

KG
11366
x 911



Harvard Lunar Plates,
Measures and Reductions
Mary Fowler

Volume XXXV

Plate No.	Date	Page.
1669	1912 Feb 27	1
1674	1912 Feb 28	11
1675	1912 Feb 28	22

8.
2

2
1
1

3
2
2

MC1669 Stan. Measures.

1912 Oct. 3

1

	a	n	a	n
1	19169	19504	19811	15004
8.1	12340	16300	11658	13136
21.6	42	02	57	8630
	53	85	97	85
	<u>21.6815</u>	<u>.6806</u>	<u>8.1859</u>	<u>.1866</u>
2	16248	18110	18733	18418
19.3	12895	11445	11378	15762
14.4	99	50	70	66
	40	05	20	02
	<u>14.3350</u>	<u>.3340</u>	<u>19.2650</u>	<u>19.2648</u>
3	17260	16886	16262	18548
24.5	7980	16151	10430	14341
28.9	80	59	40	40
	40	80	32	42
	<u>28.9261</u>	<u>.9269</u>	<u>24.4191</u>	<u>.4206</u>

Grade 3.

1161669

Star. measures

1912 Oct. 3

1

	a	N	a	N
1	19169	19504	19811	15004
21	12340	16300/0	11658	13136
216	42	02	59	8630
	53	85	97	85
	<u>21.6815</u>	<u>.6806</u>	<u>8.1859</u>	<u>.1866</u>
2	16248	18110	18733	18418
193	12895	11445	11378	15762
144	99	50	70	66
	40	05	20	02
	<u>14.3350</u>	<u>3340</u>	<u>19.2650</u>	<u>19.2648</u>
3	17260	16886	16262	18548
245	798080	1615151	10430	1434140
289	80	59	40	40
	40	80	32	42
	<u>28.9261</u>	<u>9269</u>	<u>244191</u>	<u>4206</u>

Grade 3.

1121669 moon-measures		1913 Oct. 3,	
scratch	d	d	v
17.5	14132	16522	17335
18.1	1266566	1160700	1224542
	59	1.00	35
	36	18	23
<u>18.1470</u>	<u>1465</u>	<u>17.5086</u>	<u>.5088</u>
2	19150		
17.0	15420	19011	
18.4	0920	1272518	
	44	3020	
<u>18.3731</u>	<u>3723</u>		
3			
16.4		19666	19210
19.0		1313835	1571110
		37	12
		52	92
		<u>16.3480</u>	<u>.3493</u>
4 scratch			
16.2		19582	18260
19.4	17950	10840	17000
	1371515	3035	9898
	16	70	40
	50	16.1264	<u>.1259</u>
<u>19.4235</u>	<u>.4236</u>		
5			
16.0	hard point 2	16412	1391210
20.0	measures	1633140	20
		50	13850
		<u>15.9928</u>	<u>.9933</u>
6			
16.0		15402	12935
20.2		1527065	3430
near		70	12857
36		<u>15.9866</u>	<u>.9824</u>

1121669	known-measures	1913 Oct 3,	2
scratch d	N	d	N
175 14132	17941	16522	17335
18.1 1266566	889795	1160700	1224542
59	99	10	35
36	30	18	23
<u>181470</u>	<u>1465</u>	<u>175086</u>	<u>5088</u>
2 19150	19011		
17.0 15420	1272518		
18.4 09	3020		
44	94		
<u>183731</u>	<u>3723</u>		
3		19666	19210
16.4		1313835	1171110
19.0		37	12
		52	92
		<u>163480</u>	<u>3493</u>
4 scratch		19582	18260
162		10840	17000
194 17950	16970	3035	9898
1371515	1120094	70	40
16	9894		
50	54	161264	<u>1259</u>
<u>194235</u>	<u>4236</u>		
5		16412	1391210
160- hard point 2		1633140	20
200 measures		50	13850
		<u>159928</u>	<u>9933</u>
6		15402	12935
16.0- 202		1527065	3430
max		70	12857
2		<u>159866</u>	<u>9924</u>

14C1669 moon measures 1913 Oct 3, 3

7
16.2
21.0

18880
10310.5
10
72
16.1439

17321
15860.60
60
18
1461

8
17.0 12160
220 12055.5
49

10645
55.57
10562

bad point.

22.0107

.0090

9
18.0 15340
22.9 12092.94
60
35

14810
8020
25.30
0.8

22.3242

.3216

min 4 -

14330
11040.38
47
28
22.3287

13820
7079.80
90
12
.3268

1101669 brown measures 1913 Oct 3.

3.

7
16.2
21.0

18880	17321
10310.5	15860.60
10	60
72	18
<u>16.1439</u>	<u>1461</u>

8

170 12160
220 1205555
49

10645
5557
10562

bad front

220107.0090

9
140 15340
274 1209294
0094
35

223242

14810
802030
2130
08

3216

min 4.

14330
1104038
47
25
223267

13820
707980
90
12
3268

NAC 1669

1913 Oct 3.

4

Plate Constants

	1	2	3
x	81862	192649	244198
z	88813	200617	250261
$x-z$	-6951	-7968	-6063
y	216810	143345	289265
m	219432	147393	294018
$y-m$	-2622	-4048	-4753

$$\begin{array}{rclcl}
 x-z & -131.54 & +4.5x & -54-3x & +9778 \\
 -6951 - 2851 = -9802 + 37 = -9765 - 11 - 2 = -9778 = 0 \\
 -7968 - 1885 = -9853 + 87 = -9766 - 7 - 6 = -9779 = -1 \\
 -6063 - 3804 = -9867 + 110 = -9757 - 14 - 7 = -9778 = 0 \\
 18.1204 - 2665 = +76 = 18.8393
 \end{array}$$

$$\begin{array}{rclcl}
 y-m & +130x & +2.4y & +.3x & +1503 \\
 -2622 + 1064 = -1558 + 52 = -1506 + 2 = -1504 = -1 \\
 -4048 + 2504 = -1544 + 34 = -1510 + 6 = -1504 = -1 \\
 -4753 + 3175 = -1578 + 69 = -1509 + 7 = -1502 = +1 \\
 20.1913 + 2361 = +49 = 20.5825
 \end{array}$$

$$\begin{array}{rclcl}
 \text{Tables } a = +0.9 & e = +0.9 & a-e = 0.0 & b+a = -0.0 \\
 \text{Obs.} & -4.2 & +2.4 & -1.8 & +1.7
 \end{array}$$

1912 1669

1913 Oct 3.

4

Plate Constants

	1	2	3
α	8 1862	19 2649	24 4198
δ	8 8813	20 0617	25 0261
$\alpha - \delta$	- 6951	- 7968	- 6063
μ	21 6810	14 3345	28 9265
η	21 9432	14 7393	29 4018
$\eta - \mu$	- 2622	- 4048	- 4753
$\alpha - \delta$	- 13154	+ 4.52	- 754-32 0 + 9778
- 6951	- 2851	- 9802 + 37	- 9765-11-22-9778 = 0
- 7968	- 1885	- 9853 + 87	- 9766-7-6-9779 = -1
- 6063	3804	- 9867 + 110	- 9757-14-7-9778 = 0
18.1204	- 2665	+ 76	= 18.8393
$\mu - \eta$	+ 1302	+ 244	+ .82 + 1103
- 2622	+ 1064	- 1558 + 52	- 1506 + 2 = -1504 = -1
- 4048	+ 2504	- 1544 + 34	- 1510 + 6 = -1504 = -1
- 4753	+ 3175	- 1578 + 69	- 1509 + 7 = -1502 = +1
20 1913	+ 2361	+ 48	= 20 5825

Tables $a = +0.9$ $\alpha = +0.9$ $a - \alpha = 0.0$ $b + a = 0.0$
 $\delta = -42$ $\delta = -24$ -1.8 $+1.7$

NAC 1669	Times etc	1913 Oct	5
Exp to stars 1912 Feb 27	7 ^h 23 ^m	- 7 ^h 35 ^m	
moon	7 29	06.75	7 29 06.9
clock slow	01	46.5	
H. Sid T.	7 30	53.3	
H long	4 44	31.05	
B. Sid T.	12 15	24.35	
Sid T. in moon	22 23	51.28	
Interval	13 51	33.07	
Reduction	2	16.23	
B. M. T.	13 49	16.84	6-X=0 ^h 54 ^m 34 ^s

from Almanac	R - A	Decl.	
moon 14 ^h	6 ^h 36 ^m	48.08	+28 10 33.8
motion in 1 ^m = 2.7360		1.491	
" " = 10.7193	- 29.33	+	16.0
Tabular place	6 36	18.75	+28 10 49.8

Moon's parallax	58' 53.9	
semidiam.	16' 20.8	
934 = 15.0	R =	980.8
981 = 16.6	augmentation	+16.6
	Tridialin (3)	-0.7
	R =	996.7
	R =	2.1365
a = -42	(1+a)R =	2.1356
	R ² =	4.5608

NA 61669	Times etc	1913 Oct	
Exp To Stars 1912 Feb 22	7 ^m 23 ^m	- 7 ^m 34 ^m	
known	7 29	067-7 29 069	
clock slow	01	465	
H Sact T	7 30	533	
H long	4 44	3105	
G Sact T	12 15	2435	
Sact T in known	22 23	5128	
Interval	13 51	3307	
Reduction	2	1623	
G in T	13 49	1684	G-X = 0 ^h 54 ^m 34 ^s

~~Known~~ ~~Almadiana~~	R	Q	Result:
known 14 ^m	6 ^m 36 ^m	4504	+28 10 338
Another at = 2.7360			1491
-10.7193		- 2933	+ 16.0
Tabular phase	6 36	1875	+28 10 498

Known parallel
reduction

934 - 15.0
981 - 16.6

16' 20.8
R - 9808
Argumentation + 16.6
In addition (3) - 0.7
R - 996.7
R - 21365
(1+a)R = 21356
R² = 45608

a - - 42

pt.	pos. L	resid.	$\frac{1}{2} \text{wt.}$
1	196.8	-167	
2	211.8	+20	
3	236.1	-22	
4	248.9	+54	
5	264.9	+18	
7	292.2	-44	
8	328.4	-19	
9	356.6	-29	

MC 1.669

1913 Oct. 3.

6

Moon's Center

	x	$x - x_0$	Δx^2	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	17.5087	-0.6174	0.3812	4.5505	-103	
2	17.0000	-1.1261	1.2681	4.5751	+143	
3	16.3486	-1.7775	3.1595	4.5785	-177	
4	16.1262	-1.9999	3.9996	4.5887	+279	
5	15.9930	-2.1331	4.5501	4.5867	+259	
~~6~~	~~15.9895~~	~~-2.1366~~	~~4.5651~~	~~4.5651~~		
7	16.1450	-1.9811	3.9248	4.5790	+182	
8	17.0000	-1.1261	1.2681	4.5754	+146	
9	18.0000	-0.1261	0.0159	4.5600	-8	
~~10~~	~~18.1261~~	~~0.0000~~	~~0.0000~~	~~4.5651~~		

Comp $R^2 = 4.5608$

	y	$y - y_0$	Δy^2	$(y - y_0)^2$
1	18.1468	-2.0444	4.1793	
2	18.3727	-1.8185	3.3070	
3	19.0000	-1.1912	1.4190	
4	19.4236	-0.7676	0.5891	
5	20.0000	-0.1912	0.0366	
~~6~~	~~20.1912~~	~~0.0000~~	~~0.0000~~	
7	21.0000	+0.8088	0.6542	
8	22.0098	+1.8186	3.3073	
9	22.3229	+2.1317	4.5441	
~~10~~	~~22.3278~~	~~+2.1366~~	~~4.5651~~	

Approximate Center

$$x = 17.0 \quad y = 18.3727$$

$$22.0098$$

$$4038.25$$

$$\text{mean } y = 20.1912$$

$$y = \text{max} \quad 22.3278$$

$$R = 2.1366$$

$$y = \text{min} = 15.9895$$

$$\text{mean } x = 18.1261$$

$$\text{Center } \begin{cases} x_0 = 18.1261 \\ y_0 = 20.1912 \end{cases}$$

M16 1669

1912 Oct. 3 6

Unknown Center

	x	$x - x_0$	x^2	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$y - y_0$
1	17.5087	-0.6174	0.3812	4.5505	-1.03	
2	17.0000	-1.1261	1.2681	4.5751	+1.43	
3	16.3486	-1.7775	3.1595	4.5785	+1.77	
4	16.1262	-1.9999	3.9996	4.5887	+2.79	
5	15.9930	-2.1331	4.5501	4.5867	+2.59	
6	15.9895	-2.1366	4.5651	4.5651		
7	16.1450	-1.9811	3.9248	4.5790	+1.82	
8	17.0000	-1.1261	1.2681	4.5754	+1.46	
9	18.0000	-0.1261	0.0159	4.5600	- .8	
10	18.1261	0.0000	0.0000	4.5651		

Comp $R^2 = 4.5608$

	y	$y - y_0$	y^2	$(y - y_0)^2$
1	18.1468	-2.0444	4.1793	
2	18.3727	-1.8185	3.3070	
3	19.0000	-1.1912	1.4190	
4	19.4236	-0.7676	0.5891	
5	20.0000	-0.1912	0.0366	
6	20.1912	0.0000	0.0000	
7	21.0000	+0.8088	0.6542	
8	22.0098	+1.8186	3.3073	
9	22.3229	+2.1317	4.5441	
10	22.3278	+2.1366	4.5651	

Approximate Center

 $x = 17.0$ $y = 18.3727$ 22.0098 40.3825 mean $y = 20.1912$ $y_{\text{max}} = 22.3278$ $R = 2.1366$ $y_{\text{min}} = 15.9895$ mean $x = 18.1261$ Center $\begin{cases} x_0 = 18.1261 \\ y_0 = 20.1912 \end{cases}$

Formation of hornah

1	+ 0.32	+ 16.1	+ 105.1
2	+ 206	- 161.6	- 260.3
3	+ 212	- 315.1	- 210.6
4	+ 1.54	- 558.0	- 214.8
5	+ 0.40	- 551.7	- 49.2
7	- 1.60	- 360.4	+ 147.4
8	- 2.06	- 165.0	+ 265.7
9	- 0.28	+ 1.0	- 17.0
	+ 2.50	- 2094.7	- 233.7
	+ 0.32	+ 16.1	+ 105.1
	+ 282	- 2078.6	- 128.6

Giving (1) full wt.

MC 1669

1913 Oct 3.

7

Moon's Center
Conditional Equations

$\frac{1}{2} \text{ wt}$	a	b	0	c	0-c
1	-0.62	-2.04	= -1.03	+ 70 - 6 = +64	- 167
2	-1.13	-1.82	= +1.43	+ 128 - 5 = +123	+ 20
3	-1.78	-1.19	= +1.77	+ 202 - 3 = +199	- 22
4	-2.00	-0.77	= +2.79	+ 227 - 2 = +225	+ 54
5	-2.13	-0.19	= +2.59	+ 242 - 1 = +241	+ 18
7	-1.98	+0.88	= +1.82	+ 224 + 2 = +226	- 44
8	-1.13	+1.82	= +1.46	+ 127 + 5 = +132	+ 14
9	-0.13	+2.13	= - 8	+ 15 + 6 = + 21	- 29

Average = 46

without (1) = 29.

Normal Equations

$$+ 18.57 + 2.50 = -2095$$

$$+ 2.50 + 18.03 = -234$$

$$- 2.50 - 0.34 = + 282$$

$$+ 17.69 = + 48 \quad b = + 2.7$$

$$- 0.35 - 2.50 = + 32$$

$$+ 18.22 = -2063 \quad a = -113.4$$

Giving (1) full wt.

$$+ 18.76 + 2.82 = -2079$$

$$+ 2.82 + 20.30 = -129$$

$$- 2.82 - 0.42 = + 312$$

$$+ 19.88 = + 83 \quad b = + 4.8$$

$$+ 18.76 = -2079 - 12 = -2091 \quad a = -111.5$$

ML 1669

1913 Oct. 3.

7

Woods Center
Conditional Equations

$\frac{1}{2} \sqrt{x}$	a	b	0	c	$0-c$
1	-0.62	-2.04	= -1.03	+ 7.0 - 6 = +1.4	- 1.67
2	-1.13	-1.82	= +1.43	+ 1.28 - 5 = +1.23	+ 2.0
3	-1.78	-1.19	= +1.77	+ 2.02 - 3 = +1.99	- 2.2
4	-2.00	-0.77	= +2.79	+ 2.27 - 2 = +2.25	+ 5.4
5	-2.13	-0.19	= +2.59	+ 2.42 - 1 = +2.41	+ 1.8
7	-1.98	+0.86	= -1.82	+ 2.24 + 2 = +2.26	- 4.4
8	-1.13	+1.82	= +1.46	+ 1.27 + 5 = +1.32	+ 1.4
9	-0.13	+2.13	= - 8	+ 1.5 + 6 = + 2.1	- 2.9

Average = 9

with $b(1) = 2.9$

Normal Equations

$$+ 18.57 + 2.50 = - 209.5$$

$$+ 2.52 + 18.03 = - 234$$

$$- 2.50 - 0.34 = + 282$$

$$+ 17.69 = + 48 \quad b = + 2.7$$

$$- 0.35 - 2.50 = + 32$$

$$+ 18.22 = - 2063 \quad a = - 1134$$

MC 1669

1913 Oct. 3.

8

hypothesized Position (1911.0)

$$X_0 = 18.1261^{\circ}$$

$$Y_0 = 20.1912^{\circ}$$

$$\frac{1}{2}a = -57^{\circ}$$

$$\frac{1}{2}b = +1^{\circ}$$

$$X = 18.1204^{\circ}$$

$$Y = 20.1913^{\circ}$$

From plate constants $X = 18.8393^{\circ}$ $Y = 20.5825^{\circ}$

$$\xi = +0.8393^{\circ}$$

$$\eta = -1.4175^{\circ}$$

$$\log \xi = 9.92392^{\circ}$$

$$\cos \delta = 9.94625^{\circ}$$

$$\cos \alpha = 8.50724^{\circ}$$

$$\log \tan \delta = 9.7244^{\circ}$$

$$\log \tan \alpha = 9.8478^{\circ}$$

$$\log \eta = 6.6286^{\circ}$$

$$(X-A) = 1.47043^{\circ}$$

$$A-A = +29.54^{\circ}$$

$$\eta_1 = +4^{\circ}$$

$$\eta_0 = -1.4179^{\circ}$$

$$A = 6 \ 35 \ 01^{\circ}$$

$$X_0 = 6^h \ 35^m \ 30.54^s$$

$$\log \eta_0 = 0.15165^{\circ}$$

$$\cos \alpha = 7.33115^{\circ}$$

$$\text{Red} = +0.97^{\circ}$$

$$-(\delta - \delta_0) = 2.82050^{\circ}$$

$$X = 6 \ 35 \ 31.51^{\circ}$$

$$\delta - \delta_0 = -11 \ 01.5^{\circ}$$

$$D = +28 \ 06 \ 20^{\circ}$$

$$\delta_0 = +27 \ 55 \ 18.5^{\circ}$$

$$\text{Red} = +9.3^{\circ}$$

$$\delta' = +27 \ 55 \ 27.8^{\circ}$$

ML 1669

1913 Oct 3.

8

Mars Position (1911.0)

$$X_0 = 18.1261$$

$$Y_0 = 20.1912$$

$$\frac{1}{2} \Delta = -5.7$$

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

$$X = 18.1204$$

$$Y = 20.1913$$

Sun Plate Constant $X = 18.8393$ $Y = 20.5825$

$$\bar{s} = +0.4393$$

$$\eta = -1.4175$$

$$\log \bar{s} = 9.92392$$

$$\cos \bar{s} = 9.94625$$

$$\cos \eta = 8.50724$$

$$\log \tan \delta = 9.7244$$

$$\log \bar{s} = 9.8478$$

$$\eta_1 = 6.6286$$

$$(X-A) = 1.47043$$

$$\eta_1 = +4$$

$$A-A = +29.54$$

$$\eta_0 = -1.4179$$

$$A = 6.35.01$$

$$\log \eta_1 = 0.15165$$

$$\cos \eta_1 = 7.33115$$

$$X_0 = 6.35.30.54$$

$$\text{Red} = +0.97$$

$$-(\delta-1) = 2.8.20.50$$

$$X = 6.35.31.51$$

$$\delta - 0 = -1.1.01.5$$

$$D = 7.28.06.20$$

$$\delta_0 = +27.55.18.5$$

$$\text{Red} = +9.3$$

$$\delta = +27.55.27.8$$

1669 Red. ad l. aph.

$$H + \alpha \quad 2 \quad 09 = 32^\circ 15'$$

$$H \quad 19 \quad 34$$

$$\alpha \quad 6 \quad 35$$

$$G \quad 18 \quad 22$$

$$G + \alpha \quad 0 \quad 57 = 14^\circ 15'$$

$$\delta \quad +27 \quad 55$$

$$\log e = 0.8789$$

$$\cos \delta = 9.9462$$

$$(e) = 0.8251$$

$$\log \cos(G + \alpha) 9.9864$$

$$- \quad \delta \quad 9.9390$$

$$- \quad \sin \quad 9.3912$$

$$- \quad \tan \delta \quad 9.7242$$

$$- \quad \frac{1}{\sin} \quad 8.5239$$

$$(g') \quad 0.9254$$

$$(g) \quad 8.8783$$

$$\log \sin \delta = 9.4704$$

$$\cos(H + \alpha) = 9.9272$$

$$- \quad h \quad 1.2792$$

$$- \quad \sin \quad 9.7272$$

$$- \quad \sec \delta = 0.0538$$

$$- \quad \frac{1}{\sin} = 8.5237$$

$$\log(h') \quad 0.8768$$

$$- \quad h \quad 9.8841$$

$$f = +0.12$$

$$(g) \quad +0.08$$

$$(h) \quad +0.77$$

$$\hline +0.97 \checkmark$$

$$(g') \quad +8.42$$

$$(h') \quad +7.53$$

$$(i) \quad -6.69$$

$$\hline +9.26 \checkmark$$

1669

Red ad. l. aph

9

$$H + \alpha \quad 2 \quad 09 = 32^\circ 15'$$

$$H \quad 19 \quad 34$$

$$\alpha \quad 6 \quad 35$$

$$G \quad 18 \quad 22$$

$$G + \alpha \quad 0 \quad 57 = 14^\circ 15'$$

$$\delta \quad +27 \quad 55$$

$$\log \epsilon = 0.8789$$

$$- \cos S = 9.9462$$

$$(L) = 0.8251$$

$$\log \cos(G + \alpha) \quad 9.9864$$

$$\quad \quad \quad 0.9390$$

$$\sin \quad \quad \quad 9.3912$$

$$\tan S \quad \quad \quad 9.7242$$

$$\quad \quad \quad 8.8239$$

$$\log(g') \quad \quad \quad 0.9254$$

$$\log(g) \quad \quad \quad 8.8783$$

$$\log \sin S = 9.4704$$

$$\cos(H + \alpha) = 9.9272$$

$$h = 1.2792$$

$$\sin \quad \quad \quad 9.7272$$

$$\sec S = 0.0538$$

$$\quad \quad \quad 8.8237$$

$$\log(h') \quad \quad \quad 0.8768$$

$$h = 9.8841$$

$$f = +0.12$$

$$g = +0.08$$

$$h = +0.77$$

$$+0.97$$

$$g' = +8.92$$

$$h' = +7.53$$

$$L = -6.69$$

$$+9.26$$

1669

Lunar Parallax

$$\begin{array}{rcl}
 \alpha' & = & 6^h \ 35^m \ 31.5^s \\
 \delta & = & 7 \ 30 \ 53.3 \\
 \alpha - \alpha' & = & + \ 55 \ 21.8 \\
 & + & 13^\circ \ 50' \ 27'' \\
 & + & 6 \ 01'' \\
 & + & 13 \ 44 \ 26
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 \hline
 0.01261 \\
 9.96988
 \end{array}$$

$$\gamma = 43^\circ \ 00' \ 53.0''$$

$$\delta = 27 \ 55 \ 27.8$$

$$\gamma - \delta = 15 \ 05 \ 25.2''$$

$$\begin{array}{r}
 9.82640 \\
 8.24112 \\
 9.41555 \\
 \hline
 0.16610 \\
 7.64917
 \end{array}$$

$$\delta - \delta' = +15 \ 19.6''$$

$$S = +28 \ 10 \ 47.4''$$

$$\text{Am Ephes } S = +28 \ 10 \ 49.6''$$

$$O - C = -2.4''$$

$$\delta' = +27^\circ \ 55' \ 27.8''$$

$$\pi = 59' \ 53.9''$$

$$\begin{array}{r}
 9.86913 \\
 8.24112 \\
 9.37881 \\
 \hline
 0.05480 \\
 7.54386
 \end{array}$$

$$\alpha - \alpha' = +12' \ 01.5''$$

$$= +48.11''$$

$$\alpha = 6 \ 36 \ 19.62''$$

$$\alpha = 6 \ 36 \ 18.75''$$

$$+0.87''$$

1667

Luminous Transient

$$x = 6^{\circ} 35' 31.5''$$

$$y = 7^{\circ} 30' 53.3''$$

$$z = 1^{\circ} 55' 21.8''$$

$$+ 12^{\circ} 50' 27''$$

$$+ 6^{\circ} 01'$$

$$+ 13^{\circ} 44' 26''$$

$$995727$$

$$000000$$

$$001261$$

$$996988$$

$$x = 92^{\circ} 00' 53.0''$$

$$y = 27^{\circ} 55' 77.8''$$

$$z = 15^{\circ} 05' 25.2''$$

$$982640$$

$$824112$$

$$941555$$

$$016610$$

$$764917$$

$$\delta = 71^{\circ} 19'$$

$$S = 28^{\circ} 10' 47.4''$$

$$\text{Cor. Eph. } S = +28^{\circ} 10' 49.8''$$

$$O - C = 2.9$$

$$S = +27^{\circ} 55' 27.8''$$

$$IT = 59' 53.9''$$

$$986913$$

$$824112$$

$$957651$$

$$005980$$

$$759346$$

$$x - x' = 12^{\circ} 01.58''$$

$$+ 48.11$$

$$d = 6^{\circ} 36' 19.62''$$

$$x = 6^{\circ} 36' 18.75''$$

$$+ 0.87$$

MC 1674

1913 lat. 4.

11

Stars - measures.

	d	v	d	x	w
L	19730	13968	19970	15211	
44	16322	737572	1333132	1183038	
11.6	20	83	31	2538	
mag	32	76	70	02	
8.5	<u>11.3410</u>	<u>3404</u>	<u>4.3361</u>	<u>3377</u>	
2					
9.6	17263	18740	18610	18752	
24.5	1276868	1321005	1487162	1247580	
mag	70	05	6975	79	
8.5	55	34	00	50	
	<u>24.4490</u>	<u>4470</u>	<u>96263</u>	<u>6273</u>	
3					
26.8	18248	15171	17415	17460	
20.9	911009	1429907	1478080	1006158	
mag	48	03	80	57	
6.8	20.9135	74	00	53	
	<u>20.9135</u>	<u>9132</u>	<u>26.7369</u>	<u>7396</u>	
4					
28.8	10520	939090	15541	17090	
12.01	10220	93	1417270	8426	
mag	1820	9100	8082	2078	
8.6			31	76	
	<u>12.0301</u>	<u>0291</u>	<u>28.8636</u>	<u>8653</u>	

Grade 2.

Star	14032	11943	10485	842121
	971010	624038	1003537	2121
	10	40	39	7977
	<u>24.4025</u>	30		
	<u>24.4318</u>	<u>4303</u>	<u>19.9552</u>	<u>19556</u>

MG 1674

1912 Oct 4

11

Stars - ~~unclassified~~

	d	v	d	v
✓	19730	13968	19970	15211
44	16322	7375	13331	11830
114	20	83	31	25
mg	32	76	70	02
85	<u>113410</u>	<u>3404</u>	<u>43361</u>	<u>3377</u>
3			18610	18752
96	17263	18740	14871	12475
24.5	12768	13210	6975	79
mg	70	05	00	50
85	55	34	<u>96263</u>	<u>6273</u>
	<u>244490</u>	<u>4470</u>		
3	18248	15171	17415	17460
268	9110	14299	14780	10061
209	17	03	80	57
mg	48	74	00	53
68	<u>209135</u>	<u>9132</u>	<u>267369</u>	<u>7396</u>
4				
288	10520	9390	15541	17090
1201	10220	93	14172	8426
mg	18	9100	8082	20
86			31	76
	<u>120301</u>	<u>0291</u>	<u>288636</u>	<u>8653</u>

Grade 2.

14032	11943	10485	8421
9710	6240	10035	21
10	40	39	7977
24.4025	30		
<u>244318</u>	<u>4303</u>	<u>199152</u>	<u>9556</u>

AAC 1674

known measures.

1913 Oct. 4.

12

6
16.4
19.0

16070
978090
10
58
16.3730

14706
1098070
95
95
3720

2
16.0 19278
19.4 15960 64
48
85
19.3323

18921
1228806
00
18
3289

3
15.6
20.0

197760
1568090
90
48
15.5932

19019
1306050
50
00
5955

4
15.5
20.8
21.0

18700
1315050
50
92
15.4454

15020
1356052
60
30
4469

5
15.5
21.0

many the in hole

18680
1333025
37
70
15.4656

17629
1236559
55
19
4684

6
15.8
22.0

17630
1595060
55
20
15.8327

17060
871100
10
50
8345

11C1674

known - measures

1912 Oct 4

12

d

w

d

w

$$\begin{array}{r} 16.4 \\ 19.6 \end{array}$$

$$\begin{array}{r} 16070 \\ 978090 \\ 10 \\ 58 \\ \hline 163730 \end{array}$$

$$\begin{array}{r} 14706 \\ 1098070 \\ 95 \\ 95 \\ \hline 3720 \end{array}$$

$$\begin{array}{r} 160 \\ 194 \\ 19278 \\ 15960 \\ 48 \\ 85 \\ \hline 193323 \end{array}$$

$$\begin{array}{r} 18921 \\ 122806 \\ 00 \\ 18 \\ \hline 3289 \end{array}$$

$$\begin{array}{r} 15.6 \\ 20.0 \end{array}$$

$$\begin{array}{r} 19760 \\ 1568090 \\ 90 \\ 48 \\ \hline 151932 \end{array}$$

$$\begin{array}{r} 19019 \\ 1306050 \\ 50 \\ 00 \\ \hline 5955 \end{array}$$

$$\begin{array}{r} 15.5 \\ 20.8 \\ 21.0 \end{array}$$

$$\begin{array}{r} 18700 \\ 1315050 \\ 50 \\ 90 \\ \hline 154454 \end{array}$$

$$\begin{array}{r} 15020 \\ 1356052 \\ 60 \\ 30 \\ \hline 4469 \end{array}$$

$$\begin{array}{r} 18680 \\ 1333020 \\ 37 \\ 70 \\ \hline 154656 \end{array}$$

$$\begin{array}{r} 17029 \\ 1236559 \\ 55 \\ 19 \\ \hline 4684 \end{array}$$

$$\begin{array}{r} 15.8 \\ 22.0 \end{array}$$

$$\begin{array}{r} 17630 \\ 1595060 \\ 55 \\ 20 \\ \hline 158327 \end{array}$$

$$\begin{array}{r} 17060 \\ 871100 \\ 10 \\ 50 \\ \hline 8345 \end{array}$$

11C1674 known measures 1913 Oct 4

13

$$\begin{array}{r}
 \alpha \\
 16640 \\
 16.0 \quad 1451020 \\
 22.2 \quad 10 \\
 \quad 32 \\
 \hline
 222125
 \end{array}
 \qquad
 \begin{array}{r}
 \alpha \\
 16230 \\
 8355 \\
 6060 \\
 30 \\
 \hline
 2128
 \end{array}$$

$$\begin{array}{r}
 8 \\
 17.0 \quad 15598 \\
 22.7 \quad 721805 \\
 \quad 0010 \\
 \quad 90 \\
 \hline
 228384
 \end{array}
 \qquad
 \begin{array}{r}
 16261 \\
 1464948 \\
 41 \\
 62 \\
 \hline
 8385
 \end{array}$$

$$\begin{array}{r}
 9 \\
 17.5 \quad 15560 \\
 22.9 \quad 6305 \\
 \text{max} \quad 9083 \\
 \quad 60 \\
 \hline
 22.9268
 \end{array}
 \qquad
 \begin{array}{r}
 16280 \\
 15520 \\
 20-20 \\
 \hline
 9242
 \end{array}$$

Stars

$$\begin{array}{r}
 15615 \\
 801010 \\
 11 \\
 5620 \\
 \hline
 11.7609
 \end{array}
 \qquad
 \begin{array}{r}
 17827 \\
 1544042 \\
 38 \\
 22 \\
 \hline
 17614
 \end{array}$$

$$\begin{array}{r}
 19029 \\
 1322128 \\
 21 \\
 19 \\
 \hline
 21.5801
 \end{array}
 \qquad
 \begin{array}{r}
 17470 \\
 1326070 \\
 60 \\
 66 \\
 \hline
 15795
 \end{array}$$

$$\begin{array}{r}
 8700 \\
 846360 \\
 6060 \\
 \hline
 6.9761
 \end{array}
 \qquad
 \begin{array}{r}
 1250900 \\
 0000 \\
 12285 \\
 \hline
 9782
 \end{array}$$

$$\begin{array}{r}
 12857 \\
 667560 \\
 8055 \\
 45 \\
 \hline
 10.3818
 \end{array}
 \qquad
 \begin{array}{r}
 17540 \\
 1375510 \\
 16 \\
 30 \\
 \hline
 3822
 \end{array}$$

NIC 1674 brown measures 1913 Oct 4

13

$$\begin{array}{r}
 16640 \\
 160 \quad 1451020 \\
 222 \quad 10 \\
 \quad 32 \\
 \hline
 222125
 \end{array}
 \qquad
 \begin{array}{r}
 16230 \\
 8355 \\
 6060 \\
 30 \\
 \hline
 2128
 \end{array}$$

$$\begin{array}{r}
 8 \\
 170 \quad 15598 \\
 227 \quad 721805 \\
 \quad 0010 \\
 \quad 90 \\
 \hline
 228384
 \end{array}
 \qquad
 \begin{array}{r}
 16261 \\
 1464948 \\
 41 \\
 62 \\
 \hline
 8385
 \end{array}$$

$$\begin{array}{r}
 9 \\
 175 \quad 15560 \\
 229 \quad 630583 \\
 \text{max} \quad 9089 \\
 \quad 60 \\
 \hline
 229268
 \end{array}
 \qquad
 \begin{array}{r}
 16280 \\
 15520 \\
 25-20 \\
 \hline
 9242
 \end{array}$$

Stam

$$\begin{array}{r}
 15615 \\
 801010 \\
 11 \\
 5620 \\
 \hline
 117609
 \end{array}
 \qquad
 \begin{array}{r}
 17827 \\
 1544042 \\
 3842 \\
 22 \\
 \hline
 7614
 \end{array}
 \qquad
 \begin{array}{r}
 8700 \\
 846360 \\
 6060 \\
 \hline
 69761
 \end{array}
 \qquad
 \begin{array}{r}
 1250900 \\
 0000 \\
 12285 \\
 \hline
 9782
 \end{array}$$

$$\begin{array}{r}
 19029 \\
 1322128 \\
 21 \\
 19 \\
 \hline
 215801
 \end{array}
 \qquad
 \begin{array}{r}
 17470 \\
 1326070 \\
 6070 \\
 66 \\
 \hline
 5795
 \end{array}
 \qquad
 \begin{array}{r}
 12857 \\
 667560 \\
 8055 \\
 45 \\
 \hline
 103818
 \end{array}
 \qquad
 \begin{array}{r}
 17540 \\
 1371510 \\
 16 \\
 30 \\
 \hline
 3822
 \end{array}$$

NG 1674

Standard Correl.

1912 Oct 4.

14

Capetown (Cambridge) m. 4069

A.S. m. 4100 m. 8.5

$$\begin{array}{rcl}
 1875^- & & \\
 A.S. & 7^h & 29^m & 19^s & 93^{\checkmark} \\
 Prec & & +02 & 15.23^{\checkmark} \\
 A = & 7 & 31 & 35.16^{\checkmark} \\
 A & 7 & 39 & 20^{\checkmark} \\
 \alpha - A & - & 7 & 44.84^{\checkmark} \\
 \sin(\alpha - A) & - & 464.75^{\checkmark} \\
 \log \dots & 2.66722^{\checkmark} \\
 \dots & 9.95652^{\checkmark} \\
 \dots & 1.13098^{\checkmark} \\
 \dots & -13.5200^{\checkmark} \\
 \dots & - & 98^{\checkmark} \\
 \dots & 4.4702^{\checkmark} \\
 \dots & 4.3369^{\checkmark} \\
 \alpha - \dots & - & 1333^{\checkmark}
 \end{array}$$

$$\begin{array}{rcl}
 7^h & 32^m & 11^s & 74^{\checkmark} \\
 + & 2 & 16.79^{\checkmark} \\
 7 & 34 & 28.53^{\checkmark} \\
 7 & 39 & 20^{\checkmark} \\
 - & 4 & 51.47^{\checkmark} \\
 - & 291.45^{\checkmark} \\
 2.46456^{\checkmark} \\
 9.95017^{\checkmark} \\
 0.92197^{\checkmark} \\
 -83554^{\checkmark} \\
 - & 16^{\checkmark} \\
 9.6430^{\checkmark} \\
 9.6268^{\checkmark} \\
 - & 162^{\checkmark}
 \end{array}$$

$$\begin{array}{rcl}
 A.S. & +25^{\circ} & 17' & 35'' & 2 \\
 Prec & - & 4 & 45.3 \\
 S = & +25 & 12 & 49.9 \\
 D & +26 & 36 & 42 \\
 S-D & - & 1 & 23 & 52.1 \\
 \tan(S-D) & - & 5033.1 \\
 \log \dots & 3.70184^{\checkmark} \\
 \dots & 1.03299^{\checkmark} \\
 \dots & 9.6729 \\
 \dots & 22620 \\
 \dots & 89883 \\
 \dots & -107892 \\
 \dots & + & 773 \\
 \dots & 113081 \\
 \dots & 113407^{\checkmark} \\
 \alpha - \dots & + & 326
 \end{array}$$

$$\begin{array}{rcl}
 +27^{\circ} & 00' & 25'' & 1 \\
 - & 4 & 53.9 \\
 +26 & 55 & 31.2 \\
 +26 & 36 & 42 \\
 + & 18 & 49.0 \\
 + & 11129.0 \\
 3.05269 \\
 038384 \\
 9.7058 \\
 18439 \\
 8.6031 \\
 +24201 \\
 + & 401 \\
 244602 \\
 244480^{\checkmark} \\
 - & 122
 \end{array}$$

1912phae

Standard Catalog

1912phae

14

Cambridge (Cambridge, Eng) no 4069

G. S. no 4100, my 8.5

1575

$\alpha = 7^h 29^m 19.93$
 $\text{Prec} + 0.2 \quad 15.23$
 $A = 7 \quad 31 \quad 35.16$
 $A \quad 7 \quad 39 \quad 20$
 $\alpha - A = 7 \quad 44.84$
 $\sin(\alpha - A) = 46475$
 $\log = 2.60722$
 $\log = 9.95652$
 $\log = 1.13098$
 $\log = -1.35200$
 $\log = 98$
 $\log = 44702$
 $\log = 43369$
 $\alpha - \beta = -1.333$

$7^h 32^m 11.74$
 $+ 2 \quad 16.79$
 $7 \quad 34 \quad 28.53$
 $7 \quad 39 \quad 20$
 $- 4 \quad 51.47$
 $- 29145$
 2.46456
 9.95017
 0.92197
 $- 83554$
 $- 16$
 96420
 96268
 $- 1.62$

$G. S. + 25^0 \quad 17' \quad 35.2$
 $\text{Prec} - 4 \quad 45.3$
 $S + 25 \quad 12 \quad 49.9$
 $D + 26 \quad 36 \quad 42$
 $S - D = 1 \quad 23 \quad 52.1$
 $\sin(S - D) = 5033.1$
 $\log = 3.70184$
 $\log = 1.03299$
 $\log = 9.6729$
 $\log = 2.2620$
 $\log = 8.9883$
 $\log = -1.07892$
 $\log = 973$
 $\log = 11.3081$
 $\log = 11.3407$
 $\log = + 326$

$+ 27^0 \quad 00' \quad 25.1$
 $- 4 \quad 53.9$
 $+ 26 \quad 55 \quad 31.2$
 $+ 26 \quad 36 \quad 42$
 $+ 18 \quad 49.0$
 $+ 11129.0$
 3.05269
 0.38384
 9.7058
 1.8439
 8.6031
 $+ 2.4201$
 $+ 401$
 2.44602
 2.44480
 $- 1.22$

Cape No. 1087 mag 8.0 23.4087 mag 8.9 25.4105 (9.2)

C	7	39	44.73	7	30	50.28	7	32	40.26
L			79						
E			74						
mean	7	39	44.75						
Pres			+44.26	+2	15.23		+2	16.40	
d	7	40	29.01	7	33	05.51	7	34	56.66
A	7	39	20	7	39	20	7	39	20
$\alpha - A$		+1	09.01	-6	14.49		-4	23.34	
$\sin(\alpha - A)$			+69.01	-3	74.44		-26	3.32	
log		1.83891		2.57338			2.42048		
cos		99.5012		99.5630			99.5158		
$\sin$		0.29627		1.03692			0.87930		
$\sin$		41.9782		-10.8872			-7.5735		
$\sin$		0		-	58		-	11	
$\sin$		19.9782		7.1070			10.4254		
$\sin$		19.9554		6.9772			10.3820		
$\sin$		-228		-1298			-434		

C	+26	58	02.26	+25	21	19.4	+26	38	12.2
L			02.1						
E			02.3						
mean	+26	58	02.2						
Pres	-	1	41.8	-	4	49.8	-	4	55.5
S	+26	56	20.4	+25	16	29.6	+26	33	16.9
D	+26	36	42	+26	36	42	+26	36	42
$\alpha - D$		+19	38.4	-1	20	12.4	-	3	25.1
$\sin(\alpha - D)$		+11	78.4	-	48	13.2	-	20.5	
log		3.07129		3.68244			2.31197		
$\sin$		0.40244		1.01359			96.4312		
$\tan$		9.7060		9.6741			9.6987		
$\tan$		0.5925		2.0738			1.7586		
$\tan$		7.3519		8.8013			8.5107		
$\tan$		+25.260		-10.3179			-0.4397		
$\tan$		+22		+633			+324		
$\tan$		24.5282		11.7454			21.5927		
$\tan$		24.4310		11.7612			21.5798		
$\tan$		-972		+158			-129		

MC1674

Standard Coordinates

1912 Oct 4.

15

Cape No. 1093 mag 6.8

Cape No. 1096 mag 8.6

C 7ⁿ 43 41.44ⁿ7ⁿ 44^m 54.34ⁿ

L

38

L

28ⁿ

mean

7 44 54.33ⁿ

Prec

+44.05ⁿ+43.68ⁿ

R

7 44 25.49ⁿ7 45 38.01ⁿ

A

7 39 20ⁿ7 39 20ⁿ

R-A

+ 5 05.49ⁿ+ 6 18.01ⁿ

sin(R-A)

+305.47ⁿ+379.96ⁿ

log

2.48497ⁿ2.57745ⁿ

cos

9.95184ⁿ9.95609ⁿ-3₀094405ⁿ1.04078ⁿS₀+8.7912ⁿ+10.9845ⁿS₁+ 17ⁿ+ 58ⁿ

S

26.7929ⁿ28.9903ⁿ

2c

26.7382ⁿ28.8644ⁿ

2c-3

-547ⁿ-1259ⁿ

C +26° 30' 51.0

+25 21 47.7

L

47.5

2

47.1

mean

+25 21 47.4

Prec

-1 45.5

-1 46.6

S

+26 29 05.5

+25 20 00.8

D

+26 36 42

+26 36 42

S-D

- 7 36.5

- 1 16 41.2

tan(S-D)

- 456.5

-46020

log

2.65944ⁿ3.66295ⁿ

no

9.99059ⁿ0.99410ⁿ

tan

9.6974

9.67524

S₂

18881

20816

S₁

8.6389

88102

S₀

-0.9786

-9.8650

S₁

+ 435

+ 646

S

21.0649

12.1996

S

20.9134

12.0296

S

-1515

-1700

MC1674

Standard Error

191 Select 4

15

Cape No. 1093 mag 6.8

Cape No. 1096 mag 6.6

C 7ⁿ 43 41 447ⁿ 44^m 54 34

L

38

L

28

Mean

7 44 54 33

Prec

+ 44.05

+ 43.68

X

7 44 25 49

7 45 38 01

A

7 39 20

7 39 20

A-A

+ 5 05 49

+ 6 18 01

Sum(A-A)

+ 30 54 7

+ 37 9 6

log

2.48497

2.57745

-0.5

9.95184

9.95609

3₀

0.94405

1.04078

3₀

+ 8.7912

+ 10.9845

3₁

+ 17

+ 58

3

2.67929

2.89903

20

2.67382

2.88644

20-3

- 547

- 1259

C +26° 30' 51.0

+25 21 47.2

L

47.1

L

47.1

Mean

+25 21 47.4

Prec

- 1 45.5

- 1 46.6

S

+26 29 05.5

+25 20 00.8

D

+26 36 42

+26 36 42

S-D

- 7 36.5

- 1 16 42.8

Sum(S-D)

- 456.5

- 460.36

log

2.65944

3.66310

-0.5

9.99059

0.99425

3₀

9.6974

9.67524

3₁

1.8881

2.0816

3

8.6389

8.8102

20

- 0.9786

- 9.8685

20-3

+ 43.5

+ 64.6

3₀

2.10649

1.21961

3₁

20.9134

1.20296

3

- 1.515

- 1.665

20

20-3

3₀3₁

3

20

20-3

M 61674

1913 Oct. 4.

16

Center of Plate

	x	y	$R.A.$	Decl.
1	43369 ^v	113407 ^v	7 31 35	+25 12 50
2	9.6268 ^v	24.4480 ^v	7 34 28	+26 55 31
3	26.7382 ^v	20.9134 ^v	7 44 25	+26 29 06
4	28.8644 ^v	12.0296 ^v	7 45 38	+25 20 01
4	6957	6873	154 126	22 11 6
	17.39	17.18	7 39 02	+25 59 22
	-18.00	-22		
	0.61	4.82		
	31	465		
	61	2240		
	153			
	18.91	+37' 20"		

Center { 7^h 39^m 02^s
+25^h 59' 22"

Center { A = 7 39 20
D = +26 36 42

2-3	-80.34	-0.7x	+2246
-1333	-911	-2244	-3 = -2247
-162	-1963	-2125	-7 = -2132
-547	-1679	-2226	-19 = -2245
-1259	-966	-2225	-20 = -2245
17.5964 ^v	1668 ^v	-12 ^v	= 17.6530 ^v

$y - \eta$	+826x	-4	-673
+326	+358	+684	-11 = +673
-127	+795	+668	-24 = +644
-1515	+2209	+694	-21 = +673
-1700	+2389	+684	-12 = +672
20.7728 ^v	1453 ^v	-21 ^v	= 20.8487 ^v

Tables $a = +0.7$ $b = +0.7$ $a - b = 0.0$ $b + d = +0.5$
 $a = +0.7$ $b = +1.0$ -0.3 $b + d = -2.3$

A161674

1913 Oct 4

16

Center of P. Cal.

2

4

R. C.

Bach

1	4 33 6 9	1 1 34 0 7	7	31	35	+25	12	50
2	9.62 6 8	24 44 40	7	34	28	+26	55	31
3	20 7 38 2	20 91 34	7	44	25	+26	29	06
4	28 8 64 4	12 0 29 6	7	45	38	+25	20	01
4	69 57	68 73	1	154	126	22	11 6	28
	17.39	17.18	7	39	02	-25	59	22
	-18.00	-22						

061

482

Center { 7 39 02
(+25 59 22)

31

465

61

-240

143

Center { A: 7 39 20
D: +26 36 42

18.91

+37 20

2-3	-8034	-072	+2246
-1333	-911	-2244	-3
-162	-1963	-2125	7
-547	-1679	-2226	-19
-1259	-966	-2225	-20
17.59 64	-1668	-12	= 17.6530

4-4	+8262	-4	-673
-326	+358	-11	+673
-127	+795	-24	+644
-1515	+2209	-21	+673
-1700	+2389	-12	+672
20.77 28	+1453	-21	= 20.8487

Tables a: +0.7 2: +0.7 A: 0.0 + +0. +0.5
a: +0.7 2: +1.0 -0.3 644 = 23

1912phae.proj.15	1912 Feb 28	6 ^h 01 ^m	✓	-6 ^h 13 ^m	✓	1913 Oct 6	17
moon		6 06	438 [✓]	-6 06	442 [✓]		
clock slow		01	468 [✓]				
H. Sid. T.		6 08	308 [✓]				
H. long		4 44	31.05 [✓]				
S. Sid. T.		10 53	01.85 [✓]				
Sid. T. in Moon		22 27	47.84 [✓]				
Interval		12 25	1401 [✓]				
Reduction		- 2	02.09 [✓]				
G. M. T.		12 23	11.92 [✓]			$\Theta - \alpha = -1^{\circ} 29' 20''$	

From Kant Alman	R. A.	Alcal.
Moon 12 ^h	7 ^h 36 ^m 48.52 [✓]	+26 47 59.9 [✓]
Moon in μ = 2.7034		= 6.000 [✓]
" " 23.1987 [✓]	- + 1 02.72 [✓]	- 2 19.2 [✓]
Tabular place	7 37 51.24 [✓]	+26 45 40.7 [✓]

Age = 10.8 days.

Moon's parallax.	60' 15.6 [✓]
separation	16' 26.8 [✓]
R =	986.8 [✓]
Augmentation	+ 16.0 [✓]
Irradiation (2)	- 0.5 [✓]
R =	1002.3 [✓]
R =	2.1486 [✓]
(1+a) R =	2.1487 [✓]
R ² =	4.6169 [✓]

939 = 14.35[✓]
987 = 16.0[✓]

a = +0.7[✓]

MIC 1674	Times etc	1913 Mar 6	17
Ephemeris	1912 Feb 28 6 ^h 01 ^m	-6 ^h 13	
Moon	6 06 43.8	-6 06 44.2	
Closest slow	01 46.8		
H. Lat T.	6 08 30.8		
Hourly	4 44 31.05		
G. Lat T.	10 53 01.85		
S. Lat T. Moon	22 27 47.44		
Interval	12 25 14.01		
Radiation	2 02.09		
G. M. T.	12 23 11.92	$\Theta - \lambda = -1^{\circ} 29' 20''$	

From Kant Alman	R. G.	Alcal	
Moon 12 ^h	7 ^h 36 ^m 48.52	+26 47 59.9	
Mercury 1 ^h = 2.7034		= 6.000	
... 23.1987	+1 02.72	- 2 19.2	
Tabular place	7 37 51.24	+26 45 40.7	

Age = 10.8 days

Moon's parallax	60' 15.6
Scundian	16' 26.8
939-1435	R = 986.8
947-160	+16.0
Age Augmentation	-0.5
Irradiation (2)	R = 1002.3
	R = 2148.6
a = +0.7	(1+a) R = 2148.7
	R ² = 4616.9

pt.	wt. L.	resid.
1	214.7	+239
2	228.0	+115
3	248.9	-118
4 [	270.0	+63] $\frac{1}{2}$ wt.
5 [	276.1	-310] $\frac{1}{2}$ wt.
6	304.7	-36
7	312.0	+54
8	343.9	+54
9	0.0	+171

1674

Moon's center

18

	x	$x - X_0$	$(x - X_0)^2$	$(x - X_0)^2 + (y - Y_0)^2$	$O - C$
1	16.3725	-1.2275	1.5068	4.6503	+ 334
2	16.0000	-1.6000	2.5600	4.6405	+ 236
3	15.5944	-2.0056	4.0224	4.6199	+ 30
4	15.4462	-2.1538	4.6388	4.6388	+ 219 ^{1st}
5	15.4670	-2.1330	4.5497	4.6012	- 157 ["]
6	15.8336	-1.7664	3.1202	4.6257	+ 88
7	16.0000	-1.6000	2.5600	4.6334	+ 165
8	17.0000	0.6000	0.3600	4.6259	+ 90
9	17.6000	0.0000	0.0000	4.6332	+ 163

Comp $R^2 = 4.6169$

	y	$y - Y_0$	$(y - Y_0)^2$
1	19.0000	-1.7730	3.1435
2	19.3306	-1.4424	2.0805
3	20.0000	-0.7730	0.5975
4	20.7730	0.0000	0.0000
5	21.0000	+0.2270	0.0515
6	22.0000	+1.2270	1.5055
7	22.2126	+1.4396	2.0734
8	22.8389	+2.0654	4.2659
9	22.9255	+2.1525	4.6332

App. Center

$$x = 16.0 \quad y = 19.3306$$

$$22.2126$$

$$41.5432$$

$$Y_0 = 20.7716$$

$$y_{\text{max}} = 22.9255$$

$$R = 2.1539$$

$$y_{\text{min}} = 15.4462$$

$$X_0 = 17.6001$$

$$\text{Center} \left\{ \begin{array}{l} X_0 = 17.6000 \\ Y_0 = 20.7730 \end{array} \right.$$

1
2
3
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9

1
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3
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1679

Luvous Center

16

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	163725	-12275	15068	46503	+339
2	160000	-16000	25600	46403	+236
3	155944	-20056	40224	46199	+30
4	154462	-21538	46388	46388	+219
5	154670	-21330	45497	46012	-157
6	158336	-17664	31202	46257	+88
7	160000	-16000	25600	46334	+165
8	170000	06000	03600	46259	+90
9	176000	00000	00000	46332	+163

Covariance $R = 46169$

	y	$y - y_0$	$(y - y_0)^2$
1	190000	-17730	31435
2	193306	-14424	20805
3	200000	-67930	05975
4	207730	00000	00000
5	210000	02270	00515
6	220000	12270	15055
7	222126	+14396	20734
8	228384	+20654	42659
9	229255	+21525	46332

App. Center

$$x = 160 \quad y = 19.3306$$

$$22.2126$$

$$41.5432$$

$$y_0 = 20.7716$$

$$y - \text{max} = 22.9255$$

$$R = 21539$$

$$y - \text{min} = 15.4462$$

$$x_0 = 176001$$

$$\text{Center} \left\{ \begin{array}{l} x_0 = 176000 \\ y_0 = 20.7730 \end{array} \right.$$

Formation of houses.

1	+ 2.18	- 410.5	- 591.0
2	+ 230	- 377.5	- 340.0
3	+ 1.55	- 60.4	- 231
4	- 0.00	- 117.8	+ 00
5	- 0.12	+ 83.5	- 90
6	- 2.18	- 105.8	+ 108.1
7	- 230	- 264.0	+ 237.8
8	- 124	- 54.0	+ 186.2
9	+ 0.00	+ 0.0	+ 350.8
	+ 0.19	- 1356.5	- 80.2
		- 3532	
		- 1709.7	

giving (4) full wt.

Correct sol. giving (4) $\frac{1}{2}$ wt.

$$+ 16.43 + 0.19 = - 1356$$

$$+ 0.19 + 18.31 = - 80$$

$$- 0.19 - 0.0 = + 16$$

$$+ 18.31 = - 64$$

$$f = - 3.5$$

$$+ 16.43 = - 1356 + 1 = - 1355$$

$$a = - 82.5$$

		C	O	O-C
1	+ 101 + 6 =	+ 107	+ 324	+ 227
2	+ 132 + 5 =	+ 137	+ 236	+ 99
3	+ 166 + 3 =	+ 169	+ 30	- 139
4	+ 177 + 0 =	+ 177	+ 219	+ 42
5	+ 175 - 1 =	+ 174	- 157	+ 331
6	+ 146 - 9 =	+ 142	+ 88	- 54
7	+ 132 - 5 =	+ 127	+ 165	+ 38
8	+ 49 - 7 =	+ 42	+ 90	+ 48
9	+ 0 - 8 =	- 8	+ 143	+ 171

1674

Moon's Center

19

Conditional Equations

	a	b	0	c	0-c
1	-1.23	-1.77	+334	+89+6 = +95	+239
2	-1.60	-1.44	+236	+116+5 = +121	+115
3	-2.01	-0.77	+30	+145+3 = +148	-118
4	-2.15	+0.00	+219	+156-0 = +156	+63
5	-2.13	+0.23	-157	+154-1 = +153	-310
6	-1.77	+1.23	+88	+128-4 = +124	-36
7	-1.60	+1.44	+165	+116-5 = +111	+54
8	-0.60	+2.07	+90	+43-7 = +36	+54
9	+0.00	+2.15	+163	-0-8 = -8	+171

+696-464

Average = 128

Normal Equations

$$\begin{aligned}
 +18.72a + 0.19b &= -1356 \\
 +0.19a + 18.35b &= -80 \\
 -0.19a - 0.00b &= +14 \\
 +18.35b &= -66 \\
 +18.72a &= -1356 + 14 = -1342
 \end{aligned}$$

$$b = -3.6$$

$$a = -72.5$$

giving pt. (4) full wt. (5) 1/2 wt.

$$\begin{aligned}
 +19.91a + 0.19b &= -1710 \\
 +0.19a + 18.31b &= -80 \\
 -0.19a - 0.00b &= +16 \\
 +18.31b &= -64
 \end{aligned}$$

$$b = -3.5$$

$$+19.91a = -17.10 + 1 = -17.09$$

$$a = -85.9$$

0	c	0-c
+334	+105+6 = +111	+223
+236	+137+5 = +142	+94
+30	+172+3 = +175	-145
+219	+184+0 = +184	+35
-157	+183-1 = +182	-339
+88	+152-4 = +148	-60
+165	+137-5 = +132	+33
+90	+51-7 = +44	+46
+163	-0-8 = -8	+171

1674

Moon's Center

19

Conditional Equations

	a	b	0	c	0-c
1	-123	-177	+334	+89+6 = +95	+239
2	-160	-144	+236	+116+5 = +121	+115
3	-201	-077	+30	+145+3 = +148	-118
4	-215	+000	+219	+156-0 = +156	+63
5	-213	+023	-157	+154-1 = +153	-310
6	-177	+123	+88	+128-4 = +124	-36
7	-160	+144	+165	+116-5 = +111	+54
8	-060	+207	+90	+43-7 = +36	+54
9	+000	+215	+163	-0-8 = -8	+171

Normal Equations

$$\begin{aligned}
 +18.72a + 0.19b &= -135.6 \\
 +0.19a + 18.31b &= -80 \\
 -0.19a - 0.00b &= +14 \\
 +18.31b &= -66 \\
 +18.72a - 135.6 + 1 - 135.6 &
 \end{aligned}$$

$$\begin{aligned}
 b &= -3.6 \\
 a &= -7.25
 \end{aligned}$$

Solving for (4) full wt. (5) $\frac{1}{2}$ wt.

$$\begin{aligned}
 +1991 + 00.19 &= -1710 \\
 +0.19a + 18.31b &= -80 \\
 -0.19a - 0.00b &= +16 \\
 +18.31b &= -64
 \end{aligned}$$

$$b = -3.5$$

$$+1991 = -17.10 + 1 = -17.09$$

$$a = -85.9$$

0	c	0-c
+334	+105 + 6 = +111	+223
+236	+137 + 5 = +142	+94
+30	+172 + 3 = +175	-145
+219	+184 + 0 = +184	+35
-157	+183 - 1 = +182	-339
+88	+152 - 4 = +148	-60
+161	+137 - 5 = +132	+33
+90	+51 - 7 = +44	+46
+1163	-0 = -8	+121

$$+602 - 4 = 602 - 4$$

1674

Red ad. to apph.

$$S' = +26^{\circ} 28'$$

$$H + \alpha \quad 3 \quad 08 = 47^{\circ} 08'$$

$$H \quad 19 \quad 29$$

$$\alpha = 7 \quad 39$$

$$G \quad 18 \quad 24$$

$$G + \alpha \quad 2 \quad 03 = 30^{\circ} 45'$$

$$\cos(G + \alpha) : 9.9342$$

$$g : 0.9414$$

$$\sin \quad : 9.7087$$

$$\tan S : 9.0971$$

$$\frac{1}{2} : 8.5239$$

$$(S') : 0.8756$$

$$(g) : 9.1711$$

$$f : + 0.13$$

$$g : + 0.15$$

$$h : + 1.04$$

$$+ 1.30$$

$$\log \cos S \quad 9.9519$$

$$\dots L \quad 0.8819$$

$$\dots (L) \quad 0.8333$$

$$\sin S \quad 9.6490$$

$$\sin(H + \alpha) \quad 9.8338$$

$$h \quad 1.2787$$

$$\sin \quad 9.8641$$

$$\sec S \quad 0.0492$$

$$\frac{1}{2} : 8.8239$$

$$\log(h) \quad 0.7615$$

$$\dots (h) \quad 0.0159$$

$$g' : + 7.51$$

$$h' : + 5.77$$

$$L : - 6.81$$

$$+ 6.47$$

1674 Moon's Mean Position (1912.0)

$X_0 = 17.6000''$	$Y_0 = 20.7730''$	Given (4) Bull. wt.
$\frac{1}{2}a = -36''$	$\frac{1}{2}b = -2''$	$X = 17.6000$
17.5964	20.7728	17.5957

From Plate Constant $X = 17.6530''$ $Y = 20.8487''$
(17.6523)

$$\bar{z} = -0.3470'' \quad (-0.3477) \quad \eta = -1.7513''$$

$\log \bar{z} = 9.54033''$	(9.54120)	$\log \tan \delta = 9.6946$
$\log \bar{z} = 9.95194''$		$\bar{z} = 9.0807$
$\log \bar{z} = 8.50724$		$\eta = 5.8287$

$$(\alpha - A) = 108115'' \quad (108202) \quad \eta_1 = +1''$$

$$\alpha - A = -12.05'' \quad (-12.08) \quad \eta_0 = -1.1514''$$

$\delta = 7^\circ 39' 20''$	$\Delta \eta = 0.06123''$
	$733115''$

$$\alpha_0 = 7^\circ 39' 07.95'' \quad (07.92)$$

$$(\delta - D) = 2.73008''$$

$$Red = +1.32$$

$$S - D = -8.571''$$

$$\alpha' = 7^\circ 39' 09.27'' \quad (09.24)$$

$$D = +26^\circ 36' 42''$$

$$S_0 = +26^\circ 27' 44.9''$$

$$Red = +65$$

$$S' = +26^\circ 27' 51.4''$$

1674 known mean Position (1912.0)

$$\begin{array}{r} X = 17.6000 \quad Y = 20.7730 \\ - .36 \quad - .2 \\ \hline 17.5964 \quad 20.7728 \end{array}$$

$$\begin{array}{r} \text{Given (41 bull wt)} \\ X = 17.6000 \\ - .43 \\ \hline 17.5957 \end{array}$$

From Plate Constant $X = 17.6530 \quad Y = 20.8487$
(17.6523)

$$\bar{z} = -0.3470 \quad (-0.3477) \quad \eta = -1.2513$$

$$\begin{array}{r} \log \bar{z} = 9.59033 \sim (9.59120) \quad \log 1/\bar{z} = 9.6946 \\ \log \bar{z} = 9.95194 \quad \bar{z} = 9.0807 \\ \log \bar{z} = 8.50724 \quad \eta = 5.8287 \end{array}$$

$$(x-A) = 1.08115 \sim (1.08202) \quad \eta_1 = +1$$

$$x-A = -1.205 \quad (-12.08) \quad \eta_0 = -1.1514$$

$$\begin{array}{r} \lambda = 7 \quad 39 \quad 20 \quad \log \lambda = 0.06123 \sim \\ \lambda = 7 \quad 39 \quad 07.95 \quad (0.192) \quad 7.33115 \end{array}$$

$$\alpha_0 = 7 \quad 39 \quad 07.95 \quad (0.192) \quad (d-D) = 2.73008 \sim$$

$$\text{Red} = +1.32$$

$$\alpha' = 7 \quad 39 \quad 09.27 \quad (0.24)$$

$$S-D = -8.57.1$$

$$D = +26.36.42$$

$$S_0 = +26^{\circ} 27' 44.9''$$

$$\text{Red} = +6.5$$

$$S' = +26 \quad 27 \quad 51.4$$

1674

Lunar Parallax

$$\begin{aligned} \alpha' &= 7^h 39^m 09.27^s \quad (09.24) \\ \theta &= 6.08 \quad 30.8^{\circ} \\ 0 - \alpha' &= -1 \quad 30 \quad 38.4^{\circ} \\ &= -22 \quad 39' \quad 36'' \end{aligned}$$

$$\begin{aligned} &= -9 \quad 37 \\ &= -22 \quad 29 \quad 59 \end{aligned}$$

$$\begin{aligned} &9.95727^{\circ} \\ &0.00000 \\ &0.03438^{\circ} \\ &9.99165^{\circ} \end{aligned}$$

$$y = 44 \quad 27 \quad 00$$

$$26 \quad 27 \quad 52^{\circ}$$

$$y - \delta = 17 \quad 59 \quad 08^{\circ}$$

$$\begin{aligned} &9.82640^{\circ} \\ &8.24373^{\circ} \\ &9.48964^{\circ} \\ &0.15472^{\circ} \\ &7.71449^{\circ} \end{aligned}$$

$$\delta - \delta' = +17 \quad 48.9^{\circ}$$

$$\delta + 26^{\circ} 45' 40.3^{\circ}$$

$$\text{Cum Eph } \delta = +26.45 \quad 40.7^{\circ}$$

$$0 - c = -0.4^{\circ}$$

$$\text{Cor to star, radius} = -0.1$$

$$= 0.5$$

$$\delta' = +26^{\circ} 27' 51.4^{\circ}$$

$$\pi = 60' 15.6^{\circ}$$

$$\begin{aligned} &9.86913^{\circ} \\ &8.24373^{\circ} \\ &9.58576^{\circ} \\ &0.04920^{\circ} \\ &7.74782^{\circ} \end{aligned}$$

$$\alpha - \alpha' = -19' 19.1^{\circ}$$

$$= -1^m 16.94^{\circ}$$

giving (4) full wt.
(52.30)

$$\alpha = 7^h 37^m 52.33^s$$

$$\alpha = 7 \quad 37 \quad 51.24^{\circ}$$

$$\begin{aligned} &+ 1.09^{\circ} \\ &(+ 1.06) \end{aligned}$$

$$+ 0.3$$

$$+ 1.09$$

1679 ~~human~~ Parallax

21

$$\begin{array}{r}
 \alpha - 7 \quad 39 \quad 09.27 \quad (09.24) \\
 0 \quad 6 \quad 0.8 \quad 30.8 \\
 0 - \alpha \quad -1 \quad 30 \quad 38.4 \\
 \quad \quad -22 \quad 39' \quad 20''
 \end{array}$$

$$-9 \quad 37$$

$$-22 \quad 29 \quad 43$$

$$9.95727$$

$$000000$$

$$003436$$

$$999163$$

$$y \quad 44 \quad 26 \quad 53$$

$$26 \quad 27 \quad 52$$

$$\delta - S \quad 17 \quad 59 \quad 01$$

$$9.82640$$

$$824373$$

$$944960$$

$$015474$$

$$7.71447$$

$$S - \delta' = +17 \quad 48.8$$

$$S + 26^\circ \quad 45' \quad 40.3$$

$$\text{Circ Eph } S = +26 \quad 45 \quad 40.7$$

$$O - C \quad = \quad 0.4$$

$$\text{Cor to H\&m. readings} = -0.1$$

$$= 0.5$$

$$S = +26^\circ \quad 27' \quad 51.4$$

$$\pi \quad 60 \quad 156$$

$$9.86413$$

$$824373$$

$$958596$$

$$004920$$

$$774782$$

$$\alpha - \alpha' = -19' \quad 14.87$$

$$= -1' \quad 16.94$$

Primary (4) full wt
(5230)

$$\alpha - 7 \quad 37 \quad 52.33$$

$$\alpha = 7 \quad 37 \quad 51.24$$

$$+ 1.09$$

$$(+ 1.06)$$

$$+ 0.3$$

$$+ 1.09$$

MC1675

1913 Oct 6

22

Star - Measures

	d	N	d	N
1	19090	18842	15630	15028
4.6	11425 ²⁰	16490 ⁰⁴	11949 ⁵⁵	8660 ⁶¹
11.8	30 ³⁰	95	55 ⁵⁵	62
	80	32	17	10
	<u>11.7656</u>	<u>7656</u> ✓	<u>46328</u>	<u>.6354</u>
2	18000	17860	14200	13450 ⁵⁰
10.0-	95-35 ³⁴	16331 ³⁵	14038 ³⁰	14250 ⁵⁰
24.8	2424	40	30	13290
	06	43		
	<u>14.8476</u>	<u>.8477</u>	<u>9.9833</u>	<u>.9840</u>
3	17240	15680	11900 ⁰⁰	16458
27.1	14920 ²⁰	7990 ⁰³	03	15675 ⁷⁷
21.3	20	0092	11130	80
	44	73		
	<u>212321</u>	<u>.2320</u>	<u>27.0771</u>	<u>.0781</u>
4	15730	14344	16350	14838
29.2	12300 ⁰⁰	7765	7930 ³¹	13210 ⁰⁷
12.4	00	5859	35	05
	10	34	28	23
	<u>12.3423</u>	<u>.3422</u>	<u>29.1601</u>	<u>.1629</u>

Grade 2.

1161675-

1913 Oct 6

22

Stars: Measured.

	d	N	d	N
1	19090	18842	15630	15023
46	1142520	1649004	1194955	866061
118	3030	95	5555	6261
	80	32	17	10
	<u>117656</u>	<u>76564</u>	<u>46328</u>	<u>6354</u>
2	18000	17860	14200	1345050
100	953534	1633135	1403830	105050
248	2424	40	20	13290
	06	43		
	<u>148476</u>	<u>8477</u>	<u>99833</u>	<u>9840</u>
3	17240	15680	1170000	16458
271	1492020	799092	03	1567577
213	20	0092	11130	8077
	44	73		
	<u>212321</u>	<u>2320</u>	<u>270771</u>	<u>0781</u>
4	15730	14349	16350	14838
292	1230000	77615	793031	1321007
124	00	5859	3131	0507
	10	39	28	23
	<u>173423</u>	<u>3422</u>	<u>291601</u>	<u>1629</u>

Grade 2.

MC 1678

1913 Oct 6

23

moon-measures

d 4

n

d^{2c}

w

1. scratch.

17.6	18905	18700	13942	14720
19.3	7696060	10625	899000	9660
	60	2026	05	6868
	00	80	40	20
	<u>19.1944</u>	<u>1940</u>	<u>17.5057</u>	<u>5056</u>

2

17.0	18928	18650
19.6	123555	1514852
	9885	4052
	18	40
	<u>19.6532</u>	<u>6500</u>

3

16.7		19100	17745
20.0		16865	994288
		5852	30
		87	29
		<u>16.7761</u>	<u>7795</u>

4

16.6		18016	16880
21.0		13310	1153930
min		20	39
in		1.0	70
2		<u>16.5302</u>	<u>5339</u>

5

16.8		17815	16920
22.0		15650	208087
		60	8087
		15	20
		<u>16.7838</u>	<u>7839</u>

6

17.0	15575	15487	15575
22.3	2220712	880040	2220712
	07	1500	07
	73	80	73
	<u>22.3365</u>	<u>3332</u>	

1912phae

1912phae

23

1912phae

d 4

d 4

d 4

d 4

1. Sarahel.

176	18905	18700	13942	14720
193	1696060	10625	899000	9660
	60	2026	0500	6308
	00	80	40	20
	<u>191944</u>	<u>1940</u>	<u>175057</u>	<u>1056</u>

170	18928	18650
196	129855	1514852
	9885	40
	18	40
	<u>196532</u>	<u>6500</u>

3	19100	17745
167	16865	994288
20.0	5852	30
	87	29
	<u>167761</u>	<u>7795</u>

4	18016	16880
166	13310	1153930
21.0	20	39
mm	1.0	70
2	<u>165302</u>	<u>5329</u>

5	17815	16920
168	1565050	9080
22.0	60	6089
	15	20
	<u>167838</u>	<u>7839</u>

6	15575	15487
170	1220712	880040
22.2	07	1500
	73	80
	<u>223365</u>	<u>3332</u>

18
2
8
18
23
27

11101675

d

4

7 12340
 18.0 11989
 23.1 706080

23.0367

191300ct 6.

d

w

24.

938180
 6180
 9010

.0364fuzzy
point

8/
 18.6 15310
 23.2 1385-229
 may 35-15-2
 00
 23.1450

15586
 701005
 0205
 75-
1429

fuzzy
point

11101675

d

4

$\begin{array}{r} 7 \\ 180 \\ 231 \end{array} \begin{array}{r} 12340 \\ 11989 \\ 706080 \end{array}$

230367

$\begin{array}{r} 8 \\ 186 \\ 232 \\ \text{max} \\ 7 \end{array} \begin{array}{r} 15310 \\ 1385229 \\ 35152 \\ 00 \\ 23.1450 \end{array}$

$\begin{array}{r} 938180 \\ 6180 \\ 9010 \end{array}$

0364

$\begin{array}{r} 15586 \\ 701005 \\ 02 \\ 75 \\ 1429 \end{array}$

1913 Oct 6

d

N

24

fuzzy front

fuzzy front

MC 1675

1913 Oct 6

25

Plate Constants

2	4.6341	9.9836	27.0786	29.1615
3	4.4702	9.6430	26.7929	28.9903
2-3	+1639	+3406	+2857	+1712
4	11.7656	24.8476	21.2320	12.3422
4-4	11.3081	24.4602	21.0649	12.1996
4-4-4	+4575	+3874	+1671	+1426

$$\begin{array}{rclcl}
 x - \bar{x} & -128.84 & +12 & -125 \\
 +1639 & -1515 & +124 & +0 & +124 & = -1 \\
 +3406 & -3200 & +206 & +1 & +207 & = \text{reject} \\
 +2857 & -2735 & +122 & +3 & +125 & = 0 \\
 +1712 & -1590 & +122 & +3 & +125 & = 0 \\
 18.6806 & -2704 & & +2 & & = 18.3979 \checkmark
 \end{array}$$

$$\begin{array}{rclcl}
 y - \bar{y} & +128.32 & +2.64 & -5200 \\
 +4575 & +595 & +5170 & +31 & +5201 & = +1 \\
 +3874 & +1281 & +5155 & +65 & +5220 & = \text{reject} \\
 +1671 & +3474 & +5145 & +55 & +5200 & = 0 \\
 +1426 & +3741 & +5167 & +32 & +5199 & = -1 \\
 20.9954 & +2397 & & +55 & & = 20.7206 \checkmark
 \end{array}$$

$$\begin{array}{llll}
 \text{Tables } a = +0.7 & c = +0.7 & a - c = 0.0 & b + d = +0.0 \\
 \text{Obs } a = -0.1 & c = -2.6 & a - c = +2.5 & b + d = +0.5
 \end{array}$$

MC 1073

19.3 Oct 6

25

Plate Count

2	46341	99838	270786	291615
3	44702	96430	267929	289903
c-3	+1639	+3406	+2857	+1712
7	117656	248476	212320	123422
7	113081	244602	210649	121996
497	+4575	+3874	+1671	+1426
77				

c-3	-12889	+12	-121
+1639	-1515	+12450	+124
+3406	-3200	+206	+1207
+2857	-2735	+122+3	+125
+1712	-1590	+122+3	+125
186806	-2709	+2	= 183979

7-7	+12832	+267	-5200
+4575	+595	+5170	+31
+3874	+1281	+5155	+65
+1671	+3479	+5195	+55
+1426	+3741	+5167	+32
0.9959	+2397	+55	= 20.7206

Tables a = +0.7 c = +0.7 a - c = 0.0 b + d = +0.0
 Obs a = -0.1 c = -2.6 a - c = +2.5 b + d = +0.1

1675

Times etc.

Uph. testan	1912 Feb 28	6 ^h 14 ^m	- 6 ^h 26 ^m
.. known		6 20	18.4 ^v - 6 20 18.8 ^v
Clock slow		1	46.8 ^v
H. sid T.		6 22	054 ^v 6-22-1 ^m 16 ^m
H. comp.		4 44	3 1.05 ^v
G. sid T.		1 1 06	36.45 ^v
Sid T. unknown		22 27	47.84 ^v
Interval		12 38	48.61 ^v
Reduction		2	04.31 ^v
G. M. T.		12 36	44.30 ^v

From Kant Alman

R.A.

Decl.

known 12 ^h	7 36	48.52 ^v	+ 26 47	59.9 ^v
unknown 1 ^m 2.703 ^v				5.02 ^v
" - 36.7383 ^v	+ 1	39.32 ^v	- 3	41.2 ^v
Tabula place	7 38	27.84 ^v	+ 26 44	18.7 ^v

Moon's age 11 days

934: 14.55^v
 987: 1.6.2

parallel
 perpendicular

60' 15.8^v
 16 26.8^v
 R 986.8^v

Argument (2)
 Irradiation (2)

2 16.2^v
 - 0.5^v

R

1002.5^v

R

2.1490^v

a = - 0.1

(1+a)R
 R²

2
 4.6182^v

11.75°

Times etc

Sept. 17 th 1912	28	6	19	- 6	26
known		6	20	18.9	6 20 18.8
Unobserved			1	46.8	

H. Ind. T.		6	22	059	0-2-1	16
Wharf		7	44	310.5		
G. Ind. T.		1	1	06	364.5	
Sept. 18 th known		2	27	478.9		
Ind. Ind.		1	2	38	486.1	
Reduction				2	093.1	
G. Ind. T.		1	2	36	443.0	

From Hart's Album

R.C.

R.C.

known 18 th	7	3.6	48.52	726	47	599
Unobserved 1 st 27035				599.5		
" 36.7383	7	1	3932	-	3	40.2
Tabula place	7	38	2784	726	44	197

Arrows & ga 11 days

934 1915	franchises	60	158
987 162	franchises	16	268
	R		9868
	Amplitude (2)		1162
	Intensity (2)		- 0.5
	R		10025
	R		21490
G - 0.1	(11a) R		2
	R ²		9.6142

pt	pos L	resid.
1	213.2	+67
2	231.5	+120
3	242.5	-70
4	270.0	-2
5	297.7	-114
6	308.5	+1
7	341.5	+115
8	0.0	+43

1675

Moon's Center

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$o - c$
1	17.5056	-1.1784	1.3886	4.6243	+ 61
2	17.0000	-1.6840	2.8359	4.6353	+ 171
3	16.7778	-1.9062	3.6336	4.6196	+ 14
4	16.5316	-2.1524	4.6328	4.6328	+ 146
5	16.7838	-1.9002	3.6108	4.6248	+ 66
6	17.0000	-1.6840	2.8359	4.6364	+ 182
7	18.0000	-0.6840	0.4679	4.6442	+ 260
8	18.6840	0.0000	0.0000	4.6328	+ 146

Comp R = 4.6182

	y	$y - y_0$	$y - y_0$
1	19.1942	-1.7988	3.2357
2	19.6516	-1.3414	1.7994
3	20.0000	-0.9930	0.9860
4	21.0000	+0.0070	0.0000
5	22.0000	+1.0070	1.0140
6	22.3348	+1.3418	1.8005
7	23.0366	+2.0436	4.1763
8	23.1454	+2.1524	4.6328

Alpha Center

$$x = 17.0 \quad y = 19.6516$$

$$22.3348$$

$$41.9864$$

$$y_0 = 20.9932$$

$$y_{\text{max}} = 23.1454$$

$$R = 2.1522$$

$$x_{\text{min}} = 16.5316$$

$$x_0 = 18.6838$$

$$\text{Center } \begin{cases} x_0 = 18.6840 \\ y_0 = 20.9930 \end{cases}$$

1675

Nervous Center

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	17.5056	-1.1784	1.3886	4.6243	+ 6.1
2	17.0000	-1.6840	2.8359	4.6353	+ 1.71
3	16.7778	-1.9062	3.6336	4.6196	+ 1.4
4	16.5316	-2.1524	4.6328	4.6328	+ 1.46
5	16.7838	-1.9002	3.6108	4.6248	+ 6.6
6	17.0000	-1.6840	2.8359	4.6364	+ 1.82
7	18.0000	-0.6840	0.4679	4.6442	+ 2.60
8	18.6840	0.0000	0.0000	4.6328	+ 1.96

Comp R = 4.6182

	y	$y - y_0$	$y - y_0$
1	19.1942	-1.7988	3.2357
2	19.6516	-1.3414	1.7994
3	20.0000	-0.9930	0.9860
4	21.0000	+0.0070	0.0000
5	22.0000	+1.0070	1.0140
6	22.3348	+1.3418	1.8005
7	23.0366	+2.0436	4.1763
8	23.1454	+2.1524	4.6328

Center

$x = 17.0$	$y = 19.6516$
	<u>22.3348</u>
	41.9864
$y_0 =$	20.9932
$y_{max} =$	23.1454
$R =$	21.522
$x_{min} =$	16.5316
$x =$	18.6838

Center $\left\{ \begin{array}{l} x_0 = 18.6840 \\ y_0 = 20.9930 \end{array} \right.$

Formation of Normals

	ab	ac	bc
1	+ 2.12	- 72.0	- 109.8
2	+ 2.25	- 287.0	- 229.4
3	+ 1.89	- 26.7	- 13.9
4	- 0.02	- 314.0	+ 1.5
5	- 1.92	- 125.2	+ 66.6
6	- 2.25	- 305.6	+ 244.0
7	- 1.39	- 176.9	+ 530.3
8	+ 0.00	- 0.0	+ 314.0
	+ 0.68	- 1307.4	+ 803.3

1675

Moon's Center

Conditional Equations

	a	b	0		c	0-c
1	-1.18	-1.80	+61	+ 81 - 87 = -	6	+ 67
2	-1.68	-1.34	+171	+ 116 - 65 = +	51	+120
3	-1.91	-0.99	+14	+ 132 - 48 = +	84	-70
4	-2.15	+0.01	+146	+ 148 + 0 = +	148	-2
5	-1.90	+1.01	+66	+ 131 + 49 = +	180	-114
6	-1.68	+1.34	+182	+ 116 + 65 = +	181	+1
7	-0.68	+2.04	+260	+ 47 + 98 = +	145	+115
8	0.00	+2.15	+146	- 0 + 103 = +	103	+43

Average = 66

Normal Equations

$$+ 19.41 + 0.68 = -1307$$

$$+ 0.68 + 17.64 = +803$$

$$- 0.68 - 0.02 = + 46$$

$$+ 17.62 = + 849$$

$$b = +48.0$$

$$+ 19.41a = -1307 - 33 = -1340$$

$$a = -69.0$$

1675

Innovis Center

Constitutional Equation

	a	b	0		c	0-c
1	-1.18	-1.80	+61	+ 81 - 87	- 6	+ 67
2	-1.68	-1.34	+171	+ 116 - 65	+ 51	+ 120
3	-1.91	-0.99	+14	+ 132 - 98	+ 84	- 70
4	-2.15	+0.01	+146	+ 148 + 0	+ 148	- 2
5	-1.90	+1.01	+66	+ 131 + 99	+ 180	- 114
6	-1.68	+1.34	+182	+ 116 + 65	+ 181	+ 1
7	-0.68	+2.04	+260	+ 47 + 98	+ 145	+ 115
8	0.00	+2.15	+146	- 0 + 103	+ 103	+ 43

Average: 66

Normal Equations

$$+ 19.41 + 0.68 = -1307$$

$$+ 0.68 + 17.64 = +803$$

$$- 0.68 - 0.02 = + 46$$

$$+ 17.62 + 849$$

$$b = +480$$

$$+ 19.41 - 1307 - 33 = -1340$$

$$a = -69.0$$

Red. ad. l. app.

$$\begin{array}{rcl}
 H + \alpha & 3 & 09 = 47^\circ 15' \\
 H & 19 & 30 \\
 \alpha & 7 & 39.5 \\
 G & 18 & 24 \\
 G + \alpha & 2 & 03 = 30^\circ 45'
 \end{array}$$

$$\begin{array}{rcl}
 l \cos(G + \alpha) & 9 & 9342 \\
 g & 0 & 9414 \\
 \sin & 9 & 7087 \\
 \tan S & 9 & 6968 \\
 \frac{1}{\sin} & 5 & 8239 \\
 g' & 0 & 8756 \\
 g & 9 & 1708
 \end{array}$$

$$\begin{array}{rcl}
 p & = & +0.13 \\
 q & & +0.15 \\
 r & & +1.04 \\
 \hline
 & & +1.32
 \end{array}$$

$$\begin{array}{rcl}
 S & 1 & 26 \quad 27 \\
 l \cos S & 9 & 9520 \\
 i & 0 & 8816 \\
 (i) & 0 & 8336
 \end{array}$$

$$\begin{array}{rcl}
 l \sin S & 9 & 6488 \\
 \cos(H + \alpha) & 9 & 8317 \\
 h & 1 & 2788 \\
 \sin & 9 & 8659 \\
 \sec S & 0 & 0480 \\
 \frac{1}{\sin} & 8 & 5239 \\
 h' & 0 & 7593 \\
 h & 0 & 0166
 \end{array}$$

$$\begin{array}{rcl}
 g' & + & 7.51 \\
 g' & + & 5.75 \\
 i & - & 6.82 \\
 \hline
 & + & 6.44
 \end{array}$$

1675 Moon's Mean Position (1912.0)

$$\begin{array}{r}
 X_0 = 18.6840 \\
 \text{cor} = -34 \\
 \hline
 18.6806
 \end{array}
 \quad
 \begin{array}{r}
 Y_0 = 20.9930 \\
 \text{cor} = +24 \\
 \hline
 20.9954
 \end{array}$$

From Plate Constants $X = 18.3979$ $Y = 20.7206$

$$z = +0.3979$$

$$\eta = -1.2794$$

$$\begin{array}{r}
 \log 3 = 9.59977 \\
 995199 \\
 8.50724
 \end{array}$$

$$\begin{array}{r}
 \log \tan 5 = 9.6968 \\
 91995
 \end{array}$$

$$\eta_1 = 59497$$

$$114054$$

$$\eta_2 = +1$$

$$9 - A = +13.82$$

$$\eta_0 = -1.2795$$

$$A = 7 \quad 39 \quad 20$$

$$\begin{array}{r}
 \log = 0.10704 \\
 7.33115
 \end{array}$$

$$A_0 = 7 \quad 39 \quad 33.82$$

$$(S-D) = 2.77589$$

$$Red = +1.32$$

$$S-D = -9 \quad 56.9$$

$$x' = 7 \quad 39 \quad 35.14$$

$$D = +26 \quad 36 \quad 42$$

$$S_0 = +26^{\circ} \quad 26' \quad 45.1''$$

$$Red = +6.4$$

$$S' = +26^{\circ} \quad 26' \quad 51.5''$$

1675 Known Mean Position (1912.0)
 $X_0 = 18.6840$ $Y_0 = 20.9930$
 $\Delta X = -34$ $\Delta Y = +24$
 18.6806 20.9954

From Plate Constants $X = 18.3979$ $Y = 20.7206$

$$z = +0.3979$$

$$u = -1.2794$$

$$\log z = 9.59977$$

$$9.95199$$

$$8.50724$$

$$1.14054$$

$$\log \tan \delta = 9.6968$$

$$9.1495$$

$$m = 5.9497$$

$$m_0 = +1$$

$$q - A = +1.382$$

$$q_0 = -1.2795$$

$$A = 7.3920$$

$$\log = 0.10704$$

$$7.33115$$

$$q_0 = 7.393382$$

$$(d-D) = 2.77589$$

$$Red = +1.32$$

$$\delta - D = 9.569$$

$$d' = 7.393514$$

$$D = +26.3642$$

$$\delta_0 = +26.26451$$

$$Red = +64$$

$$S' = +26.26515$$

$$\begin{array}{rcl}
 1675 & \text{Lunar paralax.} & \\
 \delta' = 7 & 39 & 35.14'' \\
 \theta = 6 & 22 & 05.4'' \\
 \theta - \alpha = -1 & 17 & 29.7'' \\
 & = & -19^\circ 22' 26''
 \end{array}$$

$$- \quad 8 \quad 16''$$

$$19 \quad 14 \quad 10''$$

$$\begin{array}{r}
 9.95727'' \\
 9.00000'' \\
 \hline
 002495'' \\
 9.98222''
 \end{array}$$

$$\delta = 43 \quad 49 \quad 40''$$

$$\delta = 26 \quad 26 \quad 52''$$

$$17 \quad 22 \quad 48''$$

$$\begin{array}{r}
 9.82640'' \\
 8.24376'' \\
 9.47525'' \\
 \hline
 0.15958'' \\
 770499''
 \end{array}$$

$$\delta - \delta' = +17 \quad 25.7''$$

$$\delta = +26 \quad 44 \quad 17.2''$$

$$\text{Ann Ecl} \quad \delta = +26 \quad 44 \quad 18.7''$$

$$\theta - \alpha = -1.5$$

$$\delta' = +26^\circ 26' 51.5''$$

$$\pi = 60' 15.8''$$

$$9.86913''$$

$$8.24376''$$

$$9.52079''$$

$$004912''$$

$$768280''$$

$$\alpha - \alpha' = -16' 33.64''$$

$$= -1'' 06.24''$$

$$\alpha = 7 \quad 38 \quad 28.90''$$

$$\alpha = 7 \quad 38 \quad 27.84''$$

$$+1.06''$$

1075

~~Lunar parallaxes~~

$$\delta' = 7' \quad 39'' \quad 35.14$$

$$\delta = 6' \quad 22'' \quad 05.4$$

$$\delta - \delta' = -1' \quad 17'' \quad 29.7$$

$$= -19'' \quad 22' \quad 20''$$

$$= \quad \quad \quad 8' \quad 16''$$

$$19' \quad 19' \quad 10''$$

$$995727$$

$$900000$$

$$002495$$

$$998222$$

$$\delta = 43' \quad 49'' \quad 40$$

$$\delta = 26' \quad 26'' \quad 52$$

$$17' \quad 22'' \quad 48$$

$$982640$$

$$824376$$

$$949525$$

$$015458$$

$$770499$$

$$\delta - \delta' = \quad \quad \quad 17' \quad 25.7''$$

$$\delta = 26' \quad 44'' \quad 17.2$$

$$\alpha = 7' \quad 38'' \quad 28.98$$

$$\text{Circ. Error } \delta = 26' \quad 44'' \quad 18.7$$

$$\alpha = 7' \quad 38'' \quad 27.84$$

$$\delta - \delta' = \quad \quad \quad 1.5''$$

$$+ 10.6''$$

$$S = +26^\circ \quad 26' \quad 51.5''$$

$$\pi = 60' \quad 15.8''$$

$$986913$$

$$824376$$

$$952079$$

$$004912$$

$$768280$$

$$\alpha - \alpha' = -16' \quad 33.69''$$

$$= -1' \quad 06.24''$$

