

KG

11366

v. 902



Volume XXVI

Plate No.

1413.



1446

1445

Harvard Lunar Plates.

Measures and Reductions

Mary Fowler.

Volume XXVI

Plate No.	Date	Page
1413	1911 Nov. 13	1
1446	1911 Nov. 29	9
1445	1911 Nov. 29	19

1
1
2

2
2
2

3
20
11

INC 1413

1973 June 17

Stars - Measures

	a	w	d	x
1	17418	17241	16449	17862
112	815750	1647575	832627	1594851
23.9	51	80	20	40
	00	16	20	62
	<u>23.9249</u>	<u>.9238</u>	<u>11.1898</u>	<u>.1916</u>
2				
207	14841	14320	15022	16700
28.7	828089	1088786	1166560	1006869
	80	80	60	70
	20	30	00	10
	<u>28.6544</u>	<u>.6561</u>	<u>20.6648</u>	<u>.6638</u>
3				
29.4	18801	14781	18410	15685
111	1757072	602614	1229085	1176569
	68	19	90	60
	80	86	78	85
	<u>11.1228</u>	<u>.1231</u>	<u>29.3898</u>	<u>.3921</u>

Re-measure (2) direct

15858
 9302
 0003
 53
28.6553

17495
 1413526
 3030
 95
20.6635

WIC 1413

1913 June 17

Stars - Measures

	a	v	a	v
✓	17418	17241	16449	17862
112	815750	1647575	832627	1594851
239	51	80	20	40
	00	16	20	62
	<u>23.9249</u>	<u>9238</u>	<u>11.1898</u>	<u>1916</u>
27	14841	14320	15022	16700
87	8250	1088786	1166560	1006869
	8089	80	60	70
	20	30	00	10
	<u>28.6544</u>	<u>6561</u>	<u>20.6648</u>	<u>6638</u>
3				
74	18801	14781	18410	15685
1	17570	602614	1229085	1176569
	6872	19	90	60
	80	86	78	85
	<u>11.1228</u>	<u>1231</u>	<u>293898</u>	<u>3921</u>

Re-measure (2) direct

15858	17495
9302	1413526
0003	3030
53	95
<u>286553</u>	<u>20.6635</u>

M.C. 1413

Moon-measures

1913 June 17.

2

$\frac{1}{d}$	d	N	d	N
18.0 20.6	19120 1277368 67 10 <u>20.6345</u>	18904 1524049 30 10 <u>.6334</u>		
18.5 20.7	18155 1076063 64 35 <u>20.7378</u>	18890 1626062 58 80 <u>.7373</u>	18065 12710 0820 50 <u>18.4656</u>	17130 1245668 60 26 <u>.4667</u>
19.0 21.01	10907 1086063 60 <u>21.0046</u>	1142224 1824 11371 <u>0052</u>		
19.7 22.0			16422 1388584 84 90 <u>19.7470</u>	17602 1010520 20 00 <u>.7486</u>
19.8 22.5 max N			15438 1408589 80 08 <u>19.8651</u>	16571 790995 0595 75 <u>.8671</u>
19.8 23.0			14448 1285050 49 30 <u>19.8405</u>	15566 714847 40 58 <u>.8414</u>

M61413

1913 June 17

2

Moon - measures

$\frac{1}{2}$	d	4	N
150	19120	18904	
206	1277368	1524049	
	67	30	
	10	10	
	<u>206345</u>	<u>6334</u>	

3 scratch

18.5	18155	18890	18065	17130
207	1076063	1626062	12710	1245668
	64	58	0820	6068
	35	80	50	26
	<u>20.7378</u>	<u>7373</u>	<u>184656</u>	<u>.4667</u>

$\frac{3}{4}$	150	10907	1142228
	210	1086063	1528
		60	
	<u>21.0046</u>	<u>11371</u>	
		<u>0052</u>	

$\frac{4}{5}$	197	16422	17602
	220	1388584	101052020
		84	20
		90	00
		<u>197470</u>	<u>7486</u>

$\frac{5}{6}$	198	15438	16571
	225	1408589	7909
	max	80	0595
	π	08	75
		<u>198651</u>	<u>8671</u>

$\frac{6}{7}$	198	14448	15566
	230	1285050	714847
		49	40
		30	58
		<u>198405</u>	<u>8414</u>

MC1413

1913 June 17. 3

Phon - Measures.

d

y

v

d

x

v

$$\begin{array}{r} 7 \\ 19.4 \\ \hline 24.0 \end{array}$$

$$\begin{array}{r} 18417 \\ 1238088 \\ 7288 \\ 02 \\ \hline 19.3972 \end{array}$$

$$\begin{array}{r} 15480 \\ 1449010 \\ 60 \\ 85 \\ \hline 3982 \end{array}$$
8

$$\begin{array}{r} 19.0 \\ 24.4 \\ \hline \end{array}$$

17410

13665

64 59

90

$$\begin{array}{r} 24.3739 \\ \hline \end{array}$$

18311

12068

50 64

24

$$\begin{array}{r} 3742 \\ \hline \end{array}$$

11C 1413

1913 June 17. 3

Moon - Measures

d

y

v

d

x

v

$$\begin{array}{r} 7 \\ 194 \\ 243 \end{array}$$

$$\begin{array}{r} 18417 \\ 123.8088 \\ 7288 \\ 02 \end{array}$$

$$\begin{array}{r} 15480 \\ 1049010 \\ 60 \\ 85 \end{array}$$
193972
3982
8

$$\begin{array}{r} 190 \quad 17410 \\ 244 \quad 13665 \\ \quad 64 \quad 59 \\ \quad 90 \\ \hline 243739 \end{array}$$

$$\begin{array}{r} 18311 \\ 1206864 \\ \quad 50 \\ \quad 24 \\ \hline 3742 \end{array}$$

MC 1413

1913 June 17 4

Plato constant

x	11.1907	20.6636	293910
β	11.9677	21.4632	30.1156
$x-\beta$	-7770	-7996	-7246
y	239244	28.6557	111230
η	22.9623	27.6534	10.0756
$y-\eta$	+9621	+1.0023	+1.0474

$$\begin{array}{rclcl}
 x-\beta & +43.84 & & +2x & +6700 \\
 -7770 & +1048 & = & -6722+22 & = -6700 \\
 -7996 & +1255 & = & -6741+41 & = -6700 \\
 -7246 & +486 & = & -6760+59 & = -6701 \\
 \text{moon} & 17.7960 & + & 994 & +36 \\
 & & & & = 18.5690
 \end{array}$$

$$\begin{array}{rclcl}
 y-\eta & -44.22 & & +3.84 & -9218 \\
 +9621 & -495 & = & +9126+91 & = +9217 \\
 +1.0023 & -913 & = & +9110+109 & = +9219 \\
 +1.0474 & -1299 & = & +9175+42 & = +9217 \\
 \text{moon} & 22.6923 & - & 987 & +86 \\
 & & & & = 21.7004
 \end{array}$$

From Tables $b+a = +1.3$
 observations $+0.4$

$a = -1.0$ $c = -2.5$
 -2.0 -3.8

MC 1413

1913 June 17 4

Plate constant

x	11.1907	20.6636	293910
y	11.9677	21.4632	301156
z	-7770	-7996	-7246
u	239244	286557	111230
v	22.9623	27.6534	100756
w	+9621	+10023	+10474

2-3	+4384	+22	+6700
-7770	+1048	-6722+22	-6700
-7996	+1255	-6741+41	-6700
-7246	+486	-6760+59	-6701
177960	+994	+36	=185690

9-11	-9422	+384	-9218
+9621	-495	+9126+91	+9217
+10023	-913	+9110+109	+9219
+10474	-1299	+9175+42	+9217
226923	-987	+86	=217004

From Tables $b + a = +1.3$
 observation $+0.4$

$\alpha = -1.0$
 -2.0
 $\alpha = -2.5$
 -3.8

MC1413 Times etc 5

Substation 1911 Nov 13

moon	8 ^h 54 ^m	-9 ^h 06 ^m
clock slow	9 00 30.2 ^v	9 00 30.8 ^v
	0 44.5 ^v	
H. Sid T	9 01 15.0	
H. long.	4 44 31.05 ^v	
G. Sid T	13 45 46.05 ^v	
Sid T. M. Moon	15 25 56.17 ^v	
Interval	22 19 49.88 ^v	
Reduction	3 39.50 ^v	
G. M. T.	22 16 10.38 ^v	

From Kant. Alm.	R. A. / local
Moon 22 ^h	10 ^h 34 ^m 06 ^s 19 +13 42 32.2 ^v
Motion 1 ^m	21075 ^v 14.177 ^v
" 16.173 ^v	34.08 ^v - 3 49.3 ^v
Tabular place	-10 34 40.27 ^v +13 38 42.9 ^v
Moon's parallax	57' 56" ^v
Scintillation	15 489 ^v

MC1413 Taurus etc 5
 Sub station 1911 Nov 13 8^h 54^m -9^h 06^m
 moon 9 00 30.2 -9 00 30.8
 clock - slow 0 44.5

H Ltd T 9 01 15.0
 H Hong 4 44 31.05
 G Ltd T 13 45 46.05
 Sid Tm Nov 15 25 56.17
 Interval 22 19 49.88
 Reduction 3 39.50
 G to T 22 16 10.38

From Hank. Alms R. C. Reed
 Moon 22^h 10^h 34^m 06^s 19 +13 42 32.2
 Another 1^h 21075 14.177
 16.173 34.08 -5 29.3
 Tabular Haze 10 34 40.27 +13 37 02.9
 Moon's parallax 57' 56.4
 Semidiam 15' 48.8

Formation of Normals

	ab	an	bn
1	-0.39	+ 44	-474.5
2	-1.28	+ 12.5	-37.1
3	-0.50	+ 42.7	-60.5
4	-1.33	-197.8	+ 70.3
5	+0.00	-281.5	- 6.0
6	+0.63	-400.0	- 61.1
7	+2.08	- 33.4	- 27.6
8	+2.00	+ 164.0	+232.6
	+1.21	-689.1	-357.9

$$[aa] = +10.24$$

$$[aa] = +17.20$$

$$[bb] = -2.23$$

$$[bb] = +15.58$$

$$[cn] = +3$$

pk	hres. <	resid
1	174.7	-15
2	161.4	-95
3	[144.7]	+168] $\frac{1}{2}$ wpt.
4	109.5	+86
5	90.0	+47
6	81.4	-40
7	50.5	-52
8	35.3	-32

NIC 1413 Moving Center

1913 June 20

6

	x	$x - X_0$	Δx	$(x - X_0)^2$	R^2	$O - C$
1	18.0000	+0.1893	+2	0.0359	4.2614	+2.31
2	18.4662	+0.6555	+2	0.4299	4.2402	+1.9
3	19.0000	+1.1893	+2	1.4149	4.2528	+72
4	19.7478	+1.9371	+1	3.7528	4.2281	-1.02
5	19.8661	+2.0554	-0	4.2246	4.2246	-1.37
6	19.8410	+2.0303	-0	4.1221	4.2186	-1.97
7	19.3977	+1.5870	-1	2.5183	4.2362	-21
8	19.0000	+1.1893	-2	1.4139	4.2521	+1.38
mean =				4.2383		+3

	y	$y - Y_0$	Δy	$(y - Y_0)^2$
1	20.6340	-2.0554	-2	4.2255
2	20.7376	-1.9518	-2	3.8103
3	21.0049	-1.6845	-1	2.8379
4	22.0000	-0.6894	0	0.4753
5	22.6894	0.0000	0	0.0000
6	23.0000	+0.3106	0	0.0965
7	24.0000	+1.3106	+1	1.7179
8	24.3740	+1.6846	+1	3.8382

Approximate Center

$$\begin{array}{rcl}
 x = 19.0 & y = 21.0049 & \\
 & 24.3740 & \\
 \hline
 & 45.3789 & \\
 \text{mean } y = & 22.6894 & \\
 y = \text{min} & 20.6340 & \\
 R = & 2.0554 & \\
 x = \text{max} = & 19.8661 & \\
 \text{mean } x = & 17.8107 &
 \end{array}$$

$$\begin{aligned}
 \text{Center} = \{ & X_0 = 17.8107 - 0.147 = 17.7960 \\
 & Y_0 = 22.6894 + 29 = 22.6923
 \end{aligned}$$

M14 1413 *Narrow Center*1913 *True 20*

6

	x	$y - \bar{y}$	Δy	$(y - \bar{y})^2$	R^2	$0 - \bar{y}$
1	180000 + 01893 - 2	00359	42614	+231		
2	184662 - 06555 + 2	04399	42403	+19		
3	190000 + 11493 + 2	14149	42528	-72		
4	197478 + 19371 + 1	37528	42281	-102		
5	198661 + 20559 - 0	42246	42246	-137		
6	198410 + 20303 - 0	41221	42186	-197		
7	193977 + 15870 - 1	25183	42362	-21		
8	190000 + 11893 - 2	14139	42521	+138		
			42353	+3		

	y	$x - \bar{x}$	Δx	$(x - \bar{x})^2$
1	206340	-20554	-2	42255
2	207376	-19518	-2	38103
3	210049	-16845	-1	28379
4	220000	-06894	0	04753
5	226894	00000	0	00000
6	230000	+03106	0	00965
7	240000	+13106	+1	17179
8	243740	+16846	+1	38382

Approximate Center

$$\begin{array}{rcl}
 x = 190 & y = 210049 & \\
 & 243740 & \\
 \hline
 & 453789 & \\
 \text{mean } y = & 226894 & \\
 y = \text{mean} & 206340 & \\
 \hline
 R = & 20559 & \\
 x = \text{mean} & 198661 & \\
 \hline
 \text{mean } x = & 178107 &
 \end{array}$$

$$\text{Center} = \begin{cases} X_0 = 178107 \\ Y_0 = 226894 \end{cases}$$

				C	O	O - C
1	-	56	- 120	+ 422 = + 246	+ 231	- 15
2	-	1974	- 114	+ 422 = + 114	+ 19	- 95
3	-	174	- 49	+ 422 = - 12	+ 72	+ 84
4	-	570	- 40	+ 422 = - 188	- 102	+ 86
5	-	606	+ 0	+ 422 = - 184	- 137	+ 47
6	-	597	+ 18	+ 422 = - 157	- 197	- 40
7	-	468	+ 77	+ 422 = + 31	- 21	- 52
8	-	350	+ 98	+ 422 = + 170	+ 138	- 32
						- 234 + 217
						Average = 60

$$\begin{aligned}
 & - + 5.56 - 1.21 + 4.07 = + 2 \\
 & + 71.54 - 15.58 + 52.40 = + 21 \\
 & + 22.76 + 14.31 = - 68.7 \\
 & + 72.75 + 50.17 = - 33.7 \\
 & - 20.75 - 14.31 + 9.6 \\
 & + 2.01 = - 59.1 \quad a = - 29.4
 \end{aligned}$$

$$R^2 = 4.2383 + 4.22 = 4.2805$$

$$R = 20689$$

$$AR = +4$$

$$R = 965.3$$

$$S = 9621$$

$$R - S = +3.2$$

$$934 = 12.9$$

$$949 = 13.3$$

$$915.9$$

$$962.2$$

Conditional

	x	$x - X_0$	Δx	$(x - Y_0)^2$	R^2	$D - C$
1	18.0000	+0.2040	+2	0.0417	4.2792	- 23
2	18.4662	+0.6702	+2	0.4494	4.2710	- 105
3	19.0000	+1.2040	+2	1.4501	4.2978	+ 163
4	19.7478	+1.9518	-1	3.8099	4.2893	+ 78
5	19.8661	+2.0701	0	4.2853	4.2853	+ 38
6	19.8410	+2.0450	0	4.1820	4.2767	- 48
7	19.3977	+1.6017	-1	2.5651	4.2755	- 60
8	19.0000	+1.2040	-2	1.4491	4.2775	- 40
9					4.2815	+ 3

	y	$y - Y_0$	Δy	
1	20.6340	-2.0583	-2	4.2375
2	20.7376	-1.9547	-2	3.8216
3	21.0049	-1.6874	-1	2.8477
4	22.0000	-0.6923	0	0.4794
5	22.6899	-0.0029	0	0.0000
6	23.0600	+0.3077	0	0.0947
7	24.0000	+1.3077	+1	1.7104
8	24.3740	+1.6817	+1	2.8284

Formation of Normals

MC 1413 Moon's Center

1913 June 21

7

Conditional Equations

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
1	+0.19	-2.06	+1	=	+231	-52	-120	+422	=	+250	-19															
2	+0.66	-1.95	+1	=	+19	-179	-114	+422	=	+129	-100															
3	+0.59	-0.84	+1	=	+72	-160	-49	+211	=	+2	+70															
4	+1.94	-0.69	+1	=	-602	-526	-40	+422	=	-144	+42															
5	+2.06	+0.00	+1	=	-137	-559	0	+422	=	-137	-60															
6	+2.03	+0.31	+1	=	-197	-550	+18	+422	=	-110	-87															
7	+1.59	+1.31	+1	=	-21	-431	+77	+422	=	+168	-89															
8	+1.19	+1.68	+1	=	+138	-323	+98	+422	=	+197	-59															

Normal Equation

$$\begin{aligned}
 +17.20 + 1.21 + 10.24 &= -689 \\
 +1.21 + 15.58 - 2.23 &= -358 \\
 +10.24 - 2.23 + 7.50 &= +3
 \end{aligned}$$

$$\frac{\Delta x}{\Delta n} = -1.26$$

$$\begin{aligned}
 -1.21 - 0.085 - 0.72 &= +48 \\
 -10.24 - 0.72 &= +410
 \end{aligned}$$

$$\begin{aligned}
 +15.50 - 2.95 &= -310 \\
 -2.95 + 1.40 &= +443
 \end{aligned}$$

$$\frac{\Delta y}{\Delta n} = +0.37$$

$$\begin{aligned}
 +2.95 - 0.56 &= -59.6 \\
 +0.845 &= +354.4
 \end{aligned}$$

$$c = +320$$

$$\begin{aligned}
 -625 + 2.95 &= +853 \\
 +9.29 &= +543
 \end{aligned}$$

$$b = +40.58 \frac{1}{2}$$

$$\begin{aligned}
 +5.45 - 1.21 + 4.07 &= +2 \\
 -71.54 - 15.58 + 52.40 &= +21
 \end{aligned}$$

$$\begin{aligned}
 +22.65 + 1431 &= -687 \\
 +71.75 + 5017 &= -337
 \end{aligned}$$

$$\begin{aligned}
 -20.68 - 11.47 - 14.31 &= +9.5 \\
 +2.58 &= -597
 \end{aligned}$$

$$a = -229$$

$$+247 + 2.18$$

$$-274$$

	C	O	O - C
1	- 56 - 120 + 422 = + 246	+ 231	- 15
2	- 594 - 114 + 422 = + 114	+ 19	- 95
3	- 179 - 49 + 422 = - 12	+ 72	+ 84
4	- 570 - 40 + 422 = - 188	- 102	+ 86
5	- 606 + 0 + 422 = - 184	- 137	+ 47
6	- 597 + 18 + 422 = - 157	- 197	- 40
7	- 468 + 77 + 422 = + 31	- 21	- 52
8	- 350 + 98 + 422 = + 170	+ 138	- 32
			- 239 + 217
			Average = 60

$$+ 5.56 - 1.21 + 4.07 = + 2$$

$$+ 71.54 - 15.58 + 52.40 = + 21$$

$$+ 22.76 + 14.31 = - 68.7$$

$$+ 72.75 + 50.17 = - 33.7$$

$$- 20.75 - 14.31 = + 9.6$$

$$+ 2.01 = - 59.1$$

$$a = - 29.4$$

MC 1413 known center

1913 June 21

7

Conventional Equation

	1	2	3	4	5	6	7	8	9	10
1	+0.19	-2.06	+1.1	+2.31	-5.3	-12.0	+4.22	+2.50	-1.9	
2	+0.66	-1.95	+1.1	+1.9	-1.79	-1.14	+4.22	+1.29	-1.60	
3	-0.59	-0.84	+1.1	+7.2	-1.60	-4.9	+2.11	+2	+7.0	
4	+1.94	-0.69	+1.1	-6.02	-5.26	-4.0	+4.22	+1.44	+4.2	
5	+2.06	+0.00	+1.1	-1.37	-5.59	0	+4.22	-1.37	-6.0	
6	+2.03	+0.31	+1.1	-1.97	-5.50	+1.8	+4.22	+1.10	-8.2	
7	+1.59	+1.31	+1.1	-2.1	-4.31	+7.7	+4.22	+1.68	-8.9	
8	+1.19	+1.68	+1.1	+1.34	-3.23	+9.8	+4.22	+1.97	-5.9	

Normal Equation

$$\begin{aligned}
 +1.720 + 1.21 + 1.024 &= -6.89 \\
 +1.21 + 1.558 - 2.23 &= -3.58 \\
 -1.024 - 2.23 + 7.50 &= +3
 \end{aligned}$$

$$\begin{aligned}
 -1.21 - 0.085 - 0.72 &= +4.8 \\
 -1.024 - 0.72 - 6.10 &= +4.10
 \end{aligned}$$

$$+1.550 - 2.95 = -3.10$$

$$-2.95 + 1.40 = +4.15$$

$$\begin{aligned}
 +2.95 - 0.56 &= +9.0 \\
 +0.84 &= +3.54
 \end{aligned}$$

$$+4.22$$

$$-6.25 + 2.95 + 8.53$$

$$+19.29 + 5.43$$

$$+4.22 + 4.22 = 8.44$$

$$+5.45 - 1.21 + 4.07 + 2$$

$$-7.154 - 1.558 - 5.240 + 2.1$$

$$+2.265 + 1.431 = -6.87$$

$$+7.135 + 5.027 = -3.37$$

$$-2.068 - 2.047 - 1.431 + 9.6$$

$$+2.58 - 5.92$$

$$-2.41 + 2.18$$

$$-2.41$$

VIC 1413

1913 June 27

8

Mean Position (1911.0)

$$X_0 = 17.8107 \quad Y_0 = 22.6894$$

$$\frac{1}{2}a = \frac{-147}{17.7960} \quad \frac{1}{2}b = \frac{+29}{22.6923}$$

From Plate constants $X = 18.5690 \quad Y = 21.7004$

$$z = +0.5690$$

$$\log \delta = 9.75511$$

$$\cos \delta = 9.98843$$

$$\text{const} = 8.50724$$

$$(X - A) = 1.25944$$

$$X - A = +18.17$$

$$A = 10 \quad 35 \quad 31$$

$$X_0 = 10^h \quad 35^m \quad 49.17^s$$

$$\text{Red} = +1.92$$

$$\alpha' = 10 \quad 35 \quad 51.09$$

$$\eta = -0.2996$$

$$\log \tan \delta = 9.3710$$

$$\log \eta = 9.5102$$

$$\eta_1 = 59.346$$

$$\eta_1 = +1$$

$$\eta_0 = -0.2997$$

$$\log \eta_0 = 9.47669$$

$$\text{const} = 7.33115$$

$$(X - D) = 2.14554$$

$$\delta - D = -2 \quad 19.8$$

$$D = +13 \quad 12 \quad 18$$

$$\delta_0 = +13^\circ \quad 09' \quad 58''.2$$

$$\text{Red} = -9.2$$

$$\alpha' = +13 \quad 09 \quad 49.0$$

1161413 Mean Position (1911.0)

$Y_0 = 178107$	$Y_0 = 226894$
$\frac{1}{2}u = -147$	$\frac{1}{2}u = +29$
<u>177960</u>	<u>226923</u>

1913 June 27

8

From Plate constants $X = 185690$ $Y = 217004$

3 = + 0 5 6 9 0
long 5 = 9 7 5 5 1 1
cos 8 = 9 9 8 8 4 3
cos 1 = 8 5 0 7 2 4

$$(X - A) = 1 \ 2 \ 5 \ 9 \ 4 \ 4$$

$$\alpha - A = \quad + \quad 18.17$$

A 10 35 31

$$x_0 = 10^k 35^m 49^s 17$$

Rea - 192

$\alpha' = 10 \quad 35 \quad 51 \quad 09$

$$\gamma = 0.2996$$

hypotenuse: 93710

95102

$$m_1 = 59346$$

$$3 \cdot 10^3 = 3000$$

$$m_2 = 0.2997$$

long 2. : 947669 m

Count: 7 3 3 1 1 5

$$(A - D) = 2, 1, 4, 5, 5, 4, \dots$$

$$S - D = -219.8$$

$$D = \begin{pmatrix} 4 & 1 & 3 & 1 & 2 & 1 & 8 \end{pmatrix}$$

$$\delta_0 = +13^{\circ} \quad 09' \quad 58''2$$

Read - - 92

$$\alpha = +1.3 \quad 09 \quad 49 \quad 0$$

Lunar Parallax

$$\begin{array}{r} \alpha' \sim 10^{\circ} 35' 51.09'' \\ \theta \sim 9^{\circ} 01' 15'' \\ \theta - \alpha' = -1^{\circ} 34' 36.09'' \\ = -23^{\circ} 39' 14'' \end{array}$$

$$\begin{array}{r} - 8' 51'' \\ - 23' 30' 23'' \end{array}$$

$$\begin{array}{r} 9.95727 \\ 0.00000 \\ 003762 \\ \hline 999489 \end{array}$$

$$\begin{array}{r} \delta \sim 44' 39'' 46'' \\ 13' 09'' 49'' \\ 31' 29'' 57'' \end{array}$$

$$\begin{array}{r} 9.82640 \\ 8.22669 \\ 9.71808 \\ 0.15309 \\ \hline 7.92426 \end{array}$$

$$\delta - \alpha' = +28' 52.4''$$

$$\delta = +13^{\circ} 38' 41.6''$$

$$\text{Err Eph S} = +13^{\circ} 38' 42.9''$$

$$\theta - \alpha' = -1.3''$$

$$\text{Cor for Irradiation} = -1.4''$$

$$-2.7''$$

$$\delta = +13^{\circ} 09' 49''$$

$$\pi = 57' 56.5''$$

$$\begin{array}{r} 9.86913 \\ 8.22669 \\ 9.60338 \\ 0.01243 \\ \hline 7.71163 \end{array}$$

$$\alpha - \alpha' = -17' 41.83''$$

$$= -1^{\circ} 10.79''$$

$$\alpha \sim 10^{\circ} 34' 40.30''$$

$$\alpha = 10^{\circ} 34' 40.27''$$

$$+0.03''$$

$$+0.30''$$

$$+0.33''$$

MC1446

1911 June 18

9

Stars - Measures

	d	N	d	N
1	17036	17620	17870	18540
11.6	1509085	956772	1336162	1304040
17.2	90	70	60	40
mg	36	20	76	36
7.4	<u>17.1948</u>	<u>1950</u>	<u>11.5488</u>	<u>5498</u>
2				
21.9	16900	16815	16883	17190
33.1	1579090	792130	1547571	858480
mg	85	21	71	80
7.3	90	19	70	80
	<u>33.1111</u>	<u>1105</u>	<u>218591</u>	<u>8601</u>
3				
31.8	14430	14836	15460	15553
19.8	674042	1252522	1287067	812110
mg	35	21	70	15
8.8	20	20	46	30
	<u>19.7683</u>	<u>7691</u>	<u>31.7412</u>	<u>7421</u>

Grade 4

M161446

1911 June 18.

9

Stars - Measures.

	d	n	d	n	d	n
1	17036	17620	17870	18540		
11.6	1509085	956772	1336162	1304040		
172	90	70	60	40		
74	36	20	76	36		
	<u>17.1948</u>	<u>1950</u>	<u>115468</u>	<u>5498</u>		
2						
219	16900	16815	16883	17190		
321	1579090	792130	1547571	858480		
73	8590	21	71	80		
	90	19	70	80		
	<u>331111</u>	<u>1105</u>	<u>218591</u>	<u>8661</u>		
3						
318	14430	14836	15460	15553		
198	674042	1252522	1287067	812110		
88	35	21	70	15		
	20	20	46	30		
	<u>19.7683</u>	<u>7691</u>	<u>31.7412</u>	<u>7421</u>		

Grade 4

1.9

19

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MC1446

1913 June 18.

10

Moon-Measures.

d
1 16319
19.5 923749
197 30
min 30
19 19.7088

v
18711
1581524
07
05
7106

2
19.0 15337
19.8 767680
80
55
1.97672

18695
1636560
5860
80
7670

3
18.5
20.0

19015
1324160
60
15
18.4239

18600
1433035
40
80
4255

4
18.0 16000
20.4 1255862
70
00
20 3427.

16785
1043920
10
75
3445

5
17.6
21.0

16950
1292835
3535
44
17.5985

16750
1073025
35
40
6014

6
17.5
21.8
min
2

15900
1059098
9098
98
17.4694

16781
1206177
8277
81
4708

1161446

1913 June 18.

10

Moon - measured.

d

y

v

d²

v

1 16319
 145 923749
 147 30
 30

18711
 1581524
 07
 05

1 197088

7106

2
 190 15337
 158 767680
 80
 55

18695
 1636560
 5860
 80

197672

7670

3
 185
 200

19015
 1324160
 60
 15
 184239

18600
 1433035
 40
 80
 4255

4
 180 16000
 204 1255862
 70
 00

16785
 1043920
 10
 75

20.3437

3445

5
 176
 210

16950
 1292835
 35
 44
 175985

16750
 1073025
 35
 40
 6014

6
 175
 228
 min
 2

15900
 1059098
 90
 98
 174694

16781
 1206177
 82
 81
 4708

NO 1446 Moon Measures

1913 June 18.

11

2

a

y

w

17.5
22.0

a

N

14868

15500

980102

1084042

10

49

58

92

174941

.4952

8

18.0

9533

9665

23.0+

9025

6554

0930

9127

23.0512.0534

9

Scratch

18.3

18805

14575

18045

14310

23.3

15593

779000

1117880

1116060

9880

98

89

60

11

67

38

95

233217.3226183141.3145

NK1446 known measures

1913 June 18

11

2

a

y

N

a

N

17.5

22.0

14868

15800

980102

1084042

10

49

58

92

174941

.4952

8

180

9533

9665

230+

9025

6559

0930

9127

2305120534

9

Scratched

18.3

18805

14575

18045

14310

23.3

15593

779000

1117880

1116060

9880

98

89

60

11

67

38

95

23321732261831413145

MC1446

Standard Corridors

1913 June 19

12

Cape No. 325-8 mg 7.4				Cape No. 3273 mg 7.3				Cape No. 3290 mg 8.8			
C	23	16	00.48	23	21	24.11	23	26	36.05		
L			.56			14				02	
E			48			15				12	
mean	23	16	00.51	23	21	24.13	23	26	36.06		
Prece			+34.25			+34.10			+34.13		
q	23	16	34.76	23	21	58.23	23	27	10.19		
A	23	19	59	23	19	59	23	19	59		
a-A	-	3	24.24	+	1	59.23	+	7	11.19		
tan(x-A)			-204.23			+119.23			+431.12		
log ..			2.31012m			2.07639			2.63460		
"cos			9.99443			9.99666			9.99484		
"s.			0.81179m			0.58029			1.13668		
"s.			-6.4832			+3.8045			+13.6988		
"s.			10			13			61		
"s			11.5158			21.8058			31.7049		
"2			11.5493			21.8596			31.7416		
"-3			+335			+538			+367		
C	-9	13	19.2	-7	09	26.0	-8	52	48.3		
L			18.9			25.6			48.1		
E			19.4			26.4			49.1		
mean	-9	13	19.2	-7	09	26.0	-8	52	48.5		
Prece			+3			37.4			38.2		
S	-9	09	42.7	-7	05	48.6	-8	49	10.3		
D	-8	32	06	-8	32	06	-8	32	06		
S-D	-37		36.7	+1	26	17.4	-17		04.3		
tan(S-D)			-22568			+5178.5			-1024.3		
log ..			3.35349m			3.71420			3.01043m		
"no			0.68464m			1.04535			0.34158m		
tan(S-D)			9.2076m			9.0952m			9.1908m		
"s			16.236			11.606			2.2734		
"m			7.8846m			7.3092m			8.5176m		
"no			-4.8377			+11.1008			-2.1958		
"m			77			20			329		
"m			17.1546			33.0988			19.7713		
"y			17.4949			33.1108			19.7687		
"-m			+403			+120			-26		

NG 1446

Standard stars

1911phae 19

12

Cape No. 3228 mag 7.4

Cape No. 3273 mag 7.3

Cape No. 3290 mag 8.8

C	23	16	0048	23	21	2411	23	26	3605
L			56			14			02
E			48			15			12
mean	23	16	0051	23	21	2413	23	26	3606
Proce			+3425			+3410			+3413
q	23	16	3476	23	21	5823	23	27	1019
A	23	19	59	23	19	59	23	19	59
A-A	-	3	2424	+	1	5923	+	7	1119
tan(d-A)			-20423			+11923			+43112
log	2.3	1.0	1.2	2.0	7.6	3.9	2.6	3.4	6.0
cos	9.9	9.4	4.3	9.9	9.6	6.6	9.9	9.4	8.4
E ₀	0.8	1.1	7.9	0.5	8.0	2.9	1.1	3.6	6.8
E ₁	-6.4	8.3	2	+3.8	0.4	5	+1.3	6.9	8.8
E ₂	-		10	+		13	+		61
E ₃	1.1	5.1	5.8	2.1	8.0	5.8	3.1	7.0	4.9
E ₄	1.1	5.4	9.3	2.1	8.5	9.6	3.1	7.4	1.6
E ₅			+3.3	+		5.3	+		3.6
C	-9	13	1.92	-7	0.9	2.60	-8	5.2	4.83
L			1.89			2.56			4.81
E			1.94			2.64			4.91
mean	-9	13	1.92	-7	0.9	2.60	-8	5.2	4.85
Proce			+3			3.74			3.82
S	-9	0.9	4.27	-7	0.5	4.86	-8	4.9	1.03
D	-8	3.2	0.6	-8	3.2	0.6	-8	3.2	0.6
(D-D)			-3.7	+1		2.6			-1.7
tan(d-D)			-2.2			5.1			-10.2
log	3.3	5.3	4.9	3.7	1.4	2.0	3.0	1.0	4.3
tan	0.6	8.4	6.4	1.0	4.5	3.5	0.3	4.1	5.8
tan(E ₀)	9.2	0.7	6	9.0	9.5	2	9.1	9.0	8
E ₁	1.6	2.3	6	1.1	6.0	6	2.2	7.3	4
E ₂	7.8	8.4	6	7.3	0.9	2	8.5	1.7	6
E ₃	-4.8	3.7	7	+1.1	1.0	0.8	-2.1	9.5	8
E ₄	-		7.7	-		2.0	-		3.2
E ₅	1.7	1.5	4.6	3.3	0.9	8.8	1.9	7.7	1.3
E ₆	1.7	1.9	4.9	3.3	1.1	0.8	1.9	7.6	8.7
E ₇			+4.0	+		1.2	-		2.6

MC 1446

1913 June 19.

13

Center of Plate.

Star	x	y	RA	Decl.
1	11.5493	17.1949	23 ^h 16 35 ^m -9 09 43	
2	21.8596	33.1108	21 58 -7 05 49	
3	31.7416	19.7687	27 10 -8 49 10	
3	65.15	70.07	65 43 -24 64 42	
	21.72	23.36	23 21 54 -8 21 34	
	-1.8	-22	- 1 55 - 10 32	
	3.72	1.36	23 19 59 -8 3.2 06	
	31	465		
	372	632	A = 23 ^h 19 ^m 59 ^s	
	1116		D = - 8 32 06	
	115.32			

Plate Constant

$$\begin{aligned}
 x-3 &= 12.754 & -116 \\
 +335 &= 219 & = +116 = 0 \\
 +538 &= 422 & = +116 = 0 \\
 +367 &= 202 & = +115 = -1 \\
 \text{mean} & 19.4594 & = 277 & = 19.4201
 \end{aligned}$$

$$\begin{aligned}
 y-7 &+ 20.72 & +4.44 & -718 \\
 +403 &+ 239 & = +642 & +76 = +718 = 0 \\
 +120 &+ 452 & = +572 & +146 = +718 = 0 \\
 \text{mean} & -26 & +657 & = +631 & +87 = +718 = 0 \\
 & 21.6977 & +403 & +95 & = 21.6757
 \end{aligned}$$

$$\begin{aligned}
 \text{From Tables} & b+d = -6 & a = -0.6 & e = -50 \\
 \text{observations} & -8.0 & 0.0 & -4.4
 \end{aligned}$$

MAG 1446

1913 Jan 19

13

Center of Plate.

Star	x	y	RA	Decl.
1	11.5493	17.1949	23 ^h 16 ^m 35 ^s	-9 09 43
2	21.8596	33.1108	21 58	-7 05 49
3	31.7416	19.7687	27 10	-8 49 10
3	65.15	70.07	65 43	-9 64 42
	21.72	23.36	23 21 54	-8 21 34
	-1.8		- 1 55	- 10 32
	372	136	23 19 59	-8 32 06
	31	465		
	372	632		
	11.16			
	115.22			

Plate Constant

$$\begin{aligned}
 x-3 &= 12754 & -116 \\
 +375 &= 219 & = +116 & = 0 \\
 +538 &= 422 & = +116 & = 0 \\
 +367 &= 252 & = +115 & = -1 \\
 \text{known } 19.4594 &= 277 & & = 19.4201
 \end{aligned}$$

$$\begin{aligned}
 y-7 &+ 20.72 & +4.44 & -718 \\
 +403 &+ 239 & +642 & +76 & = +748 & = 0 \\
 +120 &+ 452 & +572 & +146 & +718 & = 0 \\
 \text{known } -26 &+ 657 & +631 & +87 & +718 & = 0 \\
 21.6977 &+ 403 & +95 & & = 21.6757
 \end{aligned}$$

$$\begin{aligned}
 \text{From Tables } k+d &= -6.2 & a &= -0.6 & z &= -5.0 \\
 \text{observation} & & & 0.0, 0 & & -4.4
 \end{aligned}$$

1446	Times etc						
Exp to stars	1911 Nov 29	1 ^h	19 ^m	-1	31		
moon		1	24	39.6	-1	24	39.8
clock slow			0	48.8			
H. Sid Time		1	25	28.5			
H. hand		4	44	31.05			
G. Sid T.		6	09	59.55			
Sid T. in moon		16	29	01.09			
Interval		13	40	58.46			
Reduction			2	14.50			
G.M.T.		13	38	43.96			

From hand, Alman			R.A.		Decl.		
Moon 13 ^h	23 ^m	20 ^m	58.95	-8°	01'	09.8	
Motion in 1 ^m	1.9040				14.408		
38.7327		1	13.75		+9	18.1	
Tabular place	23	22	1270	-7	51	51.7	
Moon's age 9 days							
Moon's parallax		56'	11.8				
semidiameter		15	20.8		=	920.3	
			augmentation		=	8.2	

$$934 = 8.5$$

Plate grade (4) irradiation cor =

$$\begin{array}{r} 928.5 \\ - 0.8 \\ \hline 927.7 \end{array}$$

$$927.7 = 1.9886 R.$$

$$R^2 = 3.9545$$

Times etc

14

Exp. 1. stars 1911 Nov 29 1^h 19^m - 1 31
 move 1 24 39.6 - 1 24 39.8
 clock alone 0 48.8

H Sid Time 1 25 28.5
 H hour 4 44 31.05
 G Sid T 6 09 59.55
 Sid T in move 16 29 01.09
 Interval 13 40 58.46
 Reduction 2 14.50
 G M T 13 38 43.96

from hand. Alman R. A. decl
 Moon 13^h 23^m 20^s 58.95^s - 8° 01' 09" 8
 Motion 1^h 1.9040 14.408
 38.7325 1 1.375 + 9 18.1
 Tabular place 28 22 1270 - 7 51 51.7

moon's parallax 56 11.8
 semidiam 15 20.9 = 920.3
 augmentation = 8.2

934 = 8.5

Plate grade (4) irradiation cor =

928.5
 - 0.8
 927.7

927.7 = 1.9886 R.

Formation

kt.	res. L.	resid
1	180.0	- 2
2	193.3	- 131
3	211.2	+ 21
4	227.2	+ 110
5	249.5	- 84
6	270.0	+ 33
7	278.7	- 27
8	312.8	+ 109
9	325.0	- 29

MC 1446		Moon's Center		1913 June 27.		15
x		$x - x_0$	$4x$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	19.4586	0.0000	-12	0.0000	3.9577	+32
2	19.0000	-0.4586	-12	0.2114	3.9440	-105
3	18.4247	-1.0339	-10	1.0710	3.9576	+31
4	18.0000	-1.4586	-8	2.1299	3.9651	+106
5	17.6000	-1.8586	-4	3.4559	3.9438	-107
-6	17.4701	-1.9885	0	3.9541	3.9541	-4
7	17.4946	-1.9640	2	3.8565	3.9476	-69
8	18.0000	-1.4586	8	2.1252	3.9604	+59
9	18.3143	-1.1443	10	1.3071	3.9467	-78
Comp. $R^2 =$						3.9545

	y	$y - y_0$	Δy	$(y - y_0)^2$
-1	19.7097	-1.9885	-9	3.9577
2	19.7671	-1.9311	-9	3.7326
3	20.0000	-1.6982	-8	2.8866
4	20.3441	-1.3541	-6	1.8352
5	21.0000	-0.6982	-3	0.4879
6	21.6982	0.0000	0	0.0000
7	22.0000	+0.3018	+1	0.0911
8	23.0523	+1.3541	+6	1.8352
9	23.3222	+1.6240	+7	2.6396

Approx. Center

$$x = 18.0 \quad y = 20.3441$$

$$\underline{23.0523}$$

$$43.3964$$

$$\text{mean } y = 21.6982$$

$$y - \text{min} = 19.7097$$

$$R = 1.9885$$

$$x - \text{min} = 17.4701$$

$$\text{mean } x = 19.4586$$

MC 1446		Moon's Center		1913 June 27		15
x	y	$x - x_0$	$y - y_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - C$
1	194586	0.0000	-12	0.0000	39577	+32
2	190000	-0.4586	-12	0.2114	39440	-105
3	184247	-1.0339	-10	1.0710	39576	+31
4	180000	-1.4586	-8	2.1299	39651	+106
5	176000	-1.8586	-9	3.4559	39438	-107
-6	174701	-1.9885	0	3.9541	39541	-19
7	174946	-1.9640	2	3.8565	39476	-69
8	180000	-1.4586	8	2.1252	39604	+59
9	183143	-1.1443	+10	1.3071	39467	-78
Comph					39545	

y	x	$y - y_0$	$x - x_0$	$(y - y_0)^2$
-1	197097	-1.9885	-9	3.9577
2	197671	-1.9311	-9	3.7326
3	200000	-1.6982	-8	2.8866
4	203441	-1.3541	-6	1.8352
5	210000	-0.6982	-3	0.4879
6	216982	0.0000	0	0.0000
7	220000	+0.3018	+1	0.0911
8	230523	+1.3541	+6	1.8352
9	233222	+1.6240	-7	2.6396

Approx Center

$$x = 180 \quad y = 203441$$

$$230523$$

$$433964$$

$$\text{mean } y = 216982$$

$$y - \text{min} = 197097$$

$$R = 19885$$

$$x - \text{min} = 174701$$

$$\text{mean } x = 194586$$

$$180500$$

AC1446

Conditional Equations

16

		0	6	0 - 6
1	$0.00 - 1.99 = +32$		$0 + 34 = +34$	-2
2	$-0.46 - 1.93 = -105$		$-9 + 33 = +26$	-131
3	$-1.03 - 1.70 = +31$		$-19 + 29 = +10$	$+21$
4	$-1.46 - 1.35 = +106$		$-27 + 23 = -4$	$+110$
5	$-1.86 - 0.70 = -107$		$-35 + 12 = -23$	-84
6	$-1.99 + 0.00 = -4$		$-37 - 0 = -37$	$+33$
7	$-1.96 + 0.30 = -69$		$-37 - 5 = -42$	-27
8	$-1.46 + 1.35 = +119$		$-27 - 23 = -50$	$+109$
9	$-1.14 + 1.62 = -78$		$-21 - 28 = -49$	-29

Average = 61

Mean Equations

$$4) -2.95 - 6.97 = +64$$

$$5) -8.41 + 2.57 = -200$$

$$+8.41 + 19.86 = -182$$

$$+22.43 = -382$$

$$b = -17.05$$

$$-2.95 = +64 - 119 = -55$$

$$a = +18.7$$

$$5) -4.81 - 7.87 = -43$$

$$4) -6.55 + 3.27 = -92$$

mean
 $b = -9.8$
 $a = +15.9$

$$+6.55 + 10.43 = +58$$

$$+13.70 = -34$$

$$b = -2.48$$

$$-4.81 = -43 - 19 = -63$$

$$a = +13.1$$

		C	0 - C
1	$0 + 5 = +5$		$+27$
2	$-6 + 5 = -1$		-104
3	$-13 + 4 = -9$		$+40$
4	$-19 + 3 = -16$		$+122$
5	$-24 + 2 = -22$		-85
6	$-26 - 0 = -26$		$+22$
7	$-26 - 1 = -27$		-42
8	$-19 - 3 = -22$		$+81$
9	$-15 - 4 = -19$		-59

Average = 65

4461446

Conditional Equations

10

	O	C	O - C
1	$000 - 199 = +32$	$0 + 34 = +34$	-2
2	$-046 - 193 = -105$	$-9 + 33 = +26$	-131
3	$-103 - 170 = +31$	$-19 + 29 = +10$	$+21$
4	$-146 - 135 = +106$	$-27 + 23 = -4$	$+110$
5	$-186 - 070 = -107$	$-35 + 12 = -23$	-84
6	$-199 + 000 = -4$	$-37 - 0 = -37$	$+33$
7	$-196 + 030 = -69$	$-37 - 5 = -42$	-27
8	$-146 + 135 = +89$	$-27 - 23 = -50$	$+109$
9	$-114 + 162 = -78$	$-21 - 28 = -49$	-29
			Average = 61

Mean Equations

$$4) -295 - 697 = +64$$

$$5) -841 + 257 = -200$$

$$+841 + 1986 = -182$$

$$+2243 = -382$$

$$b = -1705$$

$$-295 + 64 - 119 = -55$$

$$a = +187$$

$$5) -481 - 707 = -43$$

$$4) -655 + 327 = -92$$

Mean

$$b = -98$$

$$a = +159$$

$$+655 + 1043 = +58$$

$$+1370 = -34$$

$$b = -248$$

$$-481 = -43 - 19 = -63$$

$$a = +131$$

	C	O - C
1	$0 + 5 = +5$	$+27$
2	$-6 + 5 = -1$	-104
3	$-13 + 4 = -9$	$+40$
4	$-19 + 3 = -16$	$+122$
5	$-24 + 2 = -22$	-85
6	$-26 - 0 = -26$	$+22$
7	$-26 - 1 = -27$	-42
8	$-19 - 3 = -22$	$+81$
9	$-15 - 9 = -19$	-59
		Average = 65

1446

Red. ad. column - p. 10.

$$S = -8^{\circ} 35'$$

$$\begin{array}{rcl} H + \alpha & 0 & 49 - 11^{\circ} 45' \\ H & 1 & 25 \\ \alpha & 23 & 21 \\ G & 22 & 08 \\ a + \alpha & 21 & 29 = 322^{\circ} 15' \end{array}$$

$$\begin{array}{rcl} 2 \cos S & & 99951 \\ & & \underline{05065} \\ (4) & & 05016 \end{array}$$

$$\begin{array}{rcl} 2 \cos(G + \alpha) & & 98980 \\ q & & 12183 \\ \sin & & 97869 \\ \tan S & & 91788 \\ \frac{1}{\sin} & & 88239 \end{array}$$

$$8 \quad 11163$$

$$8 \quad 90079$$

$$\begin{array}{rcl} f & + & 2.24 \\ g & + & 0.10 \\ h & + & 0.28 \\ & + & \underline{2.62} \end{array}$$

$$\begin{array}{rcl} 2 \sin S & & 91739 \\ \cos(H + \alpha) & & 99908 \\ h & & 13052 \\ \sin & & 93089 \\ \sec S & & 00049 \\ \frac{1}{\sin} & & 88239 \end{array}$$

$$h' \quad 04699$$

$$h \quad 94429$$

$$\begin{array}{rcl} f' & + & 1307 \\ g' & - & 298 \\ i & + & \underline{317} \\ & + & 1329 \end{array}$$

1946

Moon's Mean Position 1911.0

$$\begin{array}{r} X_0 = 19.4586 \\ \frac{1}{2}a = +8 \\ \hline 19.4594 \end{array}$$

$$\begin{array}{r} Y = 21.6982 \\ \frac{1}{2}b = -5 \\ \hline 21.6977 \end{array}$$

From plate constants $X = 19.4201$ $Y = 21.6757$

$$\begin{array}{r} \bar{z} = +1.4201 \\ \log \bar{z} = 0.15232 \\ \log S = 9.99512 \\ -\text{const} = 8.50724 \end{array}$$

$$-(x-A) = 1.64996$$

$$x-A = 44.66$$

$$A = 23^h 19^m 59.5^s$$

$$X_0 = 23 \ 20 \ 43.66$$

$$\text{Red} = +2.62$$

$$X' = 23 \ 20 \ 46.28$$

$$\eta = -0.3243$$

$$\log \tan \delta = 9.1762m$$

$$\log \eta = 0.3046$$

$$\eta_1 = 6.5342m$$

$$\eta_1 = -3$$

$$\eta_0 = -0.3240$$

$$\log \eta_0 = 9.51055m$$

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

$$-(\delta-D) = 2.17940$$

$$\delta-D = -2 \ 31.2$$

$$D = -8 \ 32 \ 06$$

$$S = -8 \ 34 \ 37.2$$

$$\text{Red} = +13.3$$

$$\delta' = -8 \ 34 \ 23.9$$

1446

Red. ad locum after

$$S = -8^{\circ} 35'$$

$H + \alpha$	0	$49 = 11^{\circ} 45'$
H	1	26
α	23	21
G	22	08
$a + \alpha$	21	$29 = 322^{\circ} 15'$

$$\begin{array}{r} l \cos S \quad 9.99571 \\ i \quad \underline{0.5065} \\ (i) \quad 0.5016 \end{array}$$

$$\begin{array}{r} l \cos(G + \alpha) \quad 9.8980 \\ q \quad 1.2183 \\ \sin \quad 9.7869 m \\ \tan S \quad 9.1788 m \\ \frac{1}{15} \quad 8.8239 \end{array}$$

$$\begin{array}{r} 8' \quad 1.1163 \\ 8 \quad 9.0079 \end{array}$$

$$\begin{array}{r} f \quad + 2.24 \\ g \quad + 0.10 \\ h \quad + 0.28 \\ \hline + 2.62 \end{array}$$

$$\begin{array}{r} l \sin S \quad 9.1739 m \\ \cos(H + \alpha) \quad 9.9908 \\ h \quad 1.3052 \\ \sin \quad 9.3089 \\ \sec S \quad 0.0049 \\ \frac{1}{15} \quad 8.5239 \end{array}$$

$$\begin{array}{r} h' \quad 0.4699 m \\ h \quad 9.4429 \end{array}$$

$$\begin{array}{r} g' \quad + 1.307 \\ h' \quad - 2.95 \\ i \quad + 3.17 \\ \hline + 13.29 \end{array}$$

Known Mean Position 1911.0

17

$$\begin{array}{r} X_0 = 19.4586 \\ + a = + 8 \\ \hline 19.4594 \end{array}$$

$$\begin{array}{r} Y = 21.6982 \\ + b = - 5 \\ \hline 21.6977 \end{array}$$

From plate constants $X = 19.4201$ $Y = 21.6757$

$$\begin{array}{r} \bar{X} = +14201 \\ \log \bar{X} = 0.15232 \\ \log \bar{Y} = 9.99512 \\ \log \bar{Z} = 8.50724 \end{array}$$

$$(X-A) = 1.64996$$

$$X-A = +44.66$$

$$A = 23^h 19^m 59^s$$

$$X_0 = 23 \quad 20 \quad 43.66$$

$$P_{\text{Red}} = + + 2.62$$

$$\alpha'' = 23 \quad 20 \quad 46.28$$

$$\eta = -0.3243$$

$$\log \tan \delta = 9.1762 \sim$$

$$\eta_1 = 6.5342 \sim$$

$$\eta_2 = -3$$

$$\eta_0 = -0.3240$$

$$\log \eta_0 = 9.51055 \sim$$

$$(d-D) = 217940 \sim$$

$$\delta - D = -2 \quad 31.2$$

$$D = -8 \quad 32 \quad 06$$

$$\delta = -8 \quad 34 \quad 37.2$$

$$P_{\text{Red}} = + + 1.33$$

$$\delta' = -8 \quad 34 \quad 23.9$$

1446 Lunar Parallax

$$\alpha' = 23^{\circ} 20' 46.28'' \checkmark$$

$$\theta = 1^{\circ} 25' 28.5'' \checkmark$$

$$G - d = +2 \quad 04 \quad 42.2'' \checkmark$$

$$= +31^{\circ} 10' 33'' \checkmark$$

$$+ \quad 10 \quad 52'' \checkmark$$

$$+ 30 \quad 59 \quad 41'' \checkmark$$

$$9.95727$$

$$0.00000$$

$$0.06691$$

$$0.02418$$

$$\gamma = 46 \quad 35 \quad 40'' \checkmark$$

$$- 8 \quad 34 \quad 24'' \checkmark$$

$$55 \quad 70 \quad 04'' \checkmark$$

$$9.82640 \checkmark$$

$$8.21341 \checkmark$$

$$9.91425$$

$$0.13876$$

$$8.09282 \checkmark$$

$$8 - 8' = +42 \quad 348$$

$$S = -7 \quad 51 \quad 49.1'' \checkmark$$

$$\text{Cant Allen } S = -7 \quad 51 \quad 51.7'' \checkmark$$

$$O - C \quad + \quad 2.6$$

$$8' = -8^{\circ} 34' 23.9'' \checkmark$$

$$\pi = 56' 11.8'' \checkmark$$

$$9.86913 \checkmark$$

$$8.21341 \checkmark$$

$$9.71404 \checkmark$$

$$0.00411 \checkmark$$

$$7.80069 \checkmark$$

$$\alpha - \alpha' = +21' 43.52'' \checkmark$$

$$= +1^{\circ} 26.90'' \checkmark$$

$$\alpha = 23 \quad 22 \quad 13.18'' \checkmark$$

$$\alpha = 23 \quad 22 \quad 12.70'' \checkmark$$

$$+0.48'' \checkmark$$

1446

Human Parallax

$$\alpha = 23^{\circ} 20' 46.28''$$

$$\delta = 1^{\circ} 25' 28.5''$$

$$\mu - \alpha = +2 \quad 04 \quad 42.2$$

$$= +31^{\circ} 10' 33''$$

$$+ \quad 10 \quad 52$$

$$+ 30 \quad 59 \quad 41$$

$$995727$$

$$000000$$

$$006698$$

$$002498$$

$$\gamma = 46 \quad 35 \quad 40$$

$$- 8 \quad 34 \quad 24$$

$$58 \quad 10 \quad 04$$

$$9.82640$$

$$821341$$

$$991425$$

$$013876$$

$$809282$$

$$S - 8^{\circ} = +42 \quad 34 \quad 8$$

$$S = -7 \quad 51 \quad 49.9$$

$$\text{Wentzel } S = -7 \quad 51 \quad 51.7$$

$$O - 6 \quad + \quad 2.6$$

$$S = -8^{\circ} 34' 23.9''$$

$$\pi = 56 \quad 11.8$$

$$9.86913$$

$$8.21341$$

$$9.71404$$

$$0.00411$$

$$7.80069$$

$$\alpha - \alpha' = +21' 43.52''$$

$$+ 1 \quad 26.90$$

$$\alpha = 23 \quad 22 \quad 13.18$$

$$\alpha = 23 \quad 22 \quad 12.70$$

$$+ 0.48$$

MC 1445

1913 June 19. 19.

Stars - Measures.

	d	y	n	d	x	n
1	14501		15280	15567		16610
11.7	10080		9698	12940		920100
19.5	8577		0205	4045		00
	10		80	67		98
	<u>19.4424</u>		<u>.4422</u>	<u>11.7375</u>		<u>.7401</u>
2	16340		14950	18615		14818
22.2	13580		7710	10430		12972
35.3	7580		1016	3733		7082
	40		40	10		10
	<u>35.2762</u>		<u>.2769</u>	<u>22.1822</u>		<u>.1840</u>
3	17075		18212	13250		12705
31.9	8555		16730	12780		1012
21.8	5551		2531	7880		12243
	63		02			
	<u>21.8511</u>		<u>.8518</u>	<u>31.9529</u>		<u>.9134</u>

Grade 4 or 5.

MC 1445

1913 June 19. 19.

Stars - Measures.

	d	4	n	d	x	n
1	14501	15280	15567	16610		
117	10080	9698	12940	9201		
191	8577	0205	4041	0000		
	10	80	67	98		
	<u>194424</u>	<u>4422</u>	<u>117375</u>	<u>7401</u>		
2						
222	16340	14950	18615	14818		
353	13580	7710	10430	12972		
	7580	1016	3733	7082		
	40	40	10	10		
	<u>352762</u>	<u>2769</u>	<u>221822</u>	<u>1840</u>		
3						
319	17075	18212	13250	12705		
218	8555	16730	12780	10		
	55	2531	7880	12243		
	63	02				
	<u>218511</u>	<u>8518</u>	<u>319529</u>	<u>9134</u>		

Grade 4 - 5.

MAC 1443 Moon - Measmer.

1913 June 19 20

<u>1</u>	a	N	a	x	N
19.0	19255	17321			
21.3	16510 08	1004335			
	10	46			
	59	18			
	<u>21.2747</u>	<u>.2722</u>			

min in $y = \text{appr. } 21.2700$

<u>2</u>		
18.0	18316	16265
21.5	13435, 5	11120 10
	32	20
	18	49
	<u>21.4890</u>	<u>.4860</u>

3
17.4
22.0

18345	18010
11970 80	14352 49
82 62	56
35	00
<u>17.3635</u>	<u>.3654</u>

4
16.9
23.0

14878	11790 80
14195 90	11111 95
89	17

<u>16.9315</u>	<u>.9323</u>
----------------	--------------

5
16.9
23.3
min
in
x

14420	11975 80
13540 40	75
36	11120

<u>16.9119</u>	<u>.9143</u>
----------------	--------------

6
17.1
24.0

14909 05	10167
00	9616 30
14390	28

<u>17.0515</u>	<u>.0542</u>
----------------	--------------

1161443 moon - summer.
 $\frac{1}{a}$ $\frac{v}{a}$
 190 19255- 17321
 213 1651008 1004335-
 10 46
 59 18
212747 2722

1913 June 19 20
 $\frac{1}{a}$ $\frac{v}{a}$

min in 72 after 212700
 $\frac{2}{a}$
 180 18316 16265
 215 134355- 1112010
 32 20
 18 49
214890 4860

$\frac{3}{a}$
 174
 220

18345 14010
 1197050 1435249
 8262 56
 35 00
173635 3654

14878 1179050
 1419590 1111145
 89 17

169313 9323

14420 11975
 1354040 8075
 36 11120

169119 9143

1490905 10167
 00 961630
 14390 28

17.0515 0542

$\frac{4}{a}$
 169
 230

$\frac{5}{a}$
 169
 235
 min
 22

$\frac{6}{a}$
 171
 240

MC 1445

1913 June 19

21

Moon Measure.

d 4

N

d x

N

Scratch.

17.4 16221

18888

16361

15720

24.5 11090 90

14045-30

9955

12110

90

2230

59 47

21 21

31

92

53

15

24.5136.514227.3598.3601

8 9650

12964 74

18.0 9300 00

70

25.0+ 8088

12600

25.0357.0369

MC 1445

1913 June 19

21

Moon. Unseen.

d 4

N

d 2

N

Scratch.

174 16221
 245 1109090
 90
 31
245136

18888
 1404530
 2230
 92
5142

16361
 995547
 59
 53
173598

15720
 1211021
 21
 15
3601

8 9650
 180 930000
 2501 8088
250357

1296474
 70
 12600
0369

MC 1445	Times Star	1913 June 20	22
Exp to star 1911 Nov 29	0h 59m	- 1" 11"	
moon	1 05	21.05	1 05 21.3
clock slow	0	48.8	
H. Sid T.	1 06	09.95	
H. long.	4 44	31.05	
G. Sid T.	5 50	41.00	
Sid T. in hour	16 29	01.09	
Timed	13 21	39.91	
Reduction	2	11.33	
G. M. T.	13 19	28.58	$6 - \lambda = + 1^h 45^m$

from Naut. Alman	R. A.	Decl.
Moon 13h	23h 20m	58° 01'
Motion 1m 1.9039		14.400
" " 19.4763		+ 37.05
Tabular place	23 21.3603	- 7 56 29.3
Moon's parallax	56'	11.1
semidiameter	15'	20.2
934 = 8.9	R =	920.2
920 = 8.6	Augmentation	+ 8.6
	Imadiation (4)	- 0.8
	R =	928.0
	R =	2.9893
$q = +1$	(+a) R =	1.9895
	R ² =	3.9581

14161445	Trans. Star	1913 June 20.	22
Eph. tot. 1911 Nov 29	0 ^h 59 ^m	- 1 ^m 11 ^s	
moon	1 05	210 - 1 05	213
clock slow	0	488	
H. Sid T.	1 06	0995	
H. long	4 44	3105	
G. Sid T.	5 50	4100	
Sid T. in room	16 29	0109	
Trans. total	13 21	3991	
Reduction	2	1133	
G. in T.	13 19	2858	$\theta - \delta = +1^{\circ} 45''$

from Nant. Alms	R. G.	Black
Moon 13 ^h	23 ^h 20 ^m	5895 - 8 ^o 01 09.8
Proxima 1 ^m 1.9039		19,400
19.4763		+ 3705 + 440.5
Tabula place	23 21	3603 - 7 56 29.3

Moon's parallax	56' 11.1
semidiam	15' 20.2
939 - 89	R = 920.2
920 - 86	Augmentation + 8.6
	Trans. diam 4 - 0.8
	R = 928.0
	R = 898.93
$\alpha = +1$	1 + α R = 1989.5
	R ² = 39581

MC1445

1913 June 20.

23

Plato Constant

	1	2	3
x	11.7388	22.1831	31.9532
\bar{x}	11.5158	21.8058	31.7049
$x - \bar{x}$	+2.230	+3.773	+2.483
y	19.4423	35.2766	21.8514
\bar{y}	17.1546	33.0988	19.7713
$y - \bar{y}$	+2.2877	+2.1778	+2.0801

$$\begin{array}{rclcl}
 x - \bar{x} & -96.84 & -x & -336 & \\
 +2.230 & -1882 & +348 & -12 & +336 = 0 \\
 +3.773 & -3415 & +358 & -22 & +336 = 0 \\
 +2.483 & -2115 & +368 & -32 & +336 = 0 \\
 18.9018 & -2252 & -19 & & = 18.6411 \checkmark
 \end{array}$$

$$\begin{array}{rclcl}
 y - \bar{y} & +102.5 & +1.84 & -2.4115 & \\
 +2.2877 & +1203 & +2.4080 & +35 & +2.4115 = 0 \\
 +2.1778 & +2274 & +2.4052 & +64 & +2.4116 = +1 \\
 +2.0801 & +3275 & +2.4076 & +39 & +2.4115 = 0 \\
 23.2609 & +1937 & +42 & & = 21.0473 \checkmark
 \end{array}$$

$$\begin{array}{lclcl}
 \text{Tables } a = 0.0 & c = -3.9 & a - c = +3.9 & b + d = -4.5 \\
 \text{Obs } a = +1.0 & -1.8 & +2.8 & -5.7 \\
 c = 0 & & +1.1 & +1.2
 \end{array}$$

N101445

1913 June 20

23

Plate constants

	1	2	3
x	11.7388	22.1831	31.9532
y	11.5158	21.8058	31.7049
$x-3$	+2230	+3773	+2483
y	194423	352766	218519
y	171546	330988	197713
$y-3$	+22877	+21778	+20801

$$\begin{array}{rcl}
 x-3 & -4684 & -x \\
 +2230 & -1882 & +348-12 = +336 \\
 +3773 & -3415 & +358-22 = +336 \\
 +2483 & -2115 & +368-32 = +336 \\
 18.9018 & -2252 & -19 = 18.6411
 \end{array}$$

$$\begin{array}{rcl}
 y-3 & +1025 & +184 \\
 +22877 & +1203 & +24080 + 35 = +24115 \\
 +21778 & +2274 & +24052 + 64 = +24116 \\
 +20801 & +3275 & +24076 + 39 = +24115 \\
 232609 & +1937 & +92 = 210473
 \end{array}$$

Tables $a=0.0$ $b=-39$ $a-a=+39$ $b+d=-45$
 Obs $a=+10$ -18 $+28$ -57
 $c=0$ $+11$ $+12$

pt	mag. L	resid.
1	177.3	+52
2	207.0	+40
3	230.8	-11
4	262.5	-86
5	270.0	-31
6	291.7	+62
7	309.0	-114
8	333.0	+84

MC 1445

1913 June 30.

29

Moon's center

	x	$x - X_0$	Δx	$(x - X_0)^2$	R^2	$O-C$
1	19.0000	+0.0950	-9	0.0088	3.9665	+84
2	18.0000	-0.9050	-8	0.8204	3.9717	+136
3	17.3644	-1.5406	-6	2.3753	3.9692	+111
4	16.9318	-1.9732	-1	3.8939	3.9625	+44
5	16.9131	-1.9919	+0	3.9677	3.9677	+96
6	17.0528	-1.8522	+3	3.4295	3.9747	+166
7	17.3600	-1.5450	+6	2.3851	3.9541	-40
8	18.0000	-0.9050	+8	0.8176	3.9689	+108

Comp. $R^2 = 3.9581$

	y	$y - Y_0$	Δy	$(y - Y_0)^2$
1	21.2734	-1.9685	-9	3.9577
2	21.4875	-1.7744	-8	3.1513
3	22.0000	-1.2619	-6	1.5939
4	23.0000	-0.2619	-1	0.0686
5	23.2619	0.0000	0	0.0000
6	24.0000	+0.7381	+3	0.5452
7	24.5739	+1.2520	+6	1.5690
8	25.0363	+1.7744	+8	3.1513

Approx. center

$$x = 18.0 \quad y = 21.4875$$

$$\begin{array}{r} 25.0363 \\ \hline 46.5238 \end{array}$$

$$\text{mean } y = 23.2619$$

$$y - \text{min} = 21.2700$$

$$R = 1.9919$$

$$\text{min in } x = 16.9131$$

$$\text{mean } x = 18.9050$$

$$\text{Center } \left\{ \begin{array}{l} X_0 = 18.9050 \\ Y_0 = 23.2619 \end{array} \right.$$

MC 1495

1913 June 30

29

Known Center

	x	$x - X_0$	Δx	$(x - X_0)^2$	K^2	$O-C$
1	190000	+00950	-9	00084	39665	+84
2	180000	-09050	-8	08204	39717	+136
3	173644	-15406	-6	23753	39692	+111
4	169314	-19732	-1	38939	39625	+44
5	169131	-19919	+0	39677	39677	+96
6	170528	-18522	+3	34295	39747	+166
7	173600	-15450	+6	23851	39541	-40
8	180000	-09050	+8	08176	39689	+108

Comp $K^2 = 39581$

	y	$y - Y_0$	Δy	$(y - Y_0)^2$
1	212734	-19885	-9	39577
2	214875	-17744	-8	31513
3	220000	-12619	-6	15939
4	230000	-02619	-1	00686
5	232619	00000	0	00000
6	240000	+07381	+3	05452
7	245739	+12520	+6	15690
8	250363	+17744	+8	31513

Approx. center

$$x = 180 \quad y = 214875$$

$$\underline{250363}$$

$$465238$$

$$\text{mean } y = 232619$$

$$y - \text{mean} = 212700$$

$$K = 19919$$

$$\text{min in } x = 169131$$

$$\text{mean } x = 189050$$

$$\text{Center } \left\{ \begin{array}{l} X_0 = 189050 \\ Y_0 = 232619 \end{array} \right.$$

MC1445

Conditional Equations.

	a	b	c	0 - c	
1	+0.10	-1.99	= - +8.4	- 6 + 38 = +32	+52
2	-0.91	-1.77	= +1.36	+ 58 + 34 = +92	+44
3	-1.54	-1.26	= +1.11	+ 98 + 24 = +122	-11
4	-1.97	-0.26	= +4.4	+ 125 + 5 = +130	+86
5	-1.99	+0.00	= +9.6	+ 127 = 0 = +127	-31
6	-1.85	+0.74	= +1.66	+ 118 - 14 = +104	+62
7	-1.55	+1.25	= -4.0	+ 98 - 24 = +74	-114
8	-0.91	+1.77	= +1.08	+ 58 - 34 = +24	+84

Average = 60

Mean Equations.

$$-4.32 - 528 = +375$$

$$-630 + 376 = +330$$

$$+6.30 + 770 = -547$$

$$+11.46 = -217$$

$$b = -19.0$$

$$-4.32 = +375 - 100 = +275$$

$$a = -63.6$$

M 61445

Conditional Equations

	a	b	c		d	e	f	g
1	+0.10	-1.99	+5.4	-	6	+3.8	+7.32	+5.2
2	-0.91	-1.77	+1.36	+	5.8	+3.4	+9.2	+4.4
3	-1.54	-1.26	+1.11	+	9.8	+2.4	+12.2	+1.1
4	-1.97	-0.26	+4.4	+	12.5	+5	+13.0	+4.6
5	-1.49	+0.00	+4.6	+	12.7	-0	+12.7	+3.1
6	-1.85	+0.74	+1.60	+	11.8	-1.4	+10.4	+6.2
7	-1.55	+1.25	-4.0	+	9.8	-2.4	+7.4	+1.4
8	-0.91	+1.77	+1.08	+	5.8	-3.4	+2.4	+4.4

Average = 6.0

Mean Equations

$$-4.32 - 5.28 = +37.5$$

$$-6.30 + 3.76 = +33.0$$

$$+6.30 + 7.70 = -54.7$$

$$+11.46 = -21.7$$

$$L = -19.0$$

$$-9.32 = +37.5 - 100 = +27.5$$

$$L = -63.6$$

1445

Moon's Mean Position (1911.0)

$$\begin{array}{r} X_0 = 18.9050 \\ \frac{1}{2}a = -32 \\ \hline 18.9018 \end{array}$$

$$\begin{array}{r} Y_0 = 23.2619 \\ \frac{1}{2}b = -10 \\ \hline 23.2609 \end{array}$$

From Plate Constants $X = 18.6411$ $Y = 21.0473$

$$\begin{array}{r} \bar{z} = +0.6411 \\ \log \bar{z} = 9.80693 \\ \log \cos \delta = 9.99502 \\ \text{const} = 850724 \end{array}$$

$$(\alpha - A) = 130467$$

$$\alpha - A = +20.17$$

$$A = 23 \ 19 \ 59$$

$$a_0 = 23 \ 20 \ 19.17$$

$$\text{Red} = +2.61$$

$$\alpha' = 23 \ 20 \ 21.78$$

$$\eta = -0.9527$$

$$\begin{array}{r} \log \tan \delta = 9.1762 \\ \log \sec \delta = 8.6139 \\ \log \eta_1 = 4.8435 \end{array}$$

$$\begin{array}{r} \log \eta_0 = 9.97896 \\ \text{const} = 733115 \end{array}$$

$$(\delta - D) = 2.64781$$

$$\delta - D = -7 \ 24.4$$

$$D = -8 \ 32 \ 06$$

$$s_0 = -8 \ 39 \ 30.4$$

$$\text{Red} = +13.2$$

$$s' = -8 \ 39 \ 17.2$$

1445 narrow band (Pantun 4911.0)

$$\begin{array}{r} X = 189050 \\ 2a = \quad -32 \\ \hline 189018 \end{array}$$

$$\begin{array}{r} Y = 232619 \\ 2b = \quad -10 \\ \hline 232609 \end{array}$$

From Plate Constants $X = 18.6411$ $Y = 21.0473$

$$\begin{array}{r} z = +0.6411 \\ \log z = 9.80693 \\ \log \cos \delta = 9.99502 \\ \text{const} = 8.50724 \end{array}$$

$$(x-A) = 130467$$

$$x-A = +2017$$

$$A = 23 \quad 19 \quad 59$$

$$q_0 = 23 \quad 20 \quad 19.17$$

$$\text{Red} = +261$$

$$v = 23 \quad 20 \quad 21.78$$

$$y = -0.9527$$

$$\begin{array}{r} \log \tan \delta = 9.1762 \\ z = 8.6139 \\ -y_1 = 4.8435 \end{array}$$

$$\begin{array}{r} \log \eta_0 = 9.97896 \\ \text{const} = 7.33115 \end{array}$$

$$(y-B) = 264781$$

$$S-B = -7 \quad 24.4$$

$$B = -8 \quad 32 \quad 06$$

$$S_0 = -8 \quad 39 \quad 30.4$$

$$\text{Red} = +132$$

$$S' = -8 \quad 39 \quad 17.2$$

1445 Red. ad. locum rht. $S = -8^{\circ} 39' 30''$

$$H + \alpha \quad 0^{\text{h}} 46^{\text{m}} = 11^{\circ} 30'$$

$$H \quad 1 \quad 26$$

$$\alpha \quad 23 \quad 20$$

$$G \quad 22 \quad 08$$

$$G + \alpha \quad 21 \quad 28 = 322^{\circ}$$

$$l \cos(G + \alpha) \quad 9.8965$$

$$l \sin \alpha \quad 1.2183$$

$$l \sin \alpha \quad 9.7893^{\text{m}}$$

$$l \cos S \quad 9.1835^{\text{m}}$$

$$8.8239$$

$$8' \quad 1.1148$$

$$8 \quad 9.0150$$

$$l \quad + 2.24$$

$$+ 0.10$$

$$l \quad + 0.27^{\checkmark}$$

$$+ 2.61^{\checkmark}$$

$$l \cos S \quad 9.9950$$

$$i \quad 0.5065$$

$$(i) \quad 0.5015$$

$$l \sin S \quad 9.1777^{\text{m}}$$

$$\cos(H + \alpha) \quad 9.9912$$

$$h \quad 1.3052$$

$$\sin \alpha \quad 9.2997^{\checkmark}$$

$$l \cos S \quad 0.0050$$

$$8.8239$$

$$l' \quad 0.4741^{\text{m}}$$

$$h \quad 9.4338$$

$$8' \quad + 13.03^{\checkmark}$$

$$2' \quad - 2.98$$

$$i \quad + 3.17$$

$$+ 13.22^{\checkmark}$$

1445 Red ad locum rht. $S = -8^{\circ} 39' 30''$

$H + \alpha$ 0 46 - 11 30

H 1 26

α 23 20

α 22 08

$H + \alpha$ 21 28 322°

$L \cos(G + \alpha)$ 9 8965

\sin 1 2183

\sin 9 7893 m

\cos 9 1835 m

88239

8' 11148

90150

α + 224

α + 0.10

α + 0.27

7261

$L \cos S$ 99950

i 05065

(2) 05015

$L \sin S$ 9 1777 m

$\cos(H + \alpha)$ 99912

\sin 1 3052

\sin 9 2997

\cos 00050

88239

L' 04741 m

L 94338

8' + 13.03

α - 298

i + 317

+ 1322

1445

Lunar Parallax

$$\alpha' = 23^h 20^m 21^s.78^v$$

$$\delta' = -8^\circ 39' 17''.2^v$$

$$G = 1 \quad 06 \quad 0995^v$$

$$G - \alpha' = +1 \quad 45 \quad 482^v$$

$$= +26^\circ 27' 03''^v$$

$$\pi = 56' 11''.1^v$$

$$+ \quad \quad \quad 9 \quad 21^v$$

$$+ 26 \quad 17 \quad 42^v$$

$$9.95727^v$$

$$0.00000^v$$

$$004744^v$$

$$000471^v$$

$$9.86913^v$$

$$8.21332^v$$

$$9.64878^v$$

$$000418^v$$

$$773541^v$$

$$\alpha - \alpha' = +18' 41''.59^v$$

$$= + \quad 1^m 14^s.77^v$$

$$\gamma = 45 \quad 18 \quad 38^v$$

$$-8 \quad 39 \quad 17^v$$

$$53 \quad 59 \quad 55^v$$

$$9.82640^v$$

$$8.21332^v$$

$$9.90746^v$$

$$0.14877^v$$

$$809565^v$$

$$S - S' = +42 \quad 50.9^v$$

$$S = -7 \quad 56 \quad 26.3^v$$

$$\alpha = 23 \quad 21 \quad 36.55^v$$

$$\text{Lunar } S = -7 \quad 56 \quad 29.3^v$$

$$\alpha = 23 \quad 21 \quad 36.03^v$$

$$O - C \quad \quad \quad + 30^v$$

$$+ 0.52^v$$

1445

Lunar Phase Clock

 $\alpha = 23^h 20^m 21.78$ $\delta = -8^\circ 39' 17.2$ $\epsilon = 1^\circ 06' 09.95$ $\alpha = +1^\circ 45' 48.2$ $\Pi = 56'' 11''$ $+26^\circ 27' 03''$

986913

 $+ \quad \quad \quad 9 \quad 21$

821332

 $+26^\circ 17' 42''$

964878

000418

773541

995727

000000

009799

000471

 $\alpha - \alpha' = +18' 41.59$ $+ \quad 1^\circ 14.77$ $\gamma = 45^\circ 18' 38''$ $-8^\circ 39' 17''$ $53^\circ 57' 55''$

982640

821332

990790

014822

809568

 $S - S' = +42^\circ 50.9$ $S = -7^\circ 56' 26.1$ $\alpha = 23^\circ 21' 36.55$ Want Alt $\delta = -7^\circ 56' 29.3$ $\alpha = 23^\circ 21' 36.03$ $0 - 0 \quad \quad \quad + \quad 32$ $+0.52$

1447 Reason reversed 18-22

Star	SC	Y
1	9.1	16.9
2	19.6	32.7
3	29.4	19.4

Moon	SC	Y
1	18.0	19.8
2	17.7	19.8 min in Y
3	17.0	19.9
(4)	16.0	20.7)
5	15.9	21.0
6	15.7	21.6 min in SC
7	15.7	22.0
8	(16.0	22.9)
8	16.1	23.0
9	16.6	23.5 scotal

