 48 6

+ 24 25 32 6

 D + 23 04 57

+ 23 04 57

 $\delta - D$ + 1 15 51 6

+ 1 20 35 6

tans - 01 + 4 55 23

+ 4 83 64

mag 3 65 82 3

3 68 45 3

 γ_0 0 98 93 8

1 01 56 8

tans 9 65 56

9 65 72

 $\bar{s}^2$ 1 15 21

1 71 67

 γ_1 7 86 11

8 42 73

 γ_0 + 9 75 84

+ 10 36 76

 γ_1 + 73

+ 26 7

 γ 31 76 57

32 39 43

 γ 31 79 46

32 33 09

 $\gamma - \gamma$ + 28 9

- 63 4

Standard Error

Cape no. 1215 mag. 8.3

C	8h	40m	39.91
L			98
E			90
Mean	8	40	39.93
Prec			+ 41.99
α	8	41	21.92
A	8	44	40
$\alpha - A$	-	3	18.08
$\sin(\alpha - A)$			- 198.07
$\log$			2.29682m
$\dots \dots$			9.96507
$\dots \dots$			0.76913m
$\dots \dots$			- 5.8766
$\dots \dots$			- 6
$\dots \dots$			12.1228
$\dots \dots$			12.1884
$\dots \dots$			+ 656

C	+ 22°	43'	01.5
L			01.7
E			01.4
Mean	+ 22	43	01.5
Prec	-	2	35.4
S	+ 22	40	26.1
D	+ 23	04	57
$S - D$	-	24	30.9
$\tan(S - D)$			- 1470.9
$\log$			3.16758m
$\dots \dots$			0.49873m
$\dots \dots$			9.6209
$\dots \dots$			1.5383
$\dots \dots$			8.2126
$\dots \dots$			- 3.1531
$\dots \dots$			+ 163
$\dots \dots$			18.8632
$\dots \dots$			18.9095
$\dots \dots$			+ 463

Cape no. 1230 mag. 8.0

8h	48m	31.83
		86
		76
8	48	31.82
		+ 41.69
8	49	13.51
8	44	40
+ 4		33.51
+ 2		73.49
		2.43694
		9.96546
		0.90964
		+ 8.1216
		+ 17
		26.1233
		26.1755
		+ 522

+ 22	35	44.8
		45.3
		43.5
+ 22	35	44.5
-	2	44.0
+ 22	33	00.5
+ 23	04	57
-	31	56.5
-	19	16.6
		3.28253m
		0.61368m
		9.6183
		18.193
		8.4910
		- 4.1085
		+ 310
		17.9225
		17.8568
		- 657

Standard Error

4

Cable No 1215 mag 8.3

Cable No 1230 mag 8.0

C	8 ^h 40 ^m 39 ^s 91
L	98
E	90
Mean	8 40 39.93
Prece	+ 41.99
A	8 41 21.92
A	8 44 40
$\lambda - A$	- 3 18.08
$\sin(\lambda - A)$	- 198.07
log	229682 ^m
cos	996507
$\bar{z}_0$	076913 ^m
$\bar{z}_0$	- 58766
$\bar{z}_1$	- 6
$\bar{z}$	121228
$\bar{z}_c$	121884
$\lambda - \bar{z}$	+ 656

C	+ 22° 43' 01" 5
L	017
E	014
Mean	+ 22 43 01.5
Prece	- 2 35.4
S	+ 22 40 26.1
D	+ 23 04 57
$\lambda - D$	- 24 30.9
$\sin(\lambda - D)$	- 1470.9
log	3.16758 ^m
$\bar{z}_0$	049873 ^m
cos	96209
$\bar{z}_1$	15383
$\bar{z}_1$	82126
$\bar{z}_0$	- 31531
$\bar{z}_1$	+ 163
$\bar{z}$	188632
$\bar{z}$	189091
$\lambda - \bar{z}$	+ 463

8 ^h 48 ^m 31 ^s 83
86
76
8 48 31.82
+ 41.69
8 49 13.51
8 44 40
+ 4 33.51
+ 1273.49
243694
996546
090964
+ 81216
+ 17
26.1233
261755
+ 522

+ 22 35 44.8
453
435
+ 22 35 44.5
- 2 44.0
+ 22 33 00.5
+ 23 04 57
- 31 56.5
- 1916.6
3.28253 ^m
061368 ^m
7.6183
18193
84910
- 41085
+ 310
17.9225
17.8568
- 657

MC1682

Plate Centre.

6

x	y
12.1884	18.9095
14.3982	31.7946
25.3937	32.3309
26.1755	17.8568
478.16	1100.89
19.54	25.22
-1.8	-2.2
1.54	3.22
31	46.5
1.54	14.98
46.2	
47.74	

$R.A.$	$Decl.$
41 22 +22 40 26	
42 31 +24 20 49	
48 47 +24 25 33	
49 14 +22 33 00	
4 20 114.4	118 108
8 45 28 +23 29 57	
- 48 - 25	
8 44 40 +23 04 57	

$$A = 8^h 44^m 40^s$$

$$D = +23^\circ 04' 57''$$

Preliminary Reduction

$x - 3 - 804$	$+ 3x$	$+ 814$
$+ 656 - 1512 = -856$	$+ 37 = -819$	$= -5$
$+ 1667 - 2544 = -877$	$+ 43 = -834$	$= -20$
$+ 1736 - 2587 = -851$	$+ 76 = -775$	$= +39$
$+ 522 - 1429 = -907$	$+ 79 = -828$	$= -14$
$19.7556 - 1642^v$	$+ 59^v$	$= 19.6787^v$
$y - 4 + 802$	$+ 3y$	$- 1504$
$+ 463 + 975 = +1438$	$+ 57 = +1495$	$= -9$
$+ 289 + 1152 = +1441$	$+ 95 = +1536$	$= +32$
$- 634 + 2031 = +1397$	$+ 97 = +1494$	$= -10$
$- 657 + 2094 = +1437$	$+ 54 = +1491$	$= -13$
$20.52667 - 1580^v$	$+ 62^v$	$= 20.5404^v$

Tables $a = +0.6$ $e = +0.6$ $a - e = 0.0$ $f + a = 0.0$
 obs $a = -1.0$ -1.3 $= +0.3$ -0.5
 $c - 0$ $a - e = -0.3$ $b + a = +0.5$

1161682

Rhett Center

6

$$\begin{array}{r}
 12.1884 \quad 189095 \\
 19.3982 \quad 317946 \\
 25.3937 \quad 323309 \\
 26.1755 \quad 178568 \\
 \hline
 478.16 \quad 10089 \\
 19.54 \quad 2522 \\
 -18 \quad -22 \\
 \hline
 7.54 \quad 322 \\
 31 \quad 465 \\
 \hline
 1.54 \quad 1498 \\
 462 \\
 \hline
 47.74
 \end{array}$$

$$\begin{array}{r}
 R \quad a \quad decl \\
 8 \quad 41 \quad 22 \quad +22 \quad 40 \quad 26 \\
 42 \quad 31 \quad +24 \quad 20 \quad 49 \\
 48 \quad 47 \quad +29 \quad 21 \quad 33 \\
 49 \quad 14 \quad +22 \quad 33 \quad 00 \\
 \hline
 + \quad 20 \quad 1144 \quad 118 \quad 108 \\
 8 \quad 45 \quad 28 \quad +23 \quad 29 \quad 57. \\
 - \quad 48 \quad -25 \\
 \hline
 8 \quad 44 \quad 40 \quad +23 \quad 04 \quad 57
 \end{array}$$

$$\begin{aligned}
 A &= 8^h 44^m 40^s \\
 D &= +23^\circ 04' 57''
 \end{aligned}$$

Preliminary Reduction

$$\begin{array}{r}
 2-3-807 \quad +32 \quad +814 \\
 +656-1512:-856+37:-819 \quad =-5 \\
 +1667-2549:-877+93:-834 \quad =-20 \\
 +1736-2587:-851+76:-775 \quad =+39 \\
 +522-1429:-907+79:-828 \quad =-14 \\
 \hline
 197556-1642 \quad +59 \quad =19.6787
 \end{array}$$

$$\begin{array}{r}
 4-4-7802 \quad +37 \quad -1504 \\
 +463+975:-1438+57:-1495 \quad =-9 \\
 +289+1112:-1441+95:-1536 \quad =+32 \\
 -634+2031:-1397+97:-1494 \quad =-10 \\
 -657+2094:-1437+54:-1498 \quad =-13 \\
 \hline
 20.52662 \quad 1580 \quad +62 \quad =20.5404
 \end{array}$$

$$\begin{array}{l}
 \text{Tables } a = +0.6 \quad e = +0.6 \quad a-e = 0.0 \quad b+a = 0.0 \\
 \text{lbs } a = -1.0 \quad -1.3 \quad = +0.3 \quad -0.5 \\
 c = 0 \quad a-e = -0.3 \quad b+a = +0.5
 \end{array}$$

MC 1682 Times Etc. ✓

Exh testans 1912 Feb 29 7^h 17^m - 7^h 29^m ✓
 Moon 7 22 57.3^m - 7 22 57.5^m ✓
 Clock slow 01 47.1^m ✓

H. Sid T. 7 24 44.5^m ✓
 H. long 4 44 31.05^m ✓
 F. Sid T. 12 09 15.55^m ✓
 Sid T. in Moon 22 31 44.39^m ✓
 Interval 13 37 31.16^m ✓
 Reduction 2 13.93^m ✓
 G. M. T. 13 35 17.23^m 6-8-1^h 20^m ✓

From pant Alm. K. G. Heel. ✓
 Moon 13^h 8^h 42^m 59.28^m + 23 20 52.1 ✓
 Motion in 1^m 2.5760^m 10.507^m ✓
 " 35.2872^m + 1 30.90^m - 6 10.8^m ✓
 Tabular place 8 44 30.18^m + 23 14 41.3 ✓
 Moon's age = 11.8
 Moon's parallax 60' 27.7["] ✓
 " semidiameter 16' 30.0["] ✓
 939 = 14.2^m R = 990.0^m ✓
 990 = 16.0^m augmentation + 16.0^m ✓
 Irradiation (3) - 0.7^m ✓
 R = 1005.3^m ✓
 R = 2.1550^m ✓
 (1+a) R = 2.1548^m ✓
 R² = 4.6431^m ✓
 a = -1.0

N.C. 1682 *Trinius* Eta
 Exp. H. H. H. 19.2 Feb 29 7^h 17^m - 7^h 29^m
 ... moon 7 22 57.3 - 7 22 57.5
 Clock slow 01 47.1

H. S. H. T. 7 24 44.5
 H. S. H. T. 7 44 31.05
 C. S. H. T. 12 09 15.55
 S. S. H. T. M. H. H. 22 31 44.39
 Interval 13 37 31.16
 Reduction 2 13.93
 G. H. T. 13 35 17.23 G-X - 1^h 20^m

From Hant Alm. K. G. H. H. H. H.
 Moon 13^m 8^h 42^m 59.28 + 23 20 52.1
 Moon 1^m 2.5760 10.507
 35.2872 + 1 30.90 - 6 10.8
 Tabular place 8 44 30.18 + 23 14 41.3
 Moon's age = 11.8
 Moon's parallax 60' 27.7
 Moon's distance 16' 30.0
 939 - 19.2 R = 990.0
 990 - 16.0 augmentation + 16.0
 Irradiation (3) - 0.7
 R = 1005.3
 R = 2155.0
 (1 + a) R = 2154.8
 R² = 4643.1

	C	O	O-C
+ 24 + 25 - 72 =	- 23	- 5	+ 18
+ 29 + 41 - 72 =	- 2	- 20	- 18
+ 51 + 42 - 72 =	+ 21	+ 39	+ 18
+ 53 + 23 - 72 =	+ 4	- 14	- 18

- 22 + 32 - 7 =	+ 3	- 9	- 12
- 26 + 54 - 7 =	+ 21	+ 32	+ 11
- 46 + 55 - 7 =	+ 2	- 10	- 12
- 48 + 30 - 7 =	- 25	- 13	+ 12

+ 19 - 12 - 15 =	- 8	+ 3	+ 11
+ 22 - 20 - 15 =	- 13	- 23	- 10
+ 39 - 20 - 15 =	+ 4	+ 15	+ 11
+ 41 - 11 - 15 =	+ 15	+ 4	- 11

- 1 + 6 - 6 =	- 1	- 23	- 22
- 2 + 10 - 6 =	+ 2	+ 24	+ 22
- 3 + 11 - 6 =	+ 2	- 20	- 22
- 3 + 6 - 6 =	- 3	+ 18	+ 21

MC1682

Plate Constants

48

a	b	c	x-3	y-m	x-3	y-m
12.12 + 18.86 + 1 =	-5	-9	+3	-23		
14.23 + 31.76 + 1 =	-20	+32	-23	+24		
25.22 + 32.39 + 1 =	+39	-10	+15	-20		
26.12 + 17.92 + 1 =	-14	-13	+4	+18		
+ 13.18 + 25.31 + 1 =	- 12.50	+ 11.50 - 10.00	+ 0.50			
+ 25.67 + 25.16 + 1 =	+ 12.50	- 11.50 + 9.50	- 1.00			
+ 19.12 + 18.39 + 1 =	- 9.50	- 11.00 + 3.50	- 2.50			
+ 19.72 + 32.08 + 1 =	+ 9.50	+ 11.00 - 4.00	+ 2.00			
- 12.49 + 0.15 =	- 25.00	+ 23.00 - 19.50	+ 1.50			
- 0.60 - 13.69 =	- 19.00	- 23.00 + 7.50	- 4.50			
+ 0.60 - 0.01 =	+ 1.20	- 1.11 + 0.94	- 0.07			
- 13.70 =	- 17.80	- 23.11 + 8.44	- 4.57			
b =	+ 1.30	+ 1.69 - 0.62	+ 0.33			
a =	+ 2.02	- 1.82 + 1.56	- 0.12			

1682

-12.5	+12.5	-9.5	+9.5	+11.5	-11.5	-11.0	+11.0
-26.6	-52.0	-38.6	-39.8	+24.0	+46.8	+34.8	+36.0
-32.8	-32.6	-23.8	-41.6	-42.8	-42.5	-31.1	-54.2
-71.9	-72.1	-71.9	-71.9	-7.3	-7.2	-7.3	-7.2

c for (mc - 3)

c for Cg - 4)

1683

-10.0	+9.5	+3.5	-4.0	+0.5	-1.0	-2.5	+2.0
-20.5	-40.0	-29.8	-30.7	+1.5	+3.0	+2.2	+2.3
+15.6	+15.5	+11.3	+19.8	-8.4	-8.4	+6.1	+10.7
-14.9	-15.0	-15.0	-14.9	-6.4	-6.4	-6.4	-6.4

M 61682

Platen Constants

88

a	b	c	$x-3$	$y-m$
1212 + 1886 + 11	-5	-9		
1423 + 3176 + 11	-20	+32		
2522 + 3239 + 11	+39	-10		
2612 + 1792 + 11	-14	-13		

$x-3$	$y-m$
+3	-23
-23	+24
+15	-20
+9	+18

+ 1318 + 2531 + 11 = - 1250	+ 1150 - 10.00	+ 0.50
+ 2567 + 2516 + 11 = + 1250	- 1150 + 9.50	- 1.00
+ 1912 + 1839 + 11 = 950	- 1100 + 3.50	- 2.50
+ 1972 + 3208 + 11 = 950	+ 1100 - 9.00	+ 2.00
- 1249 + 015 = - 25.00	+ 2300 - 19.50	+ 1.50
- 060 - 1369 = - 19.00	- 2200 + 7.50	- 4.50
+ 060 - 001 = + 1.20	- 111 + 0.94	- 0.07
- 1370 = - 17.80	- 23.11 + 8.44	- 4.57
$b = + 1.30$	+ 1.69 - 0.62	+ 0.33
$a = + 2.02$	- 1.82 + 1.56	- 0.12

1682

- 125	+ 125	- 95	+ 95
- 266	- 520	- 386	- 398
- 328	- 326	- 238	- 416
- 719	- 721	- 719	- 719

c for (70 - 3)

+ 115	- 115	- 110	+ 110
+ 240	- 468	+ 394	+ 360
- 428	- 425	- 311	- 592
- 73	- 72	- 73	- 72

c for (49 - 4)

1683

- 100	+ 9.5	+ 35	- 4.0
- 205	- 40.0	- 298	- 30.7
+ 15.6	+ 15.5	+ 11.3	+ 19.8
- 149	- 150	- 150	- 149

+ 0.5	- 1.0	- 2.5	+ 2.0
- 1.5	- 3.0	+ 2.2	+ 2.3
- 8.4	- 8.4	+ 6.1	+ 10.7
- 6.4	- 6.4	- 6.4	- 6.4

pt.	pos. L.	read.
1	215.7	-131
2	234.5	+91
3	255.9	-33
4	270.0	+76
5	{ 282.7	-290 } $\frac{1}{4}$ wt.
6	305.5	+47
7	313.0	-34
8	339.5	-110
9	0.0	+42

MC1682

Lunar's Center

9

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	18.4928	-1.2628	1.5947	4.6272	-1.59
2	18.0000	-1.7556	3.0821	4.6503	+ 7.2
3	17.6669	-2.0887	4.3626	4.6391	- 4.0
-4	17.5990	-2.1566	4.6509	4.6509	+ 7.8
5	17.6603	-2.0953	4.3902	4.6151	-2.80 ^{1/2}
6	18.0000	-1.7556	3.0821	4.6501	+ 7.0
7	18.1843	-1.5713	2.4690	4.6423	- 8
8	19.0000	-0.7556	0.5709	4.6356	- 7.5
9	19.7556	0.0000	0.0000	4.6509	+ 7.8

Comp. $R^2 = 4.6431$

	y	$y - y_0$	$(y - y_0)^2$
1	18.7844	-1.7414	3.0325
2	19.2735	-1.2523	1.5682
3	20.0000	-0.5258	0.2765
4	20.5258	0.0000	0.0000
5	21.0000	+0.4742	0.2249
6	21.7780	+1.2522	1.5680
7	22.0000	+1.4742	2.1733
8	22.5419	+2.0161	4.0647
+9	22.6824	+2.1566	4.6509

Approximate Center

$$x = 18.0 \quad y = 19.2735$$

$$21.7780$$

$$41.0515$$

$$\text{mean } y = 20.5258$$

$$y - \text{max} = 22.6824$$

$$R = 2.1566$$

$$x - \text{min} = 17.5990$$

$$\text{mean } x = 19.7556$$

$$\text{Center } \begin{cases} x_0 = 19.7556 \\ y_0 = 20.5258 \end{cases}$$

ME1682

Motions Center

9

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - c$
1	184928	-12628	15947	46272	-159
2	180000	-17556	30821	46503	+72
3	176669	-20887	43626	46391	-40
4	175990	-21566	46507	46509	+78
5	176603	-20953	43902	46151	-280
6	180000	-17556	30821	46501	+70
7	181843	-15713	24690	46923	-8
8	190000	-67556	05709	46356	-75
9	197556	00000	00000	46509	+78

Comp $R^2 = 46431$

	y	$y - y_0$	$(y - y_0)^2$
1	187844	-17414	30325
2	192735	-12523	15682
3	200000	-05258	02765
4	205258	00000	00000
5	210000	+04742	02247
6	217780	+12522	15680
7	220000	+14742	21733
8	225419	+20161	40647
9	226824	+21566	46509

Approximate Center

$$x = 18.0 \quad y = 19.2735$$

$$21.7780$$

$$41.0515$$

$$\text{mean } y = 20.5258$$

$$y - \text{mean} = 22.6824$$

$$R = 21.566$$

$$x - \text{mean} = 17.15990$$

$$\text{mean } x = 19.7556$$

$$\text{Center } \begin{cases} x_0 = 19.7556 \\ y_0 = 20.5258 \end{cases}$$

Formation of Normal.

	at	an	bn
1	+ 2.19	+ 20 0.0	+ 27 6.5
2	+ 2.20	- 12 6.8	- 9 0.0
3	+ 1.11	+ 83.5	+ 21.2
4	- 0.00	- 168.5	+ 0.0
5	- 0.06	+ 36.8	- 8.2
6	- 2.20	- 123.2	+ 87.5
7	- 2.31	+ 12.6	- 11.8
8	- 1.53	+ 57.0	- 151.5
9	+ 0.00	+ 0.0	+ 168.5
	- 0.60	- 28.6	+ 292.2

Normal Equations

$$+ 20.91 - 0.60 = - 29$$

$$- 0.60 + 17.39 = + 292$$

$$+ 0.60 + 0.02 = - 1$$

$$+ 17.37 = + 291$$

$$b = + 16.8$$

$$+ 20.912 = - 29 + 10 = - 19$$

$$a = - 0.9$$

Residuals

	O	C	O - C
1	- 1.59	+ 1 - 29 = - 28	- 131
2	+ 72	+ 2 - 21 = - 19	+ 91
3	- 40	+ 2 - 9 = - 7	- 33
4	+ 78	+ 2 + 0 = + 2	+ 76
5	- 280	+ 2 + 8 = + 10	- 290
6	+ 70	+ 2 + 21 = + 23	+ 47
7	- 8	+ 1 + 25 = + 26	- 34
8	- 75	+ 1 + 34 = + 35	- 110
9	+ 78	- 0 + 36 = + 36	+ 42

$$\text{Average} = 90$$

MC1682 Moon's Center Conditional Equations

	a	b			
1	-1.26	-1.74	=	-1.59	
2	-1.76	-1.25	=	+72	+36 + 7 = +43 + 29
3	-2.09	-0.53	=	-40	+42 + 3 = +45 - 85
4	-2.16	+0.00	=	+78	+44 - 0 = +44 + 34
5	-2.76	+1.25	=	+70	+36 - 7 = +29 + 41
6	-1.57	+1.47	=	-8	+32 - 8 = +24 - 32
7	-0.76	+2.02	=	-75	+15 - 12 = +3 - 78
8	+0.00	+2.16	=	+78	+0 - 12 = -12 + 90

$$+194 - 195$$

$$\text{Average} = 5.6$$

$$3) -6.01 - 1.78 = +110$$

$$4) -4.09 + 6.90 = +65$$

$$+4.09 + 1.21 = -75$$

$$+8.11 = -10$$

$$b = -1.23$$

$$-6.01 = +110 - 2 = +108$$

$$a = -18.0$$

$$4) -7.77 - 0.53 = +180$$

$$3) -2.33 + 5.65 = -5$$

$$+2.33 + 0.16 = -59$$

$$+5.81 = -59$$

$$b = -10.15$$

$$-7.77 = +180 - 5 = +175$$

$$a = -22.5$$

$$\text{Mean } a = -20.2$$

$$b = -5.7$$

Normal Equations

$$a = -0.9$$

$$b = +16.8$$

1961682 Moon's Center

Conventional Equations

1	$-125 - 174 = -159$			
2	$-176 - 125 = -172$	$+36 +$	$7 = +43$	$+29$
3	$-209 - 053 = -40$	$+42 +$	$3 = +45$	-83
4	$-216 + 000 = -178$	$-44 -$	$0 = +44$	$+34$
5	$-176 + 125 = -170$	$-36 -$	$7 = -29$	$+41$
6	$-157 + 147 = -8$	$-32 -$	$8 = +29$	-32
7	$-076 + 202 = -75$	$+15 -$	$12 = +3$	-78
8	$+000 + 216 = +178$	$+0 -$	$12 = -12$	$+90$

$$+194 - 191$$

$$\text{Average} = +6$$

$$1 - 601 - 178 = +110$$

$$2 - 409 + 690 = +65$$

$$+409 + 121 = 75$$

$$+811 = -10$$

$$b = -12$$

$$1 - 601 = +110 - 2 = +108$$

$$a = -180$$

$$2 - 777 - 053 = +180$$

$$3 - 233 + 565 = -5$$

$$+233 + 016 = -59$$

$$+581 = -59$$

$$b = -10.1$$

$$-777 + 180 - 5 = -175$$

$$a = -225$$

$$\text{Mean } a = -202$$

$$b = -57$$

Normal Equation

$$a = -09$$

$$b = +108$$

Read ad. C. app.

$$S = +22^{\circ} 54'$$

$$H + \alpha_0 \quad 4 \quad 12 = 63^{\circ}$$

$$H \quad 19 \quad 26$$

$$\alpha = 8 \quad 46$$

$$G \quad 18 \quad 26$$

$$G + \alpha_0 \quad 3 \quad 12 = 48^{\circ}$$

$$\log \cos(G + \alpha_0) = 9.8215$$

$$\log \sin \alpha = 0.9450$$

$$\log \sin H = 9.8711$$

$$\log \tan S = 9.6257$$

$$\log \frac{1}{\sin} = 8.8239$$

$$\log (S') = 0.7705$$

$$\log (S) = 9.2657$$

$$\log \cos S = 9.9644$$

$$\log (L) = 0.8843$$

$$\log (L') = 0.8487$$

$$\log \sin S = 9.5901$$

$$\log \cos(H + \alpha) = 9.6571$$

$$\log h = 1.2783$$

$$\log \sin(H + \alpha) = 9.9499$$

$$\log \sec S = 0.0356$$

$$\log \frac{1}{\sin} = 8.8239$$

$$\log(h') = 0.5255$$

$$\log (L) = 0.0877$$

$$b \quad +0.14$$

$$(S) \quad +0.18$$

$$(h) + \frac{1.22}{+1.54}$$

$$(S') \quad +5.90$$

$$(L') \quad +3.35$$

$$(L) \quad -7.06$$

$$+2.19$$

MC1682

$$X_0 = 19.7556^\circ$$

$$\frac{1}{2}a = 0$$

$$19.7556$$

$$Y_0 = 20.5258^\circ$$

$$\frac{1}{2}b = +8$$

$$20.5266$$

From Prelim Reduction $X = 19.6787$ $Y = 20.5404$ Plate constant $a_x = +39$ $a_y = +35$ $b_x = -27$ $b_y = -35$ $c_x = +72$ $c_y = +7$ $X = 19.6793$ $Y = 20.5411$

$$z = +1.6793^\circ$$

$$\log \gamma = 0.22513^\circ$$

$$\log \delta = 9.96437^\circ$$

$$\log \cos \delta = 8.50724$$

$$\log (X-A) = 1.75352^\circ$$

$$\eta = -1.4589^\circ$$

$$\log \tan \delta = 9.6255$$

$$\log \eta = 0.4503$$

$$\log \eta' = 7.1292$$

$$\eta' = +13^\circ$$

$$d-A = +56.69$$

$$\eta_0 = -1.4602^\circ$$

$$A = 8^h 49^m 40^s$$

$$\log \eta_0 = 0.16441^\circ$$

$$d_0 = 8^h 45^m 36.69^s$$

$$\log \cos \delta = 7.33115$$

$$p.d. = +1.54$$

$$\log (d-D) = 2.83336^\circ$$

$$d' = 8^h 45^m 38.23^s$$

$$d-D = -11^m 21.3^s$$

$$D = +23^m 04^s 57^s$$

$$S_0 = +22^\circ 53' 35.7''$$

$$p.d. = +22$$

$$S' = +22^\circ 53' 37.9''$$

10-10-10

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M.C. 1682

$$X_0 = 19.7556$$

$$\frac{1}{2} \Delta = -00$$

$$19.7556$$

$$Y_0 = 20.5258$$

$$\frac{1}{2} \Delta = +8$$

$$20.5266$$

From Prelim Reduction $X = 19.6787$ $Y = 20.5404$

Plate constants $a_x = +39$ $a_y = +35$

$b_x = -27$ $b_y = -35$

$c = +72$ $d = +7$

$X = 19.6793$ $Y = 20.5411$

$$S = +1.6793$$

$$\log r = 0.22513$$

$$\log S = 9.96437$$

$$\cos i = 8.50724$$

$$(x-H) = 1.75352$$

$$d-H = +56.69$$

$$A = 8^{\circ} 49' 40''$$

$$H_0 = 8^{\circ} 45' 36.69''$$

$$\text{Red.} = +1.54$$

$$d = 8^{\circ} 45' 38.23''$$

$$\eta = -1.4589$$

$$\log \tan S = 9.6296$$

$$S = 0.4491$$

$$\eta' = 71321$$

$$\eta'' = 18$$

$$i_0 = -1.4607$$

$$\log \eta = 0.16448$$

$$\cos i = 7.33115$$

$$(d-D) = 283886$$

$$d-D = -11.213$$

$$D = +23.04.57$$

$$S_0 = +22^{\circ} 53' 35.7''$$

$$\text{Red.} = +22$$

$$S = +22.53.37.9$$

1682

Lunar parallax.

12

$$\begin{array}{r} \alpha' = 8^h 45^m 38.23^s \\ \theta = 7 \quad 24 \quad 44.5 \\ -1 \quad 20 \quad 53.66 \\ -20 \quad 13' \quad 25'' \end{array}$$

$$- \quad \quad \quad 8 \quad 25''$$

$$-20 \quad 05''$$

$$9.95727$$

$$0.00000$$

$$0.02724$$

$$9.98451$$

$$y = 43 \quad 58 \quad 43$$

$$+22 \quad 53 \quad 38$$

$$y - S = 21 \quad 05 \quad 05$$

$$9.82640$$

$$8.24518$$

$$9.55600$$

$$0.15841$$

$$7.78599$$

$$S - S' = +21 \quad 00.1$$

$$S = +23 \quad 14 \quad 38.0$$

$$\alpha = 8 \quad 44 \quad 30.92$$

$$\text{Ann Eph } S = +23 \quad 14 \quad 41.3$$

$$\alpha = 8 \quad 44 \quad 30.18$$

$$\theta - C = -3.3$$

$$+0.74$$

$$S' = +22 \quad 53' \quad 37.9''$$

$$\Pi = 60' \quad 27.7''$$

$$9.86913$$

$$8.24518$$

$$9.53868$$

$$0.03676$$

$$7.68975$$

$$\lambda - \lambda' = -16' \quad 49.67''$$

$$-1'' \quad 07.31''$$

1682

homo parallel $\alpha' = 8^h 45^m 38.28$ $\theta = 7 \quad 24 \quad 44.5$ $-1 \quad 20 \quad 53.66$ $-20'' \quad 13' \quad 25''$ $- \quad \quad \quad 8 \quad 25$ $-20 \quad 05$ 995727 000000 002724

 998451 $\gamma = 43 \quad 58 \quad 43$ $-22 \quad 53 \quad 37$ $\gamma - \delta = 21 \quad 05 \quad 06$ 982640 824518 955600 015841

 778599 $\delta - \delta' = \quad \quad \quad 21 \quad 00.1$ $\delta = 23 \quad 14 \quad 39.0$ $\alpha = 8 \quad 44 \quad 30.92$ $\text{Am Eph } \delta = 23 \quad 19 \quad 41.3$ $\alpha = 8 \quad 44 \quad 30.18$ $\theta - \epsilon = \quad \quad \quad -3.3$ $+0.74$

MC1680

1913 Oct. 8.

13

Stars measured

α	δ	α	δ	α	δ	α	δ
1	18940	15480	17730	16680			
10.5	17530	68900	17470	11910	15		
19.2	2523	9900	7780	40			
	48	78	30	70			
	<u>19.1415</u>	<u>.1415</u>	<u>10.4746</u>	<u>.4763</u>			
2	11374	9335	17725	16510			
12.7	11191	4039	15060	9181	80		
32.0	0000	9152	5462	82			
			30	11			
	<u>32.0177</u>	<u>.0186</u>	<u>12.7333</u>	<u>.7330</u>			
3	16515	19073	16683	15192			
23.7	11390	14193	13990	7890	94		
32.5	9090	0000	9090	9094			
	17	75	88	90			
	<u>32.5126</u>	<u>.5124</u>	<u>23.7306</u>	<u>.7300</u>			
4	11570	13554	17662	19710			
24.5	11170	59	12269	15080	87		
18.0	6076	13150	7270	90			
			68	20			
	<u>18.0401</u>	<u>.0405</u>	<u>24.4605</u>	<u>.4629</u>			

Grade 2 or 3

1912phae-proj-15

1913 Oct 8.

13

Stars measured

d	d	d	d
1 18940	15480	17730	16680
105 17530	68900	17470	11910
192 2523	9900	7780	40
48	78	30	70
<u>19.1415</u>	<u>1415</u>	<u>10.4746</u>	<u>9763</u>
2 11374	9335	17725	16510
127 1115	4039	15060	9181
320 0000	9152	5462	82
		30	11
<u>320177</u>	<u>0.186</u>	<u>12.7333</u>	<u>7330</u>
3 16515	19073	16683	15192
237 11390	14193	13990	7890
325 9090	0000	9090	9094
17	75	88	90
<u>32.5126</u>	<u>5124</u>	<u>23.7206</u>	<u>7300</u>
4 11570	13554	17662	19710
295 11170	59	12269	15080
180 6076	13150	7270	90
		68	20
<u>18.0401</u>	<u>0405</u>	<u>24.4605</u>	<u>4629</u>

Grade 2 or 3

1
18
18
2
17
19
3
17
19
4
16
20
4
16
20
4
17
21

MC1683

Moon-measures.

14

	α	δ	α	δ
1	16260	17529		
18.0	11660	12100	96	
18.1	49	60		
	70	20		
	<u>18.4612</u>	<u>.4577</u>		

2
17.4
19.0

16790	17920
10430	14289
30	75
90	20
<u>17.3647</u>	<u>.3627</u>

3	19611	16400
17.0	12745	13212
19.7	30	80
	20	02
	<u>19.6882</u>	<u>.6806</u>

4
16.9
20.0

18878	17690
18098	8462
8894	7870
78	90
<u>16.9215</u>	<u>.9217</u>

5
16.9
20.3
min
2

17861	17690
16810	8740
10	47
60	00
<u>16.8946</u>	<u>.8956</u>

6
17.0
21.0

15699	11129
0009	11079
15659	53
<u>17.0047</u>	<u>.0064</u>

MC1683

Hiron-Heavens

14

	a		N		a		N
1	16260		17529				
180	11660		12100	96			
181	49	50	60				
	70		20				
	<u>18.4612</u>		<u>4577</u>				

2
174
190

16790	17920
1043045	1428994
35	75
90	20
<u>17.3647</u>	<u>3627</u>

3	19611	10400
170	12745	13212
197	30	4098
	20	02
	<u>19.6882</u>	<u>6806</u>

4
169
200

18878	17690
18098	846280
8894	7870
78	90
<u>16.9215</u>	<u>9217</u>

17861	17690
1681000	8740
10	4742
60	00
<u>16.8946</u>	<u>8956</u>

1589909	11129
0009	1107965
15659	50
<u>17.0047</u>	<u>0064</u>

5
169
203

6
169
203

7
169
203

MC 1683

Moon

15

a

4

n

d²

2
17.7
22.0

18275
15038.20
35-35
65

15861
9095
1000
54
16751

17.67618

18.0
22.3

16680
14420.20
20
80

22.2260

13900
6160
6868
66

.22609

19.0
22.5

15661
1068878
74
57

22.4978

18930
13880
8820
20

.4961

512

5

5.1

9
14
2

C1683

Moon

15

a

4

n

d =

n

7
-0
$$\begin{array}{r}
 18275- \\
 15038.20 \\
 35-35- \\
 65- \\
 \hline
 17.6761
 \end{array}$$

$$\begin{array}{r}
 15861 \\
 9095- \\
 1000 \\
 59 \\
 \hline
 6751
 \end{array}$$
1
-0

23

16680

13900

14420 20

6160

20

6568

80

06

$$\begin{array}{r}
 22.2260 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 2260 \\
 \hline
 \end{array}$$

9-

15661

18930

140

1068878

1388090

225

75

88

114

57

20

$$\begin{array}{r}
 224978 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 4961 \\
 \hline
 \end{array}$$

Mc 16 83

Tinnies etc

16

Exp. h. stars 1912 Feb 29 $7^h 36^m \checkmark$ - $7^h 50^m \checkmark$
 Moon $7 41 57.3 \checkmark$ - $7 41 57.5 \checkmark$
 Clock slow $1 47.1 \checkmark$

H. Sid. T. $7 43 44.5 \checkmark$
 H. long $4 44 31.05 \checkmark$
 G. Sid. T. $12 28 15.55 \checkmark$
 Sid. T. h. Moon $22 31 44.39 \checkmark$
 Interval $13 56 31.16 \checkmark$
 Reduction $2 17.04 \checkmark$
 G. M. T. $13 54 14.12 \checkmark$

 $G - V = 1^h 01^m 35^s$

From Naut. Alman. RA $Dec.$
 Moon $14^h 8^h 45^m 33.76 \checkmark$ $+23^\circ 10' 19.7 \checkmark$
 Motion in $1^m = 2.5719 \checkmark$ $10.611 \checkmark$
 " " $-5.7647 \checkmark$ $-14.83 \checkmark$ $+1 01.2 \checkmark$
 Tabular place $8 45 18.93 \checkmark$ $+23 11 20.9 \checkmark$

Moon's parallax $60' 27.8 \checkmark$
 " " $16' 30.0 \checkmark$
 $934 = 14.5 \checkmark$ $= 990.0 \checkmark$
 $990 = 16.3 \checkmark$

Cumulative $+16.3 \checkmark$
 Parallax (2003) $-0.6 \checkmark$
 $R = 1005.7 \checkmark$
 $R = 2.1558 \checkmark$
 $(1+a)R = 2.1559 \checkmark$
 $R^2 = 4.6479 \checkmark$

 $a = +0.6$

16

MC 16 83	Taurus etc		
Exp. 15 Jan 1912 Feb 29	7 ^h 36 ^m	- 7 ^h 50 ^m	
known	7 41	573 - 7 41	57.5
Clockwork	1 47.1		
H. S. d. T.	7 43	445	
H. S. d. T.	4 44	3105	
G. S. d. T.	12 28	1555	
S. d. T. h. known	22 31	4439	
Individual	13 56	31.16	
Reduction	2	1704	
G. T. T.	13 54	1412	$\Delta - \delta = 1^h 01^m 35^s$

From Naut. Alman.	RG	Black
known 14 ^h	8 ^h 45 ^m 3376	+ 23° 10' 19"
known 1 ^h = 2.5719		10.611
- 5.7647	- 14.83	+ 1.012
Tabular place	8 45 1893	+ 23 11 209

Moon's parallax	60, 27.8
- lunidian	16' 30.0
934 = 14.5	= 990.0
990 = 16.3	
Augment + 16.3	
Parallax 2000 = 0.6	
R = 1005.7	
R = 2.1558	
a = +0.6	
(1+a)R = 2.1559	
R ² = 4647.9	

MC1683 Plate Constants

17

x	10.4755	12.7332	23.7303	24.4617
y	12.1228	14.2315	25.2201	26.1233
$x-y$	-1.6473	-1.4983	-1.4898	-1.6616

y	19.1416	32.0182	32.5125	18.0403
x	18.8632	31.7657	32.3943	17.9225
$y-x$	+2.2784	+2.2525	+1.1182	+1.1178

Preliminary Reduction

$x=3$	-1184	$+x$	+1.8725
-1.6473	-2259	$-1.8732 + 10$	$= -1.8722 = +3$
-1.4983	-3778	$-1.8761 + 13$	$= -1.8748 = -23$
-1.4898	-3836	$-1.8734 + 24$	$= -1.8710 = +15$
-1.6616	-2129	$-1.8745 + 24$	$= -1.8721 = +4$
19.0514	-2400	$+19$	$= 20.6858$

$y-x$	+1182	$+34$	-4100
+2.2784	+1236	$+4020 + 57$	$= +4077 = -23$
+2.2525	+1503	$+4028 + 96$	$= +4124 = +24$
+1.1182	+2800	$+3982 + 98$	$= +4080 = -20$
+1.1178	+2886	$+4064 + 54$	$+4118 = +18$
20.3479	+2248	$+61$	$= 20.1628$

Tables	$a = +0.6$	$e = +0.3$	$a - e = +0.3$	$b + d = 0.0$
Obs	$a = +0.6$	$e = -2.7$	$a - e = +3.3$	$b + d = -0.7$
$C - O$			$a - e = -3.0$	$b + d = +0.7$

MC1683 Plate constant

17

2	104755	127332	237303	244617
3	121228	142315	252201	261233
2-3	-16473	-14983	-14898	-16616

4	191416	320182	325125	180403
3-4	188632	317657	323943	179225
4-3	+2784	+2525	+1182	+1178

Preliminary Reduction

2-3	-1184	+2	+1.8725
-16473 - 2259	= -18732	+10	= -18722 = +3
-14983 - 3778	= -18761	+13	= -18748 = -23
+14898 - 3836	= -18734	+24	= -18710 = +15
-16616 - 2129	= -18745	+24	= -18721 = +4
19.0514 - 2400	+19		= 20.6858

4-3	+1182	+34	-4100
+2784 + 1236	= +4020	+57	= +4077 = -23
+2525 + 1503	= +4028	+96	= +4124 = +24
+1182 + 2800	= +3982	+98	= +4080 = -20
+1178 + 2886	= +4064	+54	= +4118 = +18
20.3929 + 2248	+61		= 20.1628

Tables	a = +0.6	e = +0.3	a - e = +0.3	b + d = 0.0
Obs.	a = +0.6	e = -2.7	a - e = +3.3	b + d = -0.7
c = 0			a - e = -3.0	b + a = +0.7

pk.	pos. $\angle$	resid.
1	209.1	+12
2	231.6	+11
3	252.3	-74
4	260.8	+49
5	270.0	+16
$\frac{1}{4}$ wt 6	[287.6	-293]
7	320.5	-60
8	330.9	+72
9	355.7	-11

MC1683

Moon's Center.

19.

	x	$(x - x_0)$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	18.0000	-1.0494	1.1012	4.6480	+ 1
2	17.3637	-1.6857	2.8416	4.6444	- 35
3	17.0000	-2.0494	4.2000	4.6384	- 145
4	16.9216	-2.1278	4.5275	4.6449	- 30
5	16.8951	-2.1543	4.6410	4.6410	- 69
6	17.0055	-2.0439	4.1775	4.6095 ^{stop}	- 384 ^{2 wt}
7	17.6756	-1.3738	1.8873	4.6339	- 140
8	18.0000	-1.0494	1.1012	4.6480	+ 1
9	19.0000	0.0494	0.0024	4.6434	- 45
			$R^2 =$	4.6479	

	y	$(y - y_0)$	$(y - y_0)^2$
1	18.4594	-1.8833	3.5468
2	19.0000	-1.3427	1.8028
3	19.6844	-0.6583	0.4334
4	20.0000	-0.3427	0.1174
5	20.3427	0.0000	0.0000
6	21.0000	+0.6573	0.4320 ^{stop}
7	22.0000	+1.6573	2.7466
8	22.2260	+1.8833	3.5468
9	22.4970	+2.1543	4.6410

Approximate Center.

$$x = 18.0 \quad y = 18.4594$$

$$\underline{22.2260}$$

$$40.6854$$

$$\text{mean } y = 20.3427$$

$$y = \text{max} = 22.4970$$

$$R = 21.543$$

$$y = \text{min} = 16.8951$$

$$\text{mean } x = 19.0494$$

$$x = 17.0 \quad y = 19.6844$$

$$\underline{20.9970}$$

$$40.6814$$

$$\text{mean } y = 20.3407$$

$$\text{Center } \begin{cases} X_0 = 19.0494 \\ Y_0 = 20.3427 \end{cases}$$

MIC 1683

Innovis Center

19.

	x	$(x - x_0)$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	180000	-1.0494	1.1012	4.6480	+1
2	173637	-1.6857	2.8416	4.6444	-35
3	170000	-2.0494	4.2000	4.6339	-145
4	169216	-2.1278	4.5275	4.6449	-30
5	168951	-2.1543	4.6410	4.6410	-69
6	170055	-2.0439	4.1775	4.6095	
7	176756	-1.3738	1.8873	4.6339	-140
8	180000	-1.0494	1.1012	4.6480	+1
9	190000	0.0494	0.0024	4.6434	-45
			$R^2 =$	4.6479	

	y	$(y - y_0)$	$(y - y_0)^2$
1	184599	-1.8833	3.5468
2	190000	-1.3427	1.8028
3	196844	-0.6583	0.4334
4	200000	0.3427	0.1174
5	203927	0.0000	0.0000
6	210000	+0.6573	0.4320
7	220000	+1.6573	2.7466
8	222260	+1.8833	3.5468
9	224970	+2.1543	4.6410

Approximate Center

$$x = 180 \quad y = 184599$$

$$\frac{222260}{4068.54}$$

$$\text{mean} = 203427$$

$$y_{\text{max}} = 224970$$

$$R = 21543$$

$$R_{\text{min}} = 168951$$

$$\text{max} = 190494$$

$$x = 170 \quad y = 196844$$

$$\frac{209970}{4068.14}$$

$$\text{mean} = 203407$$

$$\text{Center} \begin{cases} X = 190494 \\ Y = 203427 \end{cases}$$

Formation of Normals.

	at	an	bn
1	+ 1.97	- 1.0	- 1.9
2	+ 2.26	+ 59.1	+ 46.9
3	+ 1.35	+ 297.5	+ 95.6
4	+ 0.72	+ 63.0	+ 10.2
5	- 0.00	+ 148.5	- 0.0
6	- 0.08	+ 53.7	- 15.8
7	- 2.27	+ 191.8	- 232.2
8	- 1.97	- 1.0	+ 1.9
9	- 0.11	+ 22	- 96.8
	<u>+ 1.87</u>	<u>+ 813.8</u>	<u>- 192.1</u>

Residuals.

		c	U - C
1	- 41 + 50 =	- 11	+ 12
2	- 67 + 21 =	- 46	+ 11
3	- 81 + 10 =	- 71	- 74
4	- 84 + 05 =	- 79	+ 49
5	- 85 - 0 =	- 85	+ 16
6	- 81 - 10 =	- 91	- 293
7	- 54 - 26 =	- 80	- 60
8	- 41 - 30 =	- 71	+ 72
9	- 2 - 34 =	- 36	- 11

Average = 66

without (6) = 34

MC1683

Moon's Center

20

Conditional Equations.

	O	C	O-C
1	$-1.05 - 1.88 = +1$	$-40 + 25 = -15$	$+16$
2	$-1.69 - 1.34 = -35$	$-65 + 18 = -47$	$+12$
3	$-2.05 - 0.66 = -145$	$-78 + 9 = -69$	-76
4	$-2.13 - 0.34 = -30$	$-82 + 5 = -77$	$+47$
5	$-2.15 + 0.00 = -69$	$-82 - 0 = -82$	$+13$
6	$-2.04 + 0.66 = -384$	$-82 - 0 = -82$	$+13$
7	$-1.37 + 1.66 = -140$	$-52 - 22 = -74$	-66
8	$-1.05 + 1.88 = +1$	$-40 - 25 = -65$	$+66$
9	$-0.05 + 2.15 = -45$	$-2 - 29 = -31$	-14
			Average = 39.

Mean Equations

$$- 6.92 - 422 = -209$$

$$- 4.62 + 569 = -253$$

$$+ 4.62 + 2.82 = +140$$

$$+ 8.51 = -113$$

$$b = -13.3$$

$$- 6.92 = -209 - 56 = -265$$

$$a = +383$$

Normal Equations

$$+ 21.35 + 1.87 = +814$$

$$+ 1.87 + 1694 = -192$$

$$- 1.87 - 0.16 = -71$$

$$+ 16.78 = -263$$

$$b = -15.7$$

$$+ 21.35 = +814 + 29 = +843$$

$$a = +39.5$$

MC 1683

Miron's Center

20.

Conditional Equations

O

C

O-C

1	-1.05	-1.88	+1	-40 + 25	-15	+16
2	-1.69	-1.39	-35	-65 + 14	-47	+12
3	-2.05	-0.66	-145	-78 + 9	-69	-76
4	-2.13	-0.34	-30	-82 + 5	-77	+47
5	-2.15	+0.00	-69	-62 - 0	-62	+13
6	-2.09	+0.66	-78	-52 - 22	-74	-66
7	-1.37	+1.66	-140	-40 - 25	-65	+66
8	-1.05	+1.88	+1	-2 - 29	-31	-19
9	-0.05	+2.15	-45			

Average = 39.

Miron Equations

$$- 692 - 422 = -209$$

$$- 462 + 569 = -253$$

$$+ 462 + 282 = +140$$

$$+ 851 = -113$$

$$b = -133$$

$$- 692 = -209 - 56 = -265$$

$$a = +383$$

Normal Equations

$$+ 21.35 + 187 = +814$$

$$+ 187 + 1694 = -192$$

$$- 187 - 016 = -71$$

$$+ 1678 = -263$$

$$b = +157$$

$$+ 21.35 + 814 + 29 = +843$$

$$a = +395$$

Rea. ad l. app.

$$\begin{array}{rcl}
 H + \alpha & 4 & 11 = 62^\circ 45' \\
 H & 19 & 25 \\
 \alpha & 8 & 46 \\
 G & 18 & 26 \\
 \alpha + \epsilon & 3 & 12 = 48^\circ
 \end{array}$$

$$\begin{array}{rcl}
 \cos(G + \alpha) & = & 9.8255 \\
 \sin & & 0.9454 \\
 \tan & & 9.8711 \\
 \sec & & 9.6247 \\
 \csc & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log(G') & = & 0.7709 \\
 \log(G) & = & 9.2645
 \end{array}$$

$$\begin{array}{r}
 f \\
 g \\
 h \\
 \hline
 + 0.14 \\
 + 0.18 \\
 + 1.22 \\
 \hline
 + 1.54 \checkmark
 \end{array}$$

$$\delta = +22^\circ 51'$$

$$\begin{array}{rcl}
 \log \cos \delta & = & 9.9645 \\
 \log \sin \delta & = & 0.8847 \\
 \log \tan \delta & = & 0.8492
 \end{array}$$

$$\begin{array}{rcl}
 \sin S & = & 9.5892 \\
 \cos(H + \alpha) & = & 9.6608 \\
 \tan & & 1.2783 \\
 \sin & & 9.9489 \\
 \sec S & = & 0.0355 \\
 \csc & = & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log(H') & = & 0.5283 \\
 \log(H) & = & 0.0866
 \end{array}$$

$$\begin{array}{r}
 G' \\
 H' \\
 \hline
 + 59.0 \\
 + 33.8 \\
 - 7.07 \\
 \hline
 + 2.21 \checkmark
 \end{array}$$

MC1683

21

Munich Mean Position (1912.0)

$$\begin{array}{rcl}
 X_0 & = & 19.0494'' \\
 Y_0 & = & 20.3427'' \\
 \Delta\alpha & = & +20'' \\
 \Delta\delta & = & -8'' \\
 X & = & 19.0514'' \\
 Y & = & 20.3419''
 \end{array}$$

$$\begin{array}{rcl}
 \text{From Prelim Reduction} & X = & 20.6858'' \\
 & Y = & 20.1628'' \\
 \text{Plate Constants } \Delta x & = & -29'' \\
 & \Delta y = & +12'' \\
 & C = & +15'' \\
 X & = & 20.6857'' \\
 Y & = & 20.1629''
 \end{array}$$

$$\begin{array}{rcl}
 \bar{z} & = & +2.6857'' \\
 \log & & 0.42906'' \\
 \cos \delta & = & 9.96453'' \\
 \text{const} & & 8.50724'' \\
 (d-A) & = & 195729'' \\
 \eta & = & -1.8371'' \\
 \log \tan \delta & = & 9.6246'' \\
 \eta^2 & = & 0.8582'' \\
 \eta_1 & = & 7.5362''
 \end{array}$$

$$\begin{array}{rcl}
 d-A & = & +01^m 30.62'' \\
 \eta_1 & = & +34'' \\
 A & = & 8^h 44^m 40'' \\
 \eta_0 & = & -1.8405''
 \end{array}$$

$$\begin{array}{rcl}
 X_0 & = & 8^h 46^m 10.62'' \\
 \log \eta_0 & = & 0.26494'' \\
 \text{const} & = & 7.33115'' \\
 \text{Red} & = & +1.54'' \\
 (d-D) & = & 2.93379''
 \end{array}$$

$$\begin{array}{rcl}
 d' & = & 8^h 46^m 12.16'' \\
 d-D & = & -14^m 18.6'' \\
 D & = & 23^m 04^s 57''
 \end{array}$$

$$S_0 = +22^m 50^s 38.4''$$

$$\text{Red} = +22''$$

$$d' = +22^m 50^s 40.6''$$

1683

Lunar Parallax

$$\begin{aligned} \alpha' &= 8^h 46^m 12.16^s \\ \theta &= 7 \quad 43 \quad 44.5 \\ \theta - \alpha &= -1 \quad 02 \quad 27.7 \\ &\quad - 15^s \quad 36' \quad 56'' \end{aligned}$$

$$- \quad \quad \quad 6 \quad 33''$$

$$- 15 \quad 30 \quad 23''$$

$$9.95727$$

$$0.00000$$

$$0.01610$$

$$9.97337$$

$$\gamma = 43 \quad 19 \quad 41''$$

$$22 \quad 50 \quad 41''$$

$$\gamma - \delta = 20 \quad 24''$$

$$9.82640$$

$$8.24520$$

$$9.54229$$

$$0.16424$$

$$7.77813$$

$$\delta - \delta' = +20 \quad 37.5''$$

$$\delta = +23 \quad 11 \quad 18.1''$$

$$\text{Em Eph} \quad \delta = +23 \quad 11 \quad 20.9''$$

$$OCC \quad - 2.8''$$

$$\delta' = +22^{\circ} 50' 40''.6$$

$$IT = 60' 27.8''$$

$$9.86913$$

$$8.24520$$

$$9.43005$$

$$0.03659$$

$$7.58097$$

$$\alpha - \alpha' = - 13' 05.95''$$

$$= - 52.40''$$

$$\alpha = 8 \quad 45 \quad 19.76''$$

$$\alpha = 8 \quad 45 \quad 18.93''$$

$$+ 0.83''$$

M61683

Munroe's mean Position (1912.0)

$$\begin{array}{rcl}
 X_0 & = & 19.0494 \\
 Y_0 & = & 20.3427 \\
 \text{cor.} & = & +29 \\
 \text{alt.} & = & -8 \\
 \hline
 X & = & 19.0514 \\
 Y & = & 20.3419
 \end{array}$$

$$\begin{array}{rcl}
 \text{From Preliminary Reduction} & X = 20.6858 & Y = 20.1628 \\
 \text{" Plate constants as -} & -29 & +2 \\
 \text{" } \eta = & +12 & +7 \\
 \text{" } \zeta = & +15 & +6 \\
 \hline
 X & = 20.6859 & Y = 20.1629
 \end{array}$$

$$\begin{array}{rcl}
 \beta & = & +2.6857 \\
 \log & & 0.42906 \\
 \text{" } \cos \delta & = & 9.96453 \\
 \text{" } \cos \alpha & = & 8.50724
 \end{array}$$

$$\text{" } (a-A) = 195729$$

$$d-A = +01^m 30.62$$

$$A = 8^h 44^m 40^s$$

$$X_0 = 8^h 46^m 10.62^s$$

$$R_{\text{red}} = +1.54$$

$$\alpha = 8^h 46^m 12.16^s$$

$$\eta = -1.8372$$

$$\log \tan \delta = 9.6257$$

$$\beta = 0.8582$$

$$\eta_1 = 7.5373$$

$$\eta_2 = +39$$

$$\eta_0 = -1.8405$$

$$\log \eta_0 = 0.26494$$

$$\text{const. } 733115$$

$$(a-D) = 293399$$

$$S-D = -14^m 18.6^s$$

$$D = 23^m 04^s 5.7$$

$$S_0 = 22^m 50^s 38.4$$

$$R_{\text{red}} = 22$$

$$\delta = 122^m 50^s 40.6$$

1
12
3
m
6
2
1
1
m
8
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4
2
3

MC1696

Star-measures 1913 Oct 7.

22

λ	α	δ	α	δ	α	δ
124	17458	17588	18638	17891		
314	1387860	1118072	127850	1372930		
mag	90	76	85	30		
6.8	70	80	45	00		
	<u>31.3580</u>	<u>3593</u>	<u>12.4141</u>	<u>4165</u>		

λ	α	δ	α	δ	α	δ
140	1286066	12459	11638	10499		
119	60	1173035-	114545-5	0002		
mag	12128	40	56	10335-		
8.2						
	<u>11.9267</u>	<u>11.9276</u>	<u>13.9822</u>	<u>9835-</u>		

λ	α	δ	α	δ	α	δ
28.3	16630	19732	16840	14952		
18.6	1019800	1616360	1040098	1135860		
mag	98	65	05	59		
7.0	24	35-	30	50		
	<u>18.6427</u>	<u>6430</u>	<u>28.3567</u>	<u>3592</u>		

Grade 2.

λ	α	δ	α	δ	α	δ
127	16180	18790	14792	14655-		
125	1011210	1485250	1165562	7773		
	1210	50	58	7679		
	75-	88	90	60		
	<u>12.6066</u>	<u>6062</u>	<u>12.6869</u>	<u>6881</u>		

λ	α	δ	α	δ	α	δ
28.5	18903	16055-	14570	15405-		
32.9	1552010	944545-	1046070	948591		
	20	51	65	85-91		
	95-	60	66	99		
	<u>32.3383</u>	<u>3389</u>	<u>28.5897</u>	<u>5915</u>		

M61696

Stair- measures 1913 Oct 9

22

1	2	3	4
124 17458	17588	12458	17891
314 1387880	1118072	1278550	1372930
mg 90	76	85	30
68 70	80		00
<u>313580</u>	<u>3593</u>	<u>124141</u>	<u>4165</u>

2	3	4	5
140 1286066	12459	11638	10499
119 60	1173035	1145455	0002
9 12128	40	56	10335
82			
<u>119267</u>	<u>119276</u>	<u>139822</u>	<u>9835</u>

3	4	5	6
16630	19732	16840	14952
283 1019800	1616360	1040098	1135860
186 98	65	05	59
mg 24	35	30	50
70			
<u>186427</u>	<u>6430</u>	<u>283567</u>	<u>3592</u>

Grade 2

2	3	4	5
127 16180	18790	14792	14655
125 1011210	1485250	1165962	777379
12	50	18	74
75	88	90	60
<u>126066</u>	<u>6062</u>	<u>126869</u>	<u>6881</u>

4	5	6	7
255 18903	16055	14570	15405
324 1552010	944545	1046070	948591
20	51	65	85
95	60	66	99
<u>3383</u>	<u>3389</u>	<u>5897</u>	<u>5915</u>

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92
93
94
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96
97
98
99
100

MC1696

Moon Measures

a

u

N

a

x

N

1 19378
160 17740
19.2 55-50
70

18530
10110
10²⁰
35

19.16291.579

2
15.6
20.0

18140
13670
70
48

15.5527

18922
13368
62
30

5562

3
15.5
20.5
min
2

18090
12862
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00

15.4772

17910
13110
15
20

4798

4
15.6
21.0

17070
12301
08
80

15.5230

17911
12680
80
20

5230

5
160 11580
21.9 85-94
11178

11882
11445
45

21.95929558

6
17.0 15436
22.6 934040
31
40

22.6101

17155
13275
80
40

6129

MC1696

Moon measures

23

	α	δ	α	δ
1	19378	15530		
60	17740	10110		
192	55-50	10		
	7.0	35		
	<u>19.1629</u>	<u>1.579</u>		

2
5.6
20.0

18140	14922
13670	13368
70	6262
	30
<u>15.5527</u>	<u>5.562</u>

3
5.5
20.5
2

18090	17910
12862	13110
69	1525
00	20
<u>15.4772</u>	<u>4.798</u>

4
5.6
1.0

17070	17911
12301	12680
08	20
80	20
<u>15.5230</u>	<u>5.230</u>

60	11580	11882
19	85-94	11445
	11178	45

<u>21.9592</u>	<u>9.558</u>
----------------	--------------

60	15436	17155
170	934040	13275
326	31	8080
	40	40
<u>22.6101</u>	<u>6.129</u>	

MC1696 4 *hypo-mesures* 24
 2 19755 16150
 17.6 1268788 1323521
 22.6 78 15
 max 59 48
 22.7073 7075

fuzzy front

8 18740 16150
 18.0 1205848 1281250
 22.6 46 30
 44 50
 22.6691 6681

11

9 16190 15151
 19.0 1423860 706080
 22.2 38 80
 04 50
 22.1948 1923

possibly on
terminator

Additional pts. measured 1914 Feb 17,

10

MC 1696

4

brown - measure

29

Z 19755

16150

170 1268788

1323521

220 78

15

max 59

48

227073

7075

S 18740

16150

150 1205848

1281250

225 44

30

44

50

226691

6681

9 16170

15151

170 1423860

706080

222 38

80

04

50

221745

1723

Additional ft. measures 19145617

10

MC 1696 Times etc. 25th
 Eph. Star 1912 Mar 2. 11^h 50^m -12^h 02^m
 Moon 11 56 15.5 -11 56 15.9^v
 Clock slow 1 45.7^v
 H. Sid. T. 11 58 01.4^v Moon full.
 H. long 4 44 31.05 22^m 41^m 54^s
 G. Sid. T. 16 42 32.45^v 17 59 58.
 Sid. T. in Moon 22 39 37.50^v 4 41 56
 Interval 18 02 54.95^v
 Reduction 2 57.41^v
 G. M. T. 17 59 57.54^v 0 - $\alpha = +1^h 07^m 50^s$
 Moon's age 14^d

From Naut. Alman. P.A. local.
 Moon 18^h 10^m 50^m 11.91^v +110 10' 41.1^v
 Motion in 1^m 2.2304 - 0.09^v 16.12^v + 0.7^v
 ... -0.041 - 0.09^v + 0.7^v
 Tabular place 10 50 11.82^v +11 10 41.8^v

Moon's Parallax

- semidiameter 16' 22.9^v
 934 = 12.9 R 982.9^v
 983 = 14.3 Augmentation +14.3^v
 Irradiation (2) -0.7^v
 R = 996.5^v
 R = 21361^v
 0 - -2.5 (1 + α) R = 21356^v
 R = 45608^v

Cape no 14⁴4 mag 64
 C 10 54 27.57
 L 63
 Q 52
 Mean 10 54 27.57
 Prec + 37.84
 A 10 55 05.41
 A 10 49 16
 A-A + 5 49.41
 sin(A-A) + 349.37
 log... 2.54328
 -0.85 9.99012
 -E₀ 1.04064

 E₀ + 10.9810
 E₁ + 59
 E₂ 28.9869
 E₃ 28.5906
 E₄ - 39.63

C +12 14 26.4
 L 26.4
 Q 26.3
 Mean +12 14 26.4
 Prec -3 50.9
 A +12 10 35.5
 D +10 51 51
 S-D +1 18 44.5
 tan(S-D) +4725.3
 log... 3.67443
 -η₀ 1.00558

 -tan S 9.3340
 -E₂ 20813
 -η₁ 8.4687

 η₀ +10.1293
 η₁ + 294
 η₂ 321587
 η₃ 323386
 η₄ +1799

MC1696

Standard Coords.

26

Cape No. 1475 long 6.8 Cape No. 1477 long 8.2 Cape No. 1491 long 7.0

C	10 ^h	45 ^m	53.09 ^s	10 ^h	46 ^m	04.91 ^s	10 ^h	54 ^m	19.52 ^s
L			17 [°]			95 [°]			55 [°]
B			00 [°]			93 [°]			55 [°]
mean	10	45	53.09 ^v	10	46	04.93 ^v	10	54	19.54 ^v
Proc			+ 37.95 ^v			+ 37.73 ^v			+ 37.70 ^v
q	10	46	31.04 ^v	10	46	42.66 ^v	10	54	57.24 ^v
A	10	49	16 ^v	10	49	16 ^v	10	49	16 ^v
q-A		- 2	44.96 ^v		- 2	33.34 ^v		+ 5	41.24 ^v
Sid-A)		-	164.95 ^v		-	153.34 ^v			+ 341.20 ^v
log..		2.21735 ^m			2.18566 ^m			2.53301 ^m	
cos		9.99033 ^v			9.99385 ^v			9.99281 ^v	
" 30		0.71492 ^m			0.68675 ^m			1.03306 ^v	
3.		-5.1870 ^v			-4.8612 ^v			+ 10.7910 ^v	
3.		-	14 ^v		-	14 ^v			+ 35 ^v
3		12.8776 ^v			13.1374 ^v			28.7945 ^v	
2.		12.4153 ^v			12.6875 ^v			28.3580 ^v	
2-3		-3963 ^v			-4499 ^v			-4365 ^v	

C	+12°	06'	34.6"	+9	40	48.9"	+10	28	00.3"
L			34.6"			48.6"			00.8"
B			34.1"			48.1"			00.3"
mean	+12	06	34.4 ^v	+9	40	48.5 ^v	+10	28	00.5 ^v
Proc		- 3	48.2 ^v		- 3	48.3 ^v		- 3	50.8 ^v
S	+12	02	46.2 ^v	+9	37	00.2 ^v	+10	24	09.7 ^v
D	+10	51	51 ^v	+10	51	51 ^v	+10	51	51 ^v
S-D	+1	10	55.2 ^v	-1	14	50.8 ^v		- 27	41.3 ^v
tank-D)		+ 42	55.8 ^v		- 44	91.5 ^v		- 16	61.3 ^v
log..		3.62898 ^v			3.65239 ^m			3.22045 ^m	
" 30		0.96013 ^v			0.98354 ^m			0.55160 ^m	
tand		9.3392			9.2290 ^v			9.2638 ^v	
" 32		1.4298			1.3735			2.0661 ^v	
" 21		7.8229			7.6559			8.3833 ^v	
" 20		+ 9.1228			- 9.6280			- 3.5612 ^v	
" 21		+ 6.6			+ 4.5			+ 3.242 ^v	
" 22		31.1294			12.3765			18.4630 ^v	
" 4		31.3580 ^v			12.6064			18.6428 ^v	
" 9-7		+ 229.2			+ 229.9			+ 179.8 ^v	

M21696

Standard Counts

20

Cape No. 1475 mag 6.8				Cape No. 1477 mag 8.2				Cape No. 1491 mag 7.0			
C	10 ^h	45 ^m	53.09	10 ^h	46 ^m	04.91	10 ^h	54 ^m	19.52		
L			17			95			55		
E			00			93			55		
mean	10	45	53.09	10	46	04.93	10	54	19.54		
Proc			+ 3795			+ 3773			+ 3770		
d	10	46	31.04	10	46	42.66	10	54	57.24		
A	10	49	16	10	49	16	10	49	16		
1-A		- 2	44.96		- 2	33.34		+ 5	41.24		
2(A-1)		-	164.95		- 153.34			+ 341.20			
log		221735			218566			253301			
ws		999035			999385			999281			
50		071492			068675			103306			
3.		-51870			-48612			+107910			
3.		-	19		-	14		+ 35			
3		128276			131374			287945			
24		124153			126875			283580			
2-3		-5963			+4499			-4365			
C	+12	06	34.6	+9	40	48.9	+10	28	00.3		
L			346			48.6			00.8		
E			341			48.1			00.3		
mean	+12	06	34.4	+9	40	48.5	+10	28	00.5		
Proc		- 3	48.2		- 3	48.3		- 3	50.8		
S	+12	02	46.2	+9	37	00.2	+10	24	09.7		
D	+10	51	51	+10	51	51	+10	51	51		
S-D	+1	10	55.2	-1	14	50.8		-27	41.3		
1(A-1)		+ 42556			- 44915			- 1661.3			
log		3.62898			3.65239			3.22045			
70		0.96013			0.98354			0.55160			
trans		93592			92290			92638			
50		14298			13735			20661			
71		78224			76559			83833			
70		+91228			-9.6280			-3.5612			
71		+ 66			+ 45			+ 3 242			
72		31.1294			12.3765			18.4630			
73		31.3586			12.6084			18.6428			
7-7		+2292			+2299			+1795			

Repeating Star 3

$$\begin{array}{rclcl}
 5 + 3 & - 28.54 & & + 1.72 & + 4836 \\
 - 3963 - 894 & = -4857 + 21 & = -4836 & = 0 \\
 -4499 - 359 & = -4858 + 22 & = -4836 & = 0 \\
 -3963 - 922 & = -4885 + 49 & = -4836 & = 0
 \end{array}$$

$$\begin{array}{rclcl}
 4 - 11 & + 30.52 & & + 0.84 & - 2696 \\
 + 2292 + 379 & = +2671 + 25 & = +2696 & = 0 \\
 + 2291 + 387 & = +2686 + 10 & = +2696 & = 0 \\
 + 1799 + 872 & = +2671 + 26 & = +2697 & = +1
 \end{array}$$

MC1696

Plate Constant

27

x	y	K	Q	10α	10δ
12.4153 ^v	31.3586 ^v	10	46	31	+12
12.6875 ^v	12.6064 ^v		46	43	+9
28.3580 ^v	18.6428 ^v		54	57	+10
31.54.76	61.93		146	131	31
18.25	20.64	10	49	24	+10
-18	-22		-	8	+10
25	1.36	10	49	16	+10
31	46.5				
	632				

$$A = 10^h 49^m 16^s$$

$$D = +10^\circ 51' 51''$$

$$4) 28.5906 \quad 32.3386$$

$$x - \bar{x} = -28.54 \quad +2.5x \quad +4826$$

$$+3963 - 894 = -4857 + 31 = -4826 = 0$$

$$-4499 = 359 = -4858 + 32 = -4826 = 0$$

$$-4365 - 531 = -4896 + 71 = -4825 = +1$$

$$-3963 - 922 = -4885 + 43 = -4842 = -16$$

$$y - \bar{y} = +31.7x \quad +y \quad -24 \quad -2712$$

$$+2292 + 394 = +2686 + 31 = +2717 - 6 = +2711 = -1$$

$$+2299 + 402 = +2701 + 13 = +2714 - 2 = +2712 = 0$$

$$+1798 + 899 = +2697 + 19 = +2716 - 4 = +2712 = 0$$

$$+1799 + 906 = +2705 + 32 = +2737 - 6 = +2731 = +19$$

Tables $a = 0.0 \quad e = -1.6 \quad a - e = +1.6 \quad b + a = -1.0$

Obs. $-2.5 \quad -0.8 \quad -1.3 \quad -2.2$

$c - 0 \quad +3.3 \quad +1.2$

With fourth star

Obs $a = -2.8 \quad e = -0.4 \quad a - e = -2.4 \quad b + a = -3.2$

$c - 0 = +4.0 \quad +2.2$

Leaving out star 3.

$a = -1.7 \quad e = -0.8 \quad a - e = -0.9 \quad b + a = -2.0$

$c - 0 \quad +2.5 \quad +1.0$

MC1696

Plate Constant

27

α	δ	R	S	α_{Decl}	δ_{Decl}
12.4153	31.5586	10	46	31	+12 02 46
12.6875	12.6064		46	43	+9 37 00
28.3580	18.6428		54	57	+10 24 10
3) 54.76	61.93		146	131	31 63 56
18.25	20.69	10	49	24	+10 41 19
-18	-22		-	8	+10 33
25	136	10	49	16	+10 51 51
31	465				
	632				

$$A = 10^h 49^m 16^s$$

$$D = +10^\circ 51' 51''$$

$$4) 28.5906 \quad 32.3386$$

$$\begin{aligned} \alpha - \beta &= 28.59 & + 2.52 & & + 48.26 \\ - 39.63 & - 89.4 & = -48.57 & + 31 & = -48.26 & = 0 \\ - 4.499 & - 35.9 & = -48.58 & + 32 & = -48.26 & = 0 \\ - 4.365 & - 5.31 & = -48.96 & + 71 & = -48.25 & = +1 \\ - 39.63 & - 92.2 & = -48.85 & + 43 & = -48.42 & = -16 \end{aligned}$$

$$\begin{aligned} \gamma - \eta &+ 31.7\lambda & + 4 & & + 2.9 & & - 27.12 \\ + 22.92 & + 39.4 & = + 26.86 & + 31 & = + 27.17 & - 6 & = + 27.11 & = -1 \\ + 22.99 & + 40.2 & = + 27.01 & + 13 & = + 27.14 & - 2 & = + 27.12 & = 0 \\ + 17.98 & + 89.9 & = + 26.97 & + 19 & = + 27.16 & - 4 & = + 27.12 & = 0 \\ + 17.99 & + 90.6 & = + 27.05 & + 32 & = + 27.37 & - 6 & = + 27.31 & = +19 \end{aligned}$$

$$\begin{aligned} \text{Tables } a &= 0.0 & e &= -1.6 & a - e &= +1.6 & b + a &= -1.0 \\ \text{Obs.} & & -2.5 & & -0.8 & & -1.8 & & -2.2 \\ c - 0 & & & & & & +3.3 & & +1.2 \end{aligned}$$

both fourth star

$$\text{Obs. } a = -2.8 \quad e = -0.4 \quad a - e = -2.4 \quad b + a = -3.2$$

$$c - 0 = \quad \quad \quad + 4.0 \quad \quad \quad + 2.2$$

leaving out star 3.

$$a = -1.7 \quad e = -0.8 \quad a - e = -0.9 \quad b + a = -2.0$$

$$c - 0 \quad \quad \quad + 2.5 \quad \quad \quad + 1.0$$

March 2 18h GMT

MC 1696

C 10^h 50 11^m 42 + 11° 10' 41.8"

March ① 10 50 = 5.5 + 6 56

C-Station - 4^m 55.4 + 4° 15' - 1

Dolls

2 22 41.9
1 1 5-8
2 2 1 1

6152-4248 5728 0 5744 2229 570 15-
6204-4248 5701-121 5735- 5744
6026-325 5-9 38 -105 5721
6063-125 6165- -210 5755-
6165 5697
5906 + 75- 5975- -163
53-65 57-55 57-55 57-55



8.
 2
 27
 70

468

427

601 720

605- 753

468 652

217 428

433 620

608 756

436 562

667 765

4,470

2115

983

53.6

986.8

+ 3^u.6

4470

441

60

22

MC 1696, Luu's Center

25.

	x	$x - X_0$	Δx	$(x - X_0)^2$	$(x - X_0)(y - Y_0)$	$y - Y_0$
1	16.0000	-1.6269	-1	2.6471	4.6035	+4.27
2	15.5544	-2.0725	-0	4.2953	4.6078	+4.70
3	15.4785	-2.1484	0	4.6156	4.6156	
4	15.5230	-2.1039	+0	4.4264	4.6209	
5	16.0000	-1.6269	+1	2.6465	4.6026	
6	17.0000	-0.6269	+2	0.3927	4.6063	
7	17.6269	0.0000	+2	0.0000	4.6165	
8	18.0000	+0.3731	+2	0.1393	4.5906	
9	19.0000	+1.3731	+2	1.8859	4.5585	

Comp R^2 : 4.5608

	y	$y - Y_0$	Δy	$(y - Y_0)^2$
1	19.1604	-1.9986	-1	3.9956
2	20.0000	-0.5590	-0	0.3125
3	20.5590	0.0000	0	0.0000
4	21.0000	+0.4410	0	0.1945
5	21.9575	+1.3985	+1	1.9561
6	22.6115	+2.0525	+2	4.2136
7	22.7074	+2.1484	+2	4.6165
8	22.6686	+2.1096	+2	4.4513
9	22.1936	+1.6346	+2	2.6726

phase lock.

Approximate Center

$$x = 16.0 \quad y = 19.1604$$

$$21.9575$$

$$41.1179$$

$$\text{mean } y = 20.5590$$

$$y - \text{max} = 22.7074$$

$$R = 2.1484$$

$$x - \text{min} = 15.4785$$

$$\text{mean } x = 17.6269$$

$$\text{Center } \begin{cases} X_0 = 17.6269 \\ Y_0 = 20.5590 \end{cases}$$

MC 1696 Nervous Center

V8.

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	160000	-16269	-1	26471	46035	+427
2	155549	-20725	-0	42953	46078	+470
3	154785	-21484	0	46156	46156	
4	155230	-21039	-0	44264	46209	
5	160000	-16269	-1	26465	46026	
6	170000	-06269	+2	03927	46063	
7	176269	00000	+2	00000	46165	
8	180000	+03731	+2	01393	45906	
9	190000	+13731	+2	18859	45585	
				Comp Σ	45608	

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	191604	-13986	-1	29464
2	200000	-05590	-0	03125
3	205590	00000	0	00000
4	210000	+09410	0	01945
5	219175	+13985	+1	19561
6	226115	+20525	+2	42136
7	227074	+21484	+2	46165
8	226686	+21096	+2	44513
9	221936	+16396	+2	26926

Approximate Center

$$x = 160 \quad y = 191604$$

$$219175$$

$$411179$$

$$\text{mean } y = 205590$$

$$y - \text{max} = 227074$$

$$y - \text{min} = 21484$$

$$x - \text{min} = 154785$$

$$\text{mean } x = 176269$$

$$\text{Center } \begin{cases} x = 176269 \\ y = 205590 \end{cases}$$

1696

Moon's Center.

Conditional Equation.

	a	b
1	-1.63	-1.40 =
2	-2.07	-0.56 =
3	-2.15	+0.00 =
4	-2.10	+0.49 =
5	-1.63	+1.40 =
6	-0.63	+2.05 =
7	+0.00	+2.15 =
8	+0.37	+2.11 =

1696

Lunar Center

Conditional Equation

	a	b
1	-1.63	-1.40
2	-2.07	-0.56
3	-2.15	+0.00
4	-2.10	+0.49
5	-1.63	+1.40
6	-0.63	+2.05
7	+0.00	+2.15
8	+0.27	+2.11

