

KG

11366

r.904

Volume XXVIII



Plates

1463

1518

1519



1911phae.pro.190

PRINCETON OBSERVATORY
PRINCETON, N. J.
U. S. A.

Harvard Lunar Plates

Measures and Reductions

Mary Fowler

Volume XXVIII

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1
9.
30
10
2
1
4
3
2

M1C 1463

1913 June 24.

1.

Stars measures

	d	v	d	N
1	18189	14430	18695	16160
9.1	10850	11776	973035	1507473
30.7	40	7371	36	83
	87	22	65	48
	<u>30.7343</u>	<u>.7345</u>	<u>9.1068</u>	<u>.1083</u>
2				
10.4	15870	18820	16550	18681
9.9	6975	17730	1076060	1445060
	7578	2122	60	5360
	77	10	56	80
	<u>9.8900</u>	<u>.8905</u>	<u>10.4207</u>	<u>.4227</u>
3				
237	14185	16905	15252	18020
11.1	13405	808081	1257370	1066969
	0915	90	70	63
	89	01	60	11
	<u>11.1175</u>	<u>.1183</u>	<u>23.7377</u>	<u>.7346</u>
4				
30.4	16835	16768	19538	17306
25.6	1024045	1337872	1299500	1385145
	48	72	93	48
	37	85	38	28
	<u>25.6592</u>	<u>.6600</u>	<u>30.3459</u>	<u>.3462</u>

Grade 3

A/C 1463

1913 June 24

1.

Stars Unmeasured

	d	μ	α	δ	μ	α	δ
1	18189		14430		18680		16160
91	10850	45	11776		9730	35	15074
307	40		7371		36		8373
	87		22		65		48
	<u>30.7393</u>		<u>7345</u>		<u>9.1068</u>		<u>1083</u>
2	10.4	15870	18820		16550		18681
99	6975	78	17730	22	10760	60	14450
	75		21		60		5860
	77		10		56		80
	<u>9.8900</u>		<u>8905</u>		<u>10.4207</u>		<u>4227</u>
3	237	14185	16905		15252		18020
111	13405	15	8080	81	12573	70	10669
	09		90		70		6369
	89		01		60		11
	<u>11.1175</u>		<u>1183</u>		<u>23.7377</u>		<u>7346</u>
4	304	16835	16768		19538		17306
25.6	10240	45	13378	72	12998	00	13851
	48		72		93		48
	37		85		38		18
	<u>25.6592</u>		<u>6600</u>		<u>80.3459</u>		<u>3462</u>

Grade 3

M1463 *Arcturus - Ursa Major*

1913 June 24

2

scratched	d	u	d	u
<u>1</u>				
175	17962	15656	18394	15200
191	17070	653540	1391.228	968386
	7980	40	15	83
	46	56	82	00
	<u>190861</u>	<u>0882</u>	<u>17.5530</u>	<u>5516</u>

<u>2</u>		
170	17018	18600
194	14450	1117576
	50	72
	00	06
	<u>192566</u>	<u>2570</u>

3
162
210

4
158
210

17226	18362
840201	1714060
01	4056
00	70
<u>161198</u>	<u>1214</u>

16153	1860.7
13690	1104545
05-95	45-45
32	11
<u>15.7549</u>	<u>7565</u>

mean in 76 = about

157420

5
159
220

15050	17703
1396058	877176
63	72
30	01
<u>15.8918</u>	<u>8925</u>

6
167
230

15330	17383
1221025	1048079
1120	70
06	93
<u>16.6893</u>	<u>6914</u>

MC 1463

Moon-measures

1913 June 29 3

	d	n	d	n
2	18752	15720		
17.0	17000.00	7488		
23.3	88	8190		
	56	22		
	<u>23 1757</u>	<u>1764</u>		
8				
18.0	17665	15160		
23.4	1395030	889099		
max	3544	84		
$\frac{1}{2}+$	71	70		
	<u>23.3727</u>	<u>3725</u>		

NIC 1463

Moon - measures

1913 June 29 3

	α	δ	α	δ
2	18752	15720		
170	1700000	748890		
233	88	8190		
	56	22		
	<u>23 1757</u>	<u>1764</u>		
8				
180	17665	15160		
234	1395030	889099		
mark	3544	84		
8	71	70		
	<u>23 3727</u>	<u>3725</u>		

AAC 1463 Times etc. 1913 June 24 4
 Exp. to stars 1911 Dec 4 7^h 15^m - 7^h 27^m
 Moon 7 21 23.9 - 7 21 24.2
 Clock slow 0 50.6^v

H. Sid. T. 7 22 1465^v
 H. Long. 4 44 3105^v
 G. Sid. T. 12 06 45.70^v
 Sid. T. in Moon 16 48 43.89^v
 Interval 19 18 01.81^v
 Reduction 3 09.71^v
 G. M. T. 19 14 52.10^v

Town Hall Alm. R.A. Clock.
 Moon 19^h 3^h 50 4232 + 22 47 08.3
 Motion in 1^m 2.5895^v ✓ 10.759^v
 .. 14.8683^v + 38.50 ✓ + 2 20.9
 Tabular place 3 51 20.82 ✓ + 22 49 48.3

Moon's Parallax 60' 44.3^v
 Semidiameter 16 34.4^v

$$= 994.4^{\circ}$$

$$934 = 10.6$$

$$994 = 12.7$$

$$\text{ang } z = 712.7^{\circ}$$

$$\text{Irradiation} = -0.7$$

$$R = 1006.4^{\circ}$$

$$R = 2157.3^{\circ}$$

$$a = -0.8$$

$$(1+a) R = 2157.1^{\circ}$$

$$R^2 = 4.6530$$

1121463 Times etc 1913 June 24 4
 Exp. T. 1911 Dec 4 7^m 1.5^m - 7^m 27^m
 Moon 7 21 239 - 7 21 242
 Clock slow 0 50.6

H Sid T. 7 22 1465
 H Long 4 44 3105
 G Sid T. 12 06 4570
 Sid T. in Moon 16 48 4389
 Interval 19 18 0181
 Reduction 3 0971
 G. M. T. 19 14 5210

from hand Alm R.A. Clock
 Moon 19^m 3^m 50 4232 + 22 47 083
 Moon - 1^m 2.5895 10.759
 148683 3850 2 48.0
 Tabular place 3 51 2082 + 22 49 48.3

Moon Parallax 60' 44.3
 semidiam 16 34.4

= 49.44

Aug = 712.70
 Irradiation - 0.7

R = 10064

R = 21573

- 0.8

(1+a) R = 21571

R² = 4.6530

30 21 20

10

100

100

MC1463

1913 June 26

5

Plate constants

	1	2	3	4
x	9.1076	10.4217	23.7332	30.3460
y	9.0228	10.5353	23.8363	30.3050
$x-3$	+ 848	- 1136	- 1031	+ 410
y	30.7344	9.8902	11.1179	25.6596
m	31.2288	10.3994	11.7564	26.3658
$y-3$	- 4939	- 5089	- 6385	- 7062

$$\begin{aligned}
 x-3 & -954 & +x & & -224-24 & +2070 \\
 +848 & -2919 & = -2071 & +9 & -2062 & -2-6 = -2070 \\
 -1136 & -940 & = -2076 & +10 & -2066 & -2-2 = -2070 \\
 -1031 & -1056 & = -2087 & +24 & -2063 & -5-2 = -2070 \\
 \boxed{+410} & -2438 & = -2028 & +30 & -2098 & -6-5 = -2089
 \end{aligned}$$

(4) double star

$$\begin{aligned}
 y-m & +97.6x & -y & & +4081 \\
 -4939 & +890 & = -4049 & -31 & = -4080 & = +1 \\
 -5089 & +1017 & = -4072 & -10 & = -4082 & = -1 \\
 -6385 & +2316 & = -4069 & -11 & = -4080 & = +1 \\
 \boxed{-7062} & +2962 & = -4100 & -26 & = -4126 & = -45
 \end{aligned}$$

$$\begin{aligned}
 \text{Tables } a & = -1.9 & x & = -1.4 & a-x & = -0.5 & b+a & = -3.2 \\
 \text{Obs } & -0.8 & & +1.0 & & -1.8 & & -2.4 \\
 c-o & & & & & +1.3 & & -0.8
 \end{aligned}$$

MC1463

1913 June 26.

5

Plate constants

	1	2	3	4
x	9 1 0 7 6	1 0 4 2 1 7	2 3 7 3 3 2	3 0 3 4 6 0
y	9 0 2 2 8	1 0 5 3 5 3	2 3 8 3 6 3	3 0 7 0 5 0
$x-3$	+ 8 4 8	- 1 1 3 6	- 1 0 3 1	+ 4 1 0
y	3 0 7 3 4 4	9 8 9 0 2	1 1 1 1 7 9	2 5 6 5 9 6
y	3 1 2 2 8 3	1 0 3 9 9 1	1 1 7 5 6 4	2 6 3 6 5 8
$y-3$	- 4 9 3 9	- 5 0 8 9	- 6 3 8 5	- 7 0 6 2

$$\begin{aligned}
 & x-3 = -959 \quad +x \quad -20-24 \quad +2070 \\
 & +848 -2919 = -2071 \quad 9 = -2062 \quad -2-6 = -2070 \\
 & -1136 -940 = -2076 \quad -10 = -2066 \quad -2-2 = -2070 \\
 & -1031 -1056 = -2087 \quad +24 = -2063 \quad -5-2 = -2070 \\
 & [+410 -2438 = -2028 \quad -30 = -4998 \quad -6-5 = -2009]
 \end{aligned}$$

$$\begin{aligned}
 & y-m \quad +9762 \quad -y \quad +4081 \\
 & -4939 +890 = -4049 \quad -31 = -4080 \quad = +1 \\
 & -5089 +1017 = -4072 \quad -10 = -4082 \quad = -1 \\
 & -6385 +2316 = -4069 \quad -11 = -4080 \quad = +1 \\
 & [-7062 +2962 = -4100 \quad -26 = -4126 \quad = -45]
 \end{aligned}$$

$$\begin{aligned}
 \text{Tables } a &= -19 \quad b = -14 \quad a-b = -05 \quad b+a = -32 \\
 \text{Obs.} & \quad -08 \quad +10 \quad -18 \quad -24 \\
 c &= 0 \quad +13 \quad -08
 \end{aligned}$$

pt.	pos. c	resid.
1	189.2	-19
2	204.5	+13
3	235.8	+19
4	264.3	+13
5	291.3	+7
6	326.0	-53
7	335.4	-8
8	2.7	+53

MC1463

Moon's center

1913 July 2

6

	x	$x - x_0$	Δx	$(x - x_0)^2$	R^2	$0 - C$
1	17.5523	-0.3459	-7	0.1201	4.6485	-45
2	17.0000	-0.8982	-7	0.8080	4.6473	-57
3	16.1206	-1.7776	-4	3.1613	4.6407	-123
4	15.7557	-2.4425	-1	4.5903	4.6392	-158
5	15.8921	-2.0061	+2	4.0236	4.6375	-155
6	16.6904	-1.2078	+6	1.4573	4.6378	-152
7	17.0000	-0.8982	+7	0.8055	4.6448	-82
8	18.0000	+0.1018	+7	0.0105	4.6588	+58

Computed $R^2 = 4.6530$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	19.0882	-2.1282	+2	4.5284
2	19.2568	-1.9596	+2	3.8393
3	20.0000	-1.2164	+1	1.4794
4	21.0000	-0.2164	0	0.0469
5	22.0000	+0.7836	-1	0.6139
6	23.0000	+1.7836	-2	3.1805
7	23.1760	+1.9596	-2	3.8393
8	23.3726	+2.1562	-2	4.6483

Approx. Center

$$x = 17.0 \quad y = 19.2568$$

$$23.1760$$

$$424328$$

$$\text{mean } y = 21.2164$$

$$y - \text{max} = 23.3726$$

$$R = 2.1562$$

$$x - \text{min} = 15.7420$$

$$\text{mean } x = 17.8982$$

$$\text{center } \begin{cases} x_0 = 17.8982 \\ y_0 = 21.2164 \end{cases}$$

MC1463

Hydrogen Center

1913 July 2

6

	x	$x - \bar{x}$	Δx	$(x - \bar{x})^2$	$\bar{y}$	$y - \bar{y}$
1	17.5528	-0.3459	-7	0.1201	46.485	-45
2	17.0000	-0.8982	-7	0.8068	46.477	-57
3	16.1206	-1.7776	-4	3.1613	46.407	-123
4	15.7557	-2.1425	-1	4.5903	46.372	-158
5	15.8921	-2.0061	+2	4.0236	46.375	-155
6	16.6904	-1.2078	+6	1.4573	46.378	-152
7	17.0000	-0.8982	+7	0.8068	46.445	-82
8	18.0000	+0.1018	+7	0.0103	46.588	+58

Combined $\sigma^2 = 4.6530$

	y	$y - \bar{y}$	Δy	$(y - \bar{y})^2$
1	19.0882	+2.1282	+3	4.5284
2	19.2568	+1.9596	+2	3.8393
3	20.0000	+1.2164	+1	1.4794
4	21.0000	+0.2164	0	0.0469
5	22.0000	+0.7836	-1	0.6139
6	23.0000	+1.7836	-2	3.1805
7	23.1760	+1.9596	-2	3.8393
8	23.3726	+2.1562	-2	4.6483

Approximate Center

$$x = 17.0 \quad y = 19.2568$$

$$23.1760$$

$$42.4328$$

$$\text{mean } y = 21.2164$$

$$y_{\text{mean}} = 23.3726$$

$$R = 2.1562$$

$$x_{\text{min}} = 15.7420$$

$$\text{mean } x = 17.8982$$

$$\text{Center } \begin{cases} x_0 = 17.8982 \\ y_0 = 21.2164 \end{cases}$$

Formation of Normal Equations

	a	b	c
1	+ 0.74	+ 15.7	+ 95.8
2	+ 1.76	+ 51.2	+ 111.5
3	+ 2.17	+ 219.0	+ 150.0
4	+ 0.47	+ 338.0	+ 34.8
5	- 1.57	+ 311.5	- 121.0
6	- 2.15	+ 184.0	- 271.0
7	- 1.76	+ 13.8	- 160.8
8	+ 0.22	+ 5.8	+ 124.5
	- 0.12	+ 1199.0	- 362

Normal Equations

$$+ 14.98 - 0.12 = + 1199$$

$$- 0.12 + 2218 = - 36$$

$$+ 0.12 - 0.00 = + 10$$

$$+ 22.18 = - 26$$

$$+ 14.98a = + 1199$$

$$b = - 1.2$$

$$a = + 80.0$$

Residuals

	O	C	$O - C$
1	- 45	- 28 + 2 = - 26	- 19
2	- 57	- 72 + 2 = - 70	+ 13
3	- 123	- 143 + 1 = - 142	+ 19
4	- 158	- 171 + 0 = - 171	+ 13
5	- 155	- 161 - 1 = - 162	+ 7
6	- 152	- 97 - 2 = - 99	- 53
7	- 82	- 72 - 2 = - 74	- 8
8	+ 58	+ 8 - 3 = + 5	+ 53

Average = 23

1912 Sept. 25.

7

MC 1463 Luvo's center.

Conditional Equations.

	a	b	c			0 - c
1	-0.35	-2.13	= -45	-27 + 6 = -21	-24	
2	-0.90	-1.96	= -57	-70 + 6 = -64	+7	
3	-1.78	-1.22	= -123	-138 + 4 = -134	+11	
4	-2.14	-0.22	= -158	-166 + 1 = -165	+7	
5	-2.01	+0.78	= -155	-156 - 2 = -158	+3	
6	-1.21	+1.78	= -152	-94 - 5 = -99	-53	
7	-0.90	+1.96	= -82	-70 - 6 = -76	-16	
8	+0.10	+2.15	= +58	+8 - 6 = +2	+56	

$$a \quad b$$

$$-5.17 - 5.53 = -38.3$$

$$-4.02 + 6.67 = -33.1$$

$$+5.17 - 8.60 = +4.26$$

$$-14.73 = +4.3$$

$$b = -1.6 - 3.08$$

$$-4.26 = -33.1 + 11 = -38.0 \quad a = +7.6$$

$$-4.02 = -33.1 + 20 = -31.1 \quad a = +77.5$$

$$X_0 = 17.8982 \checkmark$$

$$\frac{1}{2}a = +40$$

$$X = 17.9022 \checkmark$$

$$-954 = -2016 \checkmark$$

$$-0.24 = -4 \checkmark$$

$$+0.8x = +14 \checkmark$$

$$+2070 \checkmark$$

$$Y = 17.9086 \checkmark$$

$$0914$$

$$Y_0 = 212164 \checkmark$$

$$\frac{1}{2}b = -1$$

$$Y = 212163 \checkmark$$

$$+97.6x + 1747 \checkmark$$

$$-4 - 21 \checkmark$$

$$+4081 \checkmark$$

$$217970 \checkmark$$

$$-2070$$

$$2030$$

1912 Sept 21

7

MC 1463

Luvous Center

Conditional Equations

	a	b	0		0 - c
1	-0.35	-2.13	-45	-27 + 6 = -21	-24
2	-0.90	-1.96	-57	-70 + 6 = -64	+7
3	-1.78	-1.22	-123	-138 + 4 = -134	+11
4	-2.14	-0.22	-158	-166 + 1 = -165	+7
5	-2.01	+0.78	-155	-156 - 2 = -158	+3
6	-1.21	+1.78	-152	-94 - 5 = -99	-53
7	-0.90	+1.96	-82	-70 - 6 = -76	-16
8	+0.10	+2.15	+58	+8 - 6 = +2	+56

$$\begin{aligned}
 a & b \\
 -5.17 - 5.53 &= -383 \\
 -402 + 667 &= -331
 \end{aligned}$$

$$\begin{aligned}
 +5.17 - 8.68 &= +426 \\
 -1473 &= +43
 \end{aligned}$$

$$b = -16 - 3.08$$

$$-426 - 331 + 11 = -746 \quad c = +76$$

$$-402 = -331 + 20 = -311 \quad a = +77.5$$

$$\begin{array}{r}
 X_0 = 17.8982 \\
 \frac{1}{2}a = 48 \\
 \hline
 X = 17.9022 \\
 -954 = -2016 \\
 -1.24 = -4 \\
 +0.82 = +14 \\
 \hline
 +2070 \\
 \hline
 Y = 17.9086
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 21.2164 \\
 \frac{1}{2}b = -2 \\
 \hline
 Y = 21.2163 \\
 +9762 + 1747 \\
 -9 - 21 \\
 \hline
 +4081 \\
 \hline
 \Sigma 17979
 \end{array}$$

Read d. app.

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

$$\begin{array}{rcl}
 H+K & 4 & 55 = 73^{\circ} 45' \\
 H & 1 & 6 \\
 K & 3 & 49 \\
 Q & 22 & 13 \\
 G+Q & 2 & 02 = 30^{\circ} 30'
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(G+K) & 9.9353 \\
 \dots g & 1.2234 \\
 \dots \sin & 9.7255 \\
 \dots \tan S & 9.6144 \\
 \dots \frac{1}{S} & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 (g') & 1.1587 \\
 (g) & 9.3672
 \end{array}$$

$$\begin{array}{rcl}
 f & +2.29 \\
 g & +0.23 \\
 h & +4.40 \\
 \hline
 & +39.2
 \end{array}$$

$$\begin{array}{rcl}
 l \cos S & = & 9.9660 \\
 \dots i & = & 0.4014 \\
 \dots i & = & 0.3674
 \end{array}$$

$$\begin{array}{rcl}
 l \sin S & 9.5804 \\
 \dots \cos(H+K) & 9.4469 \\
 \dots h & 1.3073 \\
 \dots \sin & 9.9823 \\
 \dots \sec S & 0.0340 \\
 \dots \frac{1}{S} & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log(a') & 0.3346 \\
 \dots (a) & 0.1475
 \end{array}$$

$$\begin{array}{rcl}
 (g') & +14.41 \\
 (h') & +2.16 \\
 (l) & +2.33 \\
 \hline
 & 189.0
 \end{array}$$

MC1463

1913 Sept. 26.

Q

Moon's mean Position (1911.0)

$$z = -0.0914$$

$$\eta = -0.2030$$

$$\log S. = 8.96095^m$$

$$7.0534$$

$$\cos \delta = 9.96608$$

$$\log \tan \delta = 9.6243$$

$$9.6144$$

$$\cos t = 8.50724$$

$$\log \tan \delta = 7.9228$$

$$7.9219$$

$$(h-t) = 0.48770^m$$

$$\eta_1 = 4.6005$$

$$4.5897$$

$$h-t = 03.09$$

$$\log \eta_0 = 9.30750^m$$

$$\cos t = 7.33115$$

$$h = 3^h 48^m 44^s$$

$$(t-D) = 1.97635^{\circ}$$

$$h_0 = 3^h 48^m 40.93^s$$

$$\delta-D = 01 34.7$$

$$Red = + 3.92$$

$$D = +22 23 42^{\circ}$$

$$\delta' = 3 48 44.85^{\circ}$$

$$\delta_0 = +22 22 07.3^{\circ}$$

$$Red = + 18.9$$

$$\delta' = +22 22 26.3^{\circ}$$

1761463

1913 Sept. 26.

4

known mean Position (1911.0)

$$3 = -00914$$

$$\gamma = -02030$$

$$\log 3 = 896095$$

$$\log 8 = 996608$$

$$\log 4 = 850724$$

$$\log \tan \delta = 96243$$

$$\log 2 = 79228$$

$$\eta = 46005$$

$$(1-1) = 048975$$

$$\log \eta = 930750$$

$$1-1 = 0309$$

$$\log 1 = 733115$$

$$1 = 3^{\circ} 48' 44''$$

$$(1-1) = 197635$$

$$10 = 3^{\circ} 44' 40'' 93''$$

$$\delta - 1 = 01349$$

$$Red = 3.92$$

$$10 = +22 23 42''$$

$$1 = 3 48 4485''$$

$$\delta = +22 22 098''$$

$$Red = 1.89$$

$$\delta = +22 22 262''$$

1463 *Lunar parallel,*

$$\begin{array}{r}
 \lambda = 3^{\circ} 48' 44.85'' \\
 \theta = 7^{\circ} 22' 14.65'' \\
 + 3^{\circ} 33' 29.8'' \\
 = + 53^{\circ} 22' 27'' \checkmark
 \end{array}$$

$$\begin{array}{r}
 + 19^{\circ} 34'' \\
 + 53^{\circ} 02' 53'' \checkmark
 \end{array}$$

$$\begin{array}{r}
 9.95727 \checkmark \\
 9.99999 \checkmark \\
 0.22102 \checkmark \\
 \hline
 0.17828
 \end{array}$$

$$\delta = 56^{\circ} 26' 35''$$

$$22^{\circ} 22' 38''$$

$$\delta - \delta' = 34^{\circ} 04' 10''$$

$$\begin{array}{r}
 9.82640 \checkmark \\
 8.24717 \checkmark \\
 9.74834 \checkmark \\
 0.07918 \checkmark \\
 \hline
 7.90109 \checkmark
 \end{array}$$

$$\delta - \delta' = + 27^{\circ} 22.6'' \checkmark$$

$$\delta = + 22^{\circ} 49' 48.8'' \checkmark$$

$$\text{Ann Eph } \delta = + 22^{\circ} 49' 48.3'' \checkmark$$

$$O - C = + 0.5'' \checkmark$$

$$\delta = + 22^{\circ} 22' 26.2'' \checkmark$$

$$\Pi = 60^{\circ} 44.3''$$

$$\begin{array}{r}
 9.86913 \checkmark \\
 8.24717 \checkmark \\
 9.90447 \checkmark \\
 0.03543 \checkmark \\
 \hline
 8.05620 \checkmark
 \end{array}$$

$$\alpha - \alpha' = + 39^{\circ} 07.67'' \checkmark$$

$$+ 2^{\circ} 36.51'' \checkmark$$

$$\lambda = 3^{\circ} 51' 21.36'' \checkmark$$

$$\lambda = 3^{\circ} 51' 20.82'' \checkmark$$

$$+ 0.54'' \checkmark$$

1413 *Lunar Parallel.*

$$\begin{array}{r}
 \lambda = 3^{\circ} 48' 44.8'' \\
 \mu = 7^{\circ} 22' 14.6'' \\
 + 3^{\circ} 33' 29.8'' \\
 = + 5^{\circ} 3' 22.2''
 \end{array}$$

$$\begin{array}{r}
 + 19^{\circ} 34' \\
 + 53^{\circ} 02' 53''
 \end{array}$$

$$\begin{array}{r}
 995727 \\
 999999 \\
 022102 \\
 \hline
 0.17828
 \end{array}$$

$$\delta = 56^{\circ} 26' 35''$$

$$22^{\circ} 22' 36''$$

$$\delta - \delta' = 34^{\circ} 04' 12''$$

$$\begin{array}{r}
 982640 \\
 824718 \\
 974634 \\
 007918 \\
 \hline
 790109
 \end{array}$$

$$\delta - \delta' = + 27^{\circ} 22.6''$$

$$\delta = + 22^{\circ} 49' 48.8''$$

$$\text{Circ. Eph. } \delta = + 22^{\circ} 49' 48.3''$$

$$O - C = + 0.5''$$

$$\delta = + 22^{\circ} 22' 26.3''$$

$$\mu = 60^{\circ} 44' 3''$$

$$\begin{array}{r}
 996913 \\
 824718 \\
 990447 \\
 003547 \\
 \hline
 805620
 \end{array}$$

$$\alpha - \alpha' = + 39^{\circ} 07.79''$$

$$+ 2^{\circ} 36.51''$$

$$\alpha = 3^{\circ} 51' 21.36''$$

$$\alpha = 3^{\circ} 51' 20.82''$$

$$+ 0.54''$$

1
9
2
m
2
2
1
m
7
3
31
34
m
7

MC 1518

Star-Measures

1913 June 25 10

	d	v	d	v
1	18888	14515	15011	19080
9.5	16200	724035	1257550	14512
22.3	90	36	80	06
mg	00	30	20	00
7.4	<u>22.2695</u>	<u>.2711</u>	<u>9.4562</u>	<u>.4579</u>
2				
40.9	16040	17060	13180	1206970
15.1	1508080	803022	1287088	6570
mg	76	22	69	11753
7.1	36	70		
	<u>15.0961</u>	<u>.0956</u>	<u>20.9689</u>	<u>.9685</u>
3				
31.4	15897	16142	15420	16145
34.7	878080	1327065	911014	1243848
mg	80	68	15	29
7.8	90	80	14	60
	<u>34.7112</u>	<u>.7124</u>	<u>31.3697</u>	<u>.3714</u>

Grade 2 or 3

M61518

Star - Uranium

1915 June 25 10

λ	d	N	d	N
1	18888	14515	18011	19080
95	16200	724030	12575	14512
223	90	36	8080	06
mg	00	30	20	00
74	<u>222695</u>	<u>2711</u>	<u>94562</u>	<u>4579</u>
2				
209	16040	17060	13180	12069
151	1508080	803022	12870	65
mg	76	22	6968	11753
71	36	70		
	<u>150961</u>	<u>0956</u>	<u>209689</u>	<u>5685</u>
3				
81.4	15897	16142	15420	16145
54.7	878080	1327665	911014	1243846
mg	80	68	15	29
74	90	80	14	60
	<u>347112</u>	<u>7124</u>	<u>513697</u>	<u>3714</u>

Grade 2 or 3

1518

Moon Measures

1913 June 25 11

17.8 scratch

20.5 18920

1498083

69

24

20.3945

2

17.0 18120

20.6 1273540

42

26

20.5384

3

17.0

21.0

16.0 16636

21.9 1320893

97

40

21.3438

5

15.7

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

22.0

18631

1256570

66

41

.3930

18582

1395050

50

98

.5360

18820

1166560

6860

18

16.2846

15312

875644

54

18

.3435

16790

1397070

6870

80

15.7182

15750

12352

5750

44

156605

15360

750

44

156605

15360

750

44

156605

15360

750

44

156605

15360

18321

1615050

5050

20

17.7829

15360

754850

5050

76

.7823

17778

1488075

7575

30

2850

17140

994051

5951

50

1197

16778

954042

4542

80

.6637

15360

750

44

156605

15360

750

44

156605

15360

750

44

156605

15360

750

44

156605

15360

750

44

1518

Miron - Unassumed

1913 June 25-11

178 scratch

20.5 18920

min 1498087

69

24

20 3945

2

170 18120

206 1273540

42

26

20.5384

3

16.4

210

4

16.0 16636

214 1320893

97

40

21.3435

5

157

220

6

15.7

22.5

min

20

18631

1256570

66

41

3930

18582

1395050

50

98

5360

18321

1615050

50

80

177829

18820

1166560

68

18

162846

15312

875644

54

18

3435

16790

1397070

68

80

157182

15750

12352

5750

44

156605

15360

754850

50

76

7823

17728

1488075

75

30

2510

17140

994051

59

50

7197

16778

954042

45

80

6637

9
16
24

1913 June 25. 12
 1911phae.proj. 19
 15.8 15.8 23.0
 15711 12980 70 16 1.57266
 16198 8922 2129 04 7278

16.0 14650 14345
 23.6 8400 00 1062892
 00 2512
 53 63
23.6252 6262

16.3 14.0 indistinct point
 15210 829010 72 15 16.3078
 14884 1172230 20 82 3159

remeasure
 18734 1180555 7015 30
16.3105

11615.8 Moon - beams 1913 June 25 12
 a y n d z v

$$\begin{array}{r} 7 \\ 15.8 \\ 230 \end{array}$$

$$\begin{array}{r} 15711 \\ 12980.5 \\ 70 \\ 16 \\ \hline 157266 \end{array}$$

$$\begin{array}{r} 16198 \\ 8922 \\ 2129 \\ 04 \\ \hline 7275 \end{array}$$

$$\begin{array}{r} 8 \\ 160 \\ 236 \end{array}$$

$$\begin{array}{r} 14650 \\ 8400 \\ 0000 \\ 53 \\ \hline 236252 \end{array}$$

$$\begin{array}{r} 14345 \\ 7062892 \\ 2512 \\ 63 \\ \hline 6262 \end{array}$$

$$\begin{array}{r} 9 \\ 163 \\ 24.0 \end{array}$$
 inches T-mat
 print

$$\begin{array}{r} 15210 \\ 829010 \\ 72 \\ 15 \\ \hline 163075 \end{array}$$
 penman

$$\begin{array}{r} 18734 \\ 11805.5 \\ 7015 \\ 30 \\ \hline 163105 \end{array}$$

$$\begin{array}{r} 14889 \\ 1172220 \\ 20 \\ 82 \\ \hline 3159 \end{array}$$

MC 1518

1913 June 21 13

Times etc.

Exp to star 1911 Dec 30 $2^h 01^m$ $-2^h 13^m$
 " " noon $2 0.6$ 49.2 $-2 0.6$ 49.6
 clock slow $1 0.6$

H Sid T. $2 07$ 55.5
 H long. $4 44$ 31.05
 G Sid T $6 52$ 26.55
 Sid T in noon $18 31$ 14.42
 Interval $12 21$ 12.13
 Reduction $2 01.43$
 G. M. T. $12 19$ 10.70

From Nant Alun R. Q. Decl.
 noon 12^h $2 11^m$ 36.24 $+13 5.6$ 00.9
 motion in 1^m $= 2.1653$ $+4.375$
 " " 19.1783 $+4 35.7$
 Tabular place $2 12$ 17.77 $+14 00$ 36.6

Moon's parallax $58 39.0$
 " " equidial $16 0.04$ $= 960.4$
 $934 = 13.8$ Aug = $+14.6$
 $960 = 14.6$ grade (2) irradiation $= 0.5$
 $R = 974.5$

$(1+a)R = 2.0890$
 $R^2 = 4.3660$

M.C. 1518

1913 June 21 - 15

Transits etc.

1911 Dec 30 $2^h 01^m$ - $2^h 13^m$
 moon $2 06 49.2 - 2 06 49.6$
 clock slow $1 06.1$

H. Sid T $2 07 55.5$
 H. Long $4 44 31.05$
 G. Sid T $6 52 26.55$
 Sid T in moon $18 31 14.42$
 Interval $12 21 12.13$
 Radiation $2 01.43$
 G. M. T. $12 19 10.70$

From Transit Alman $R C$ West
 moon 12^h $2^h 11^m 36.24 + 13 56 00.9$
 moon 1^m $2 16 53 14.375$
 $19.1783 + 4 1.53 + 4 35.7$
 Tabular place $2 12 17.77 + 14 00 36.6$

Moons parallel $58 39.0$
 Scandian $16 00.4$

MC 1518

Standard Coordinates.

1913 June 20

14

	Cape No. 319 mag 7.4			Cape No. 334 mag 7.1			Cape No. 348 mag 7.8		
C	2 ^h	07 ^m	17.564	2	13	26.53	2 ^h	18 ^m	58.79
L			66			55			76
E			64			59			74
Mean	2	07	17.65	2	13	26.56	2	18	58.76
Prec			+35.66			+35.60			+36.06
X	2	07	53.31	2	14	02.16	2	19	34.82
A	2	12	29	2	12	29	2	12	29
X-A	-	4	35.69	+	1	33.16	+	7	05.82
sin(X-A)			-275.67			+931.6			+425.75
log			2.44039			1.96923			2.62916
cos δ			9.98783			9.98944			9.98470
50			0.93546			0.46591			1.12110
S			8.6190			+2.9235			+13.2161
S ₁			-17			+			107
S			9.3793			20.9239			31.2268
X			9.4570			20.9687			31.3706
X-S			+777			+448			+1438
C	+13°	26'	56.3"	+12°	31'	47.1"	+15°	04'	17.8"
L			56.3			46.5			18.0
E			56.4			48.0			17.9
Mean	+13	26	56.3	+12	31	47.2	+15	04	17.9
Prec			+3			+3			+3
S	+13	30	03.5	+12	34	51.2	+15	07	18.9
D	13	28	21	+13	28	21	+13	28	21
S-D			+1			-53			+1
Tan(S-D)			+102.5			-3210.1			+5939.6
log			2.01072			3.50652			3.77376
η ₀			9.34187			0.83767			1.10491
tan δ			9.3804			9.3487			9.4317
52			18709			09318			224.22
η ₁			83047			73339			87273
η ₀			+0.2197			-6.8813			+12.7323
η ₁			+202			+			534
η ₂			22.2399			15.1209			34.7857
η			222703			15.0958			34.7118
η-η ₀			+304			-251			-739

MC 1518

Standard, *Condensals*

1913 June 20

14

	Cape Zn 319mg 74				Cape Zn 334mg 71				Cape Zn 348mg 78				
C	2 ⁿ	07	17	64	2	13	26	53	2 ⁿ	18	58	79	
L			66				55				76		
E			64				59				74		
Mean	2	07	17	65	2	13	26	56	2	18	58	76	
Prec			+ 35	66			+ 35	60			+ 36	06	
X	2	07	53	31	2	14	02	16	2	19	34	82	
A	2	12	29		2	12	29		2	12	29		
X-A	-	4	35	69	+	1	33	16	+	7	05	82	
tan(X-A)	-	2	75	67	+	9	31	6	+	4	25	75	
log			2440	39			1969	23			2629	16	
cos S			9987	83			9989	44			9984	70	
S _c			0935	46			0465	91			1121	10	
S ₁			8619	0	+	2923	5		+	1321	61		
S ₂			17		+	4			+	107			
S ₃			9379	3			2092	39			3122	68	
X			9457	0			2096	87			3137	06	
X-S			+ 777				+ 448				+ 1438		
C	+ 13	26	56	3	+ 12	31	47	1	+ 15	04	17	8	
L			56	3			46	5			18	0	
E			56	4			48	0			17	9	
Mean	+ 13	26	56	3	+ 12	31	47	2	+ 15	04	17	9	
Prec			+ 3	07	2		+ 3	04	0		+ 3	01	0
S	+ 13	30	03	5	+ 12	34	51	2	+ 15	07	18	9	
D	13	28	21		+ 13	28	21		+ 13	28	21		
S-D	+	1	42	5	-	53	29	8	+ 1	38	57	9	
tan(S-D)			+ 102	5			- 32	10			+ 593	96	
log			2010	72			3506	52			3773	76	
no			9341	87			0837	67			1104	91	
tan S			9380	4			9348	7			9431	7	
S ₁			1870	9			0931	8			2242	2	
no			8304	7			7333	9			8727	3	
no			+ 021	97			- 688	13			+ 127	323	
no			+ 202				+	22			+	534	
no			2223	99			1512	09			3978	57	
no			2227	03			1509	58			3471	18	
no			+ 304				- 251				- 739		

1518

1913 June 20 - 15

Center of Plate and Plate Constants

x	y	R	a	b	c
94570	222703	2 ^h	07	53	+13 30 04
209687	150958		14	02	12 34 51
313706	347118		19	35	15 07 19
3 6180	7208		41	30	10 72 14
20.60	24.03	2	13	50	13 44 05
-18	-22		-1	21	-15 44
2.60	203	2	12	29	13 28 21
31	465				
26	944				
78					
80.6					

$$A = 2^h 12^m 29^s$$

$$D = +13 28 21$$

Plate Constants

$x-5$	-49.24	$-2.3x$	$+342$
$+777$	-1096	$-319-22$	$-341 = +1$
$+448$	-743	$-295-48$	$-343 = -1$
$+1438$	-1708	$-270-72$	$-342 = 0$

$y-m$	$+47.8x$	$-0.5y$	-744
$+304$	$+452$	$+756-11$	$+745 = +1$
-251	$+1002$	$+751-8$	$+743 = -1$
-739	$+1500$	$+761-17$	$+744 = 0$

Tabular	$b+a = 0.0$	$a = +0.8$	$c = -0.2$
Observed	$= +1.4$	$a = +2.3$	$c = +0.5$

$$a - c = +1.0$$

$$= +1.8$$

1518

1913 June 24 - 15

Center of Plate and Plate Constants

x	y	R	G	B	U
94570	222703	2	07	53	+13 30 04
209687	150958		14	02	12 34 51
313706	347118		19	25	15 07 19
5 6180	7208		41	30	10 72 14
20.60	2403	2	13	50	13 44 05
-18	-22		-1	21	-15 44
2.60	203	2	12	29	13 28 21
31	465				
26	944				
78					
80.6					

$$A = 2^h 12^m 29^s$$

$$\Delta = +13 28 21$$

Plate Constants

$x - 5$	-49.24	-232	$+342$
$+777$	-1096	-319	-22
$+448$	793	-295	-48
$+1438$	-1708	-270	-72

$y - m$	$+47.82$	-0.54	-744
$+309$	$+4452$	$+756$	-11
-251	$+1002$	$+751$	8
-739	$+1500$	$+761$	17

Tabular	$b + a =$	0.0	$a = +0.8$	$a = -0.2$
Observed	$=$	$+1.4$	$a = +2.3$	$a = +0.5$

$$a - b = 71.0$$

$$+1.8$$

Formation of Normals.

	ab		an		bn
1	-0.06	+	2.1	-	150.5
2	+1.47	+	45.9	+	118.8
3	+2.18	+	94.1	+	95.0
4	+2.00	-	152.2	-	99.1
5	+0.98	-	113.7	-	227.1
6	-0.00	-	115.0	+	0.0
7	-1.04	-	62.9	+	16.0
8	-2.00	-	157.5	+	102.6
9	-2.18	-	50.4	+	53.0
	+1.35	-	509.6		+108.7

$$[aa] = +2355 \quad [bb] = +105.77$$

$$\begin{aligned}
 & a \quad b \\
 & +23.55 + 1.85 = -51.0 \\
 & + 1.35 + 15.77 = +109 \\
 & - 1.35 - 0.09 = +29 \\
 & \quad \quad + 15.69 = +138 \quad b = +88
 \end{aligned}$$

pt.	pos. L	resid.
1	180.0	+91
2	201.0	-61
3	224.5	-84
4	237.0	+58
5	256.6	+15
6	270.0	+8
7	284.3	-19
8	303.0	+41
9	316.5	-10

MA1518

1913 July 2.

16

Moon's Center

	x	$x - x_0$	$(x - x_0)^2$	R^2	$D - C$
1	17.7826	+0.0297	0.0009	4.3732	+ 72
2	17.0000	-0.7529	0.5668	4.3599	- 61
3	16.2848	-1.4681	2.1553	4.3596	- 64
4	16.0000	-1.7529	3.0726	4.3747	+ 87
5	15.7190	-2.0339	4.1368	4.3716	+ 56
6	15.6621	-2.0908	4.3715	4.3715	+ 55
7	15.7272	-2.0257	4.1035	4.3691	+ 31
8	16.0000	-1.7529	3.0726	4.3750	+ 90
9	16.3132	-1.4397	2.0727	4.3695	+ 35
			$\Sigma = 43.660$		

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	20.3938	-2.0908	-2	4.3723
2	20.5372	-1.9474	-2	3.7931
3	21.0000	-1.4846	-1	2.2045
4	21.3436	-1.1410	-1	1.3021
5	22.0000	-0.4846	0	0.2348
6	22.4846	0.0000	0	0.0000
7	23.0000	+0.5154	+0	0.2656
8	23.6257	+1.1411	+1	1.3024
9	24.0000	+1.5154	+1	2.2968

Approx. Center

$$x_0 = 16.0 \quad y = 21.3436$$

$$23.6257$$

$$44.9693$$

$$\text{mean } y = 22.4846$$

$$y = \text{min} \quad 20.3938$$

$$R = 2.0908$$

$$x = \text{min} = 15.6621$$

$$x_0 = 17.7529$$

$$x_0 = 17.7529$$

$$y_0 = 22.4846$$

M61-18

M61-18

1913 July 2

16

	$x - x_0$	$(x - x_0)^2$	$y - y_0$	$(y - y_0)^2$
1	177826 - 00297	00009	43732	+ 72
2	170000 - 07129	05068	43599	- 61
3	162848 - 14681	2.1553	43596	- 64
4	160000 - 17529	30726	43747	+ 87
5	157190 - 20339	41368	43716	+ 56
6	156621 - 20908	43715	43715	+ 55
7	157272 - 20257	41035	43691	+ 31
8	160000 - 17529	30726	43750	+ 90
9	163132 - 14397	20727	43695	+ 35
		$\Sigma = 43660$		

	$x - x_0$	$(x - x_0)^2$	$y - y_0$	$(y - y_0)^2$
1	203938 - 20908	-2	43723	
2	205372 - 19474	-2	37931	
3	210000 - 14846	-1	22043	
4	213436 - 11470	-1	13021	
5	220000 - 04846	0	02348	
6	224846 - 00000	0	00000	
7	230000 + 05154	+0	02656	
8	236257 + 11411	+1	13024	
9	240000 + 15154	+1	22968	

Apparent Center

$$x_0 = 16.0 \quad y_0 = 21.3436$$

$$23.6217$$

$$44.9693$$

$$\text{mean } y = 22.4846$$

$$y = 20.3938$$

$$R = 20.908$$

$$x = 15.6621$$

$$y_0 = 17.7529$$

$$x_0 = 17.7529$$

$$y_0 = 22.4846$$

KAC 1518

1913 Sept. 19.

17

Conditional Equations.

	a	b	OCX		c	U - c
1	+ 0.03	- 2.09	= + 72	- 1 - 18	= - 19	+ 91
2	- 0.75	- 1.95	= - 61	+ 17 - 17	= 0	- 61
3	- 1.47	- 1.48	= - 64	+ 33 - 13	= + 20	- 84
4	- 1.75	- 1.14	= + 87	+ 39 - 10	= + 29	+ 58
5	- 2.03	- 0.48	= + 56	+ 45 - 4	= + 41	+ 15
6	- 2.09	0.00	= + 55	+ 47 + 0	= + 47	+ 8
7	- 2.03	+ 0.52	= + 31	+ 45 + 5	= + 50	- 19
8	- 1.75	+ 1.14	= + 90	+ 39 + 10	= + 49	+ 41
9	- 1.44	+ 1.52	= + 35	+ 32 + 13	= + 45	- 10
						+ 213 - 174

Normal Equations.

Average = 43

$$+ 23.55 + 1.35 = - 510$$

$$+ 1.35 + 15.77 = + 109$$

$$- 1.35 - 0.08 = + 29$$

$$+ 15.69 = + 138$$

$$b = + 9$$

$$- 0.12 - 1.35 = - 9$$

$$+ 23.43 = - 519$$

$$a = - 22$$

$$X_0 = 17.7529$$

$$\Delta a = - 11$$

$$X = 17.7518$$

$$- 49.24 = - 1106$$

$$- 2.32 = - 41$$

$$+ 342$$

$$X_0 = 17.6713$$

$$Y_0 = 224846$$

$$\Delta b = + 4$$

$$Y = 224850$$

$$+ 47.82 = + 849$$

$$- 0.54 = - 11$$

$$- 744$$

$$Y = 224944$$

1913 Sept 19

1913 Sept 19

17

Conditional Equations

	a	b	0.0x		c	0 - c
1	+ 0.03	- 2.09	= + 7.2	- 1 - 1.8	= - 1.9	+ 9.1
2	- 0.75	- 1.95	= - 6.1	+ 1.7 - 1.7	= 0	- 6.1
3	- 1.47	- 1.48	= - 6.4	+ 3.3 - 1.3	= + 2.0	- 8.4
4	- 1.75	- 1.14	= + 8.7	+ 3.9 - 1.0	= + 2.9	+ 5.8
5	- 2.03	- 0.48	= + 5.6	+ 4.5 - 4	= + 4.1	+ 1.5
6	- 2.09	0.00	= + 5.5	+ 4.7 + 0	= + 4.7	+ 8
7	- 2.03	+ 0.52	= + 3.1	+ 4.5 + 5	= + 5.0	- 1.9
8	- 1.75	+ 1.14	= + 9.0	+ 3.9 + 1.0	= + 4.9	+ 4.1
9	- 1.44	+ 1.52	= + 3.5	+ 3.2 + 1.3	= + 4.5	- 1.0
						+ 213 - 174

Normal Equations

$$\begin{aligned}
 + 23.55 + 1.35 &= - 51.0 \\
 + 1.35 + 1.577 &= + 10.9 \\
 - 1.35 - 0.08 &= + 2.9 \\
 + 1.569 &= + 13.8 \\
 - 0.12 - 1.35 &= - 9 \\
 + 23.43 &= - 51.9
 \end{aligned}$$

$b = + 9$
 $a = - 22$

$$\begin{array}{r}
 X_0 = 1.77529 \\
 - 1.1 \\
 \hline
 X = 1.77518 \\
 - 49.24 = - 11.06 \\
 - 2.326 = - 4.1 \\
 + 3.92 \\
 \hline
 X_0 = 1.76713
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 22.9846 \\
 + 4 \\
 \hline
 Y = 22.9850 \\
 + 47.8x = + 8.49 \\
 - 0.5y = - 1.1 \\
 - 7.44 \\
 \hline
 Y = 22.9944
 \end{array}$$

1518 Red and brown stars

$$\begin{array}{rcl}
 H+x & 1 & 42 = 25^{\circ} 30' \\
 H & 23 & 30 \\
 q & 2 & 12 \\
 G & 22 & 23 \\
 2+x & 0 & 35 = 8^{\circ} 45'
 \end{array}$$

$$\begin{array}{rcl}
 \cos(G+x) & 9 & 9949 \\
 g & 1 & 2688 \\
 \sin & 9 & 1822 \\
 \cos & 9 & 3815 \\
 & 8 & 8239
 \end{array}$$

$$\begin{array}{rcl}
 g' & 1 & 2637 \\
 g & 8 & 6564
 \end{array}$$

$$\begin{array}{rcl}
 g & + & 259 \\
 g & + & 0.05 \\
 u & + & 0.60 \\
 \hline
 & + & 3.24
 \end{array}$$

$$E = +13^{\circ} 32'$$

$$\begin{array}{rcl}
 \cos S & 9 & 9878 \\
 i & 0 & 0670 \\
 (L) & 0 & 0548
 \end{array}$$

$$\begin{array}{rcl}
 \cos S & 9 & 3692 \\
 \cos(H+x) & 9 & 9555 \\
 h & 1 & 3099 \\
 \sin & 9 & 6340 \\
 \cos & 0 & 0122 \\
 & 8 & 8239
 \end{array}$$

$$\begin{array}{rcl}
 h' & 0 & 6346 \\
 h & 9 & 7800
 \end{array}$$

$$\begin{array}{rcl}
 g' & + & 1835 \\
 g' & + & 431 \\
 i & - & 113 \\
 \hline
 & + & 2153
 \end{array}$$

MC 1515

1913 Sept. 26.

15

Moon's Mean Position (1911.0)

$$z = -0.3287$$

$$\eta = +0.4944$$

$$\log S = 9.51680$$

$$\log \tan S = 9.3792$$

$$\log s = 9.98776$$

$$\log s_2 = 9.0336$$

$$\log \eta = 8.50724$$

$$\log \eta_1 = 5.4662$$

$$(x-A) = 1.02180$$

$$\eta_0 = 9.69408$$

$$(a-A) = -10.51$$

$$\log \eta_0 = 7.33115$$

$$(d-D) = 2.36293$$

$$A = 2^{\circ} 12' 29''$$

$$\delta - D = +03^{\circ} 50.6'$$

$$R_0 = 2^{\circ} 12' 18.49''$$

$$D = +13^{\circ} 28' 21''$$

$$Red = +324$$

$$\delta_0 = +13^{\circ} 32' 11.6''$$

$$d = 2^{\circ} 12' 21.73''$$

$$Red = +21.5$$

$$d' = +13^{\circ} 32' 33.1''$$

1518 Red ad. loann aph

$$\delta = +13^{\circ} 32'$$

$$H + \alpha \quad 1^{\circ} 42' = 25^{\circ} 30'$$

$$H \quad 23 \quad 30$$

$$\alpha \quad 2 \quad 12$$

$$\alpha \quad 22 \quad 23$$

$$\alpha + \alpha \quad 0 \quad 35 = 8^{\circ} 45'$$

$$\log S \quad 9.9878$$

$$i \quad 0.0670$$

$$(i) \quad 0.0548$$

$$\log(H + \alpha) \quad 9.9949$$

$$g \quad 1.2688$$

$$\sin \quad 9.1822$$

$$\tan S \quad 9.3815$$

$$8.8239$$

$$8' \quad 1.2637$$

$$8 \quad 8.6564$$

$$b \quad +2.59$$

$$g \quad +0.05$$

$$h \quad +0.60$$

$$+3.24$$

$$\log S \quad 9.3692$$

$$\cos(H + \alpha) \quad 9.9555$$

$$h \quad 1.3099$$

$$\sin \quad 9.6340$$

$$\log S \quad 0.0122$$

$$8.8239$$

$$h' \quad 0.6346$$

$$h \quad 9.7800$$

$$g \quad +1.835$$

$$h' \quad +4.31$$

$$i \quad -1.13$$

$$+2.153$$

MC 1514

1913 Sept 26

18

Known Mean Position (1911.0)

$$z = -0.3287$$

$$\mu = +0.4944$$

$$\log S = 9.51680$$

$$\log \delta = 9.96776$$

$$\log \alpha = 8.50724$$

$$\log \tan \delta = 9.3792$$

$$\log \epsilon = 9.0336$$

$$\log \eta = 5.4662$$

$$(V-A) = 1.02180$$

$$\log \gamma_0 = 9.69408$$

$$\log \gamma_1 = 7.33115$$

$$(A-I) = -1.051$$

$$(d-D) = 2.36293$$

$$A = 2^h 12^m 29^s$$

$$S-D = +0.3506$$

$$\delta_0 = 2^h 12^m 18.49^s$$

$$D = +13^h 28^m 21^s$$

$$Red = -3.24$$

$$\delta_1 = +13^h 32^m 11.6^s$$

$$\alpha = 2^h 12^m 21.73^s$$

$$Red = -2.15$$

$$\delta = +13^h 32^m 33.1^s$$

1518 Lunar Parallax.

$$\begin{aligned} \alpha &= 2^h 12^m 21.73^s \\ \theta &= 2 \quad 07 \quad 55.5 \\ \theta - \alpha &= - \quad 4 \quad 26.23 \\ &= - \quad 1^0 \quad 06' \quad 33'' \end{aligned}$$

$$- \quad \quad \quad 26$$

$$- \quad 1 \quad 06$$

$$9.95727$$

$$\begin{array}{r} 000008 \\ 9.95735 \end{array}$$

$$\delta - \alpha = 42 \quad 11 \quad 28$$

$$13 \quad 32 \quad 33$$

$$28 \quad 38 \quad 55$$

$$\begin{array}{r} 982640 \\ 823197 \\ 968073 \\ 0.17288 \\ 791198 \end{array}$$

$$\delta - \delta' = +28 \quad 04.3$$

$$\delta = +14 \quad 00 \quad 37.4$$

$$\text{hantaleu } \delta = +14 \quad 00 \quad 36.6$$

$$U - G \quad + \quad 0.8$$

$$\delta' = +13^0 \quad 32' \quad 33.1''$$

$$\Pi = 58' \quad 39.0''$$

$$\begin{array}{r} 9.86913 \\ 823197 \\ 828688 \\ 001311 \\ 640109 \end{array}$$

$$\alpha - \alpha' = -0' \quad 51.94''$$

$$= - \quad 03.46''$$

$$\kappa = 2 \quad 12 \quad 18.27$$

$$\alpha = 12 \quad 12 \quad 17.77$$

$$+0.50$$

15-18 Lunar Parallax

$$\begin{aligned}
 \alpha &= 2^h 12^m 21.73 \\
 \delta &= 2 \quad 07 \quad 55.5 \\
 \delta - \alpha &= - \quad 4 \quad 26.23 \\
 &\quad - \quad 1^{\circ} \quad 06' \quad 33''
 \end{aligned}$$

$$- \quad \quad \quad 26$$

$$- \quad 1 \quad 06$$

$$995727$$

$$000008$$

$$995735$$

$$\delta - 92 \quad 11 \quad 28$$

$$13 \quad 32 \quad 33$$

$$28 \quad 38 \quad 55$$

$$982640$$

$$823197$$

$$968073$$

$$017288$$

$$791198$$

$$\delta - 5 = +28 \quad 04.3$$

$$\delta = +14 \quad 00 \quad 37.4 \quad \alpha = 2 \quad 12 \quad 18.27$$

$$\text{hantalm } \delta = +14 \quad 00 \quad 36.6 \quad \alpha = 12 \quad 12 \quad 17.77$$

$$0 - 6 \quad + \quad 0.8 \quad + \quad 0.50$$

$$\delta = +13^{\circ} \quad 32' \quad 33''$$

$$\delta = 58' \quad 39''$$

$$986917$$

$$823197$$

$$828688$$

$$001311$$

$$640109$$

$$\alpha - \alpha' = -0 \quad 51.94$$

$$= - \quad 0346$$

MC1519

1913 June 27.

20

α	δ	α	δ	α	δ	α	δ
1	14186	19559	19055	17780			
9.3	904950	1470203	1224144	1457678			
21.5	50	00	43	86			
	90	63	60	90			
	<u>21.5138</u>	<u>5141</u>	<u>93185</u>	<u>3203</u>			
2							
10.9	16465	15720	16820	17290			
14.4	1317068	902228	1508984	102020			
	68	28	85	1620			
	70	25	30	00			
	<u>14.3298</u>	<u>3301</u>	<u>208264</u>	<u>8280</u>			
3							
31.3	1202023	10630	15866	16075			
33.9	18	999085	828086	1363435			
	11370	92	8996	3535			
			68	83			
	<u>33.9350</u>	<u>9359</u>	<u>312420</u>	<u>2442</u>			

Brace 3

MC1519

1913 June 27.

20

α	δ	α	δ	α	δ	α	δ
1	14186	19559		19055		17780	
9.3	9049.50	14702.08		12241.44		14576.78	
21.5	50	00		43		86	
	90	63		60		90	
	<u>21.5138</u>	<u>5141</u>		<u>93185</u>		<u>3203</u>	
2	16465	15720		16520		17290	
144	13170.68	9022.28		15089.84		7020.20	
	68	28		85		16	
	70	25		30		00	
	<u>14.3298</u>	<u>3301</u>		<u>208264</u>		<u>8280</u>	
3	12020.23	10630		15866		16075	
339	18	9990.85		8280.86		13634.35	
	11370	92		8996		35	
				68		83	
	<u>33.9350</u>	<u>9359</u>		<u>312420</u>		<u>2442</u>	

Grader 3

Measured Sept 20

$$\begin{array}{r}
 17245 \\
 1558898 \\
 90 \\
 58 \\
 \hline
 23.1655
 \end{array}$$

$$\begin{array}{r}
 16065 \\
 775061 \\
 60 \\
 80 \\
 \hline
 1679
 \end{array}$$

$$\begin{array}{r}
 18480 \\
 1252234 \\
 3034 \\
 85 \\
 \hline
 164044
 \end{array}$$

$$\begin{array}{r}
 17181 \\
 1313040 \\
 36 \\
 80 \\
 \hline
 4046
 \end{array}$$

MC 1517

known - measures

1913 June 27.

21

	d	n	d	n
1 scratch.				
18.2	120.80	1205465	15968	18532
20.1	1140005	58	922020	1531010
min	00	11380	2020	00
			78	48
	<u>20.0678</u>	<u>.0679</u>	<u>18.3245</u>	<u>.3234</u>
18.0	9871	11215749		
20.1	906770	5449		
	75	11370		
	<u>20.0800</u>	<u>.0783</u>		
3				
17.0	18483	15737		
20.5	1377540	1042940		
	80	33		
	89	47		
	<u>20.4704</u>	<u>.4692</u>		
4				
16.5			18588	16012
21.0			1351001	1108580
			8999	8680
			80	22
			<u>16.4916</u>	<u>.4933</u>
5				
162			18494	16070
22.0			10010	1453340
			1.0	29
			89	80
			<u>16.1517</u>	<u>.1538</u>
			<u>16.1460</u>	
			17410	15139
			1062529	1191402
			30	1502
			10	50
			<u>16.3218</u>	<u>.3233</u>
scratch				
2	15360	18850		
16.5	1010801	1411019	16366	15163
23.0	10	16	1301095	18540
	68	60	20	5042
	<u>23.5258</u>	<u>.5255</u>	70	73
			<u>16.6641</u>	<u>.6620</u>

min in gc = about

1911phae

moon - measure

1913 June 27.

21

1		2		3		4	
scratch		15968		18538			
18.2	12080	1205465	922020	1531010			
W1	1140005	58	2020	00			
mm	00	11380	78	48			
<u>20.0678</u>		<u>0679</u>	<u>183245</u>	<u>3234</u>			
2							
180	9871	1215749					
W1	906770	5449					
	75	11370					
<u>20.0800</u>		<u>6783</u>					
3							
170	18483	15737					
W1	1377540	1042940					
	80	33					
	89	47					
<u>20.4704</u>		<u>4692</u>					
4							
165		18588	16012				
W1		1351001	1108580				
		8999	8680				
		80	22				
		<u>164916</u>	<u>4933</u>				
5							
162		18494	16070				
22.0		1001001	1453340				
		10	29				
		89	80				
		<u>161517</u>	<u>1538</u>				
		<u>161460</u>					
moon in 2c = about							
6							
16.4		17410	15139				
23.0		1062529	1191402				
		30	1502				
		10	50				
		<u>163218</u>	<u>3233</u>				
scratch							
7							
165	15360	18850	15163				
23.0	1010801	1411019	18540				
	10	16	5042				
	68	60	73				
<u>23.5258</u>		<u>5255</u>	<u>6620</u>				
		166641					

MC1519 Times at 1913 June 29 22
 Exh. to stars 1911 Dec 30 2^h 15^m - 2^h 27^m
 " " Moon 2 20 49.3 - 2 20 49.6^v
 close slow 01 06.1

H. Sid T. 2 21 55.55^v
 H. hour 4 44 31.05^v
 G. Sid T. 7 06 26.60^v
 Sid T. to Moon. 18 31 14.42^v
 Interval 12 35 12.18^v
 Reduction 2 03.72^v
 G. M. T. 12 33 08.46^v

From Trans. Alm. R. A. Decl.
 Moon 12^h 2^h 11^m 36^s 24^u + 13° 56' 00".9^v
 Motion 1^m 2.16 62^v 14.369^v
 " 33.141^v
 Tabular place 2^h 12^m 48^s 03^u + 14° 03' 57".1^v

Moon's parallax ~~58' 44.4~~ 58' 39.5^v
 Moon's semidiameter ~~16 01.9~~ 16 00.6^v

$$934 = 13.8$$

$$960 = 14.6$$

$$\begin{aligned} \text{ang.} &= 960.6 \\ \text{grade (3)} &= +14.6 \\ R &= -0.7 \\ R &= 974.5 \end{aligned}$$

$$\begin{aligned} R &= 2.0890 \\ (1+a)R &= 2.0896 \\ R^2 &= 4.3664 \end{aligned}$$

M01519

Times etc

1913 June 27 22

Exp. T. Stars 1911 Dec 30 2^h 15^m- 2^h 27^m

Moon

2 20 49 3 - 2 20 49 6

clock slow

0.1 0.6.1

H. S. T.

2 21 55 55

H. S. T.

4. 44 31 05

G. S. T.

7 06 26 60

S. T. to Moon

18 31 19 42

Indirect

12 35 12 18

Reduction

2 03 72

G. T. T.

12 33 08 46

From Trans. Alm.

R. C.

Recd.

Moon 12^h2^h 11^m 36^s 24 130 56' 00" 9Moon 1^h

2 16 62 14 36 9

33 14 1

7 1 11 79 + 7 56 2

Tabular place

2^h 12 48 03 + 14 03 57 1

Moon parallax

~~58' 44"~~ 58' 39.5"

Moon semidiam

~~16 01.9~~ 16 00.6

= 9606

934 = 13.8

ang = +14.6

960 = 14.6

grade (3) = -0.7

R = 974.5

R = 20890

(1 + a) R = 20896

R² = 43664

11C 1519

1913 July 8

$$\begin{array}{r} x \\ y \\ x-3 \end{array} \begin{array}{r} 9.3194 \\ 9.3793 \\ -599 \end{array}$$

$$\begin{array}{r} 20.8272 \\ 20.9239 \\ -967 \end{array}$$

$$\begin{array}{r} 31.2431 \\ 31.2268 \\ +163 \end{array}$$

$$\begin{array}{r} y \\ y \\ y-y \end{array} \begin{array}{r} 21.5140 \\ 22.2399 \\ -7259 \end{array}$$

$$\begin{array}{r} 14.3300 \\ 15.1209 \\ -8909 \end{array}$$

$$\begin{array}{r} 33.9354 \\ 34.7857 \\ -8503 \end{array}$$

$$\begin{array}{r} 20-3 \\ +599 \\ -967 \\ +163 \end{array} \begin{array}{r} -56.14 \\ -1207 \\ 804 \\ -1904 \end{array} \begin{array}{r} -3.12 \\ -1806 \\ -1774 \\ -1742 \end{array} \begin{array}{r} -29 \\ -29 \\ -65 \\ -97 \end{array} \begin{array}{r} +12+14 \\ +1+2 \\ +2+1 \\ +3+3 \end{array} \begin{array}{r} +1832 \\ -1832 \\ -1833 \\ -1838 \end{array} \begin{array}{r} +1832 \\ =0 \\ =-9 \\ =0 \end{array}$$

$$\begin{array}{r} y-y \\ -7259 \\ -8909 \\ -8503 \end{array} \begin{array}{r} +56.62 \\ +527 \\ +1179 \\ +1768 \end{array} \begin{array}{r} +.34 \\ -6732 \\ -6730 \\ -6735 \end{array} \begin{array}{r} +6726 \\ +6 \\ +4 \\ +10 \end{array} \begin{array}{r} +6726 \\ =0 \\ =0 \\ =+1 \end{array}$$

$$\begin{array}{l} \text{Tabular} \\ \text{Observed} \end{array} \begin{array}{r} b+a \\ =- \end{array} \begin{array}{r} -0.0 \\ 0.6 \end{array}$$

$$\begin{array}{r} a \\ + \end{array} \begin{array}{r} +0.8 \\ 3.0 \end{array}$$

$$\begin{array}{r} e \\ = \end{array} \begin{array}{r} -0.2 \\ -0.3 \end{array}$$

$$\begin{array}{r} a-e \\ = \end{array} \begin{array}{r} +1.0 \\ +3.3 \end{array}$$

116 1519

1913 July 8

$$\begin{array}{r} x \\ 3 \\ 1 \\ x-3 \end{array} \quad \begin{array}{r} 93194 \\ 93793 \\ -599 \end{array}$$

$$\begin{array}{r} 208272 \\ 209239 \\ -967 \end{array}$$

$$\begin{array}{r} 312431 \\ 312268 \\ +163 \end{array}$$

$$\begin{array}{r} 1 \\ 2 \\ 4-7 \end{array} \quad \begin{array}{r} 215140 \\ 222399 \\ -7259 \end{array}$$

$$\begin{array}{r} 143300 \\ 151209 \\ -7909 \end{array}$$

$$\begin{array}{r} 339854 \\ 347857 \\ -8503 \end{array}$$

$$\begin{array}{r} 20-3 \\ +599 \\ -967 \\ +163 \end{array} \quad \begin{array}{r} -5614 \\ -1207 \\ 204 \\ 1904 \end{array} \quad \begin{array}{r} -312 \\ -1806 \\ -1778 \\ -1742 \end{array} \quad \begin{array}{r} -29 \\ -65 \\ -97 \end{array} \quad \begin{array}{r} +12+14 \\ +1 \times 2 \\ -2+15 \\ +3+24 \end{array} \quad \begin{array}{r} 32 \\ -1832 \\ -1433 \\ -102 \end{array} \quad \begin{array}{r} =0 \\ =0 \\ =0 \end{array}$$

$$\begin{array}{r} 4-7 \\ -7259 \\ -7909 \\ -8503 \end{array} \quad \begin{array}{r} +5662 \\ +527 \\ +1179 \\ +1768 \end{array} \quad \begin{array}{r} +34 \\ -6732 \\ -6730 \\ -6735 \end{array} \quad \begin{array}{r} +6726 \\ -6 \\ -4 \\ +10 \end{array} \quad \begin{array}{r} 0 \\ 0 \\ +1 \end{array}$$

$$\begin{array}{r} \text{Tabular } b+a \\ \text{web} \end{array} \quad \begin{array}{r} = -0.0 \\ = -0.6 \end{array} \quad \begin{array}{r} a = 10.8 \\ = 3.0 \end{array} \quad \begin{array}{r} a = 0.2 \\ = 0.3 \end{array}$$

$$\begin{array}{r} a - a = +1.0 \\ = +3.3 \end{array}$$

pt.	pos. $\angle$	resid.
1	17 7.7	+ 13
2	18 6.5	+ 8
3	21 6.1	- 1
4	23 6.6	+ 34
5	26 5.7	- 90
6	29 3.7	+ 22
7	29 8.7	+ 47

MCM 1519 Miron's Center

1913 July 2

	x	$x - x_0$	$(x - x_0)^2$	K^2	$O - C$
1	18.3240	+0.0870	0.0076	4.3807	+143
2	18.0000	-0.2370	0.0562	4.3818	+154
3	17.0000	-1.2370	1.5302	4.3836	+172
4	16.4925	-1.7445	3.0432	4.3863	+199
5	16.1525	-2.0842	4.3439	4.3691	+27
6	16.3225	-1.9145	3.6653	4.3731	+67
~~7~~	~~16.6633~~	~~-1.5737~~	~~2.4765~~	~~4.3449~~	~~-315~~
8	16.4045	-1.8325	3.3580	4.3749	+77
			$R^2 =$	4.3664	

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	20.0678	-2.0910	-2	4.3731
2	20.0792	-2.0796	-2	4.3256
3	20.4698	-1.6890	-2	2.8534
4	21.0000	-1.1588	-1	1.3431
5	22.0000	-0.1588	0	0.0252
6	23.0000	+0.8412	+1	0.7078
7	23.5256	+1.3668	+1	1.8684
7	23.1667	+1.0079	+1	1.0161

$$y_{\min} = 20.0678$$

$$R = 2.0910$$

$$\text{mean } y = 22.1588$$

$$x_{\min} = 16.1460$$

$$R = 2.0910$$

$$x_0 = 18.2370$$

$$y_0 = 22.1588$$

$$x_0 = 18.2370$$

1913 July 2 Harvard Center

1913 July 2

	Y	$Y - X_0$	$(Y - X_0)^2$	K_2	$O - C$
1	183240 + 00870	00076	43807	+143	
2	180000 - 02370	00562	43818	+154	
3	170000 - 12370	15302	43836	+172	
4	164925 - 17445	30432	43863	+194	
5	161524 - 20442	43439	43691	+27	
6	163225 - 19145	36653	43731	+67	
7	166633 - 15737	24965	43449	-215	
8	164045 - 18325	33580	43241	+77	
		R^2	43664		

	Y	$Y - Y_0$	ΔY	$(Y - Y_0)^2$
1	20.0678 - 20910	-2	4	3731
2	20.0792 - 20746	-2	4	3256
3	20.4698 - 16890	-2	2	8534
4	210000 - 1.1588	-1	1	3431
5	220000 - 0.1588	0	0	0252
6	23.0000 + 0.8912	+1	0	7078
7	23.5256 + 1.3668	+1	1	8684
7	23.1667 + 1.0079	+1	1	0161

$Y_0 = 200678$
 $R = 20910$
 $mean Y = 221588$

$Y_0 = 161460$
 $R = 20910$
 $X_0 = 182370$

$X_0 = 182370$
 $Y_0 = 221588$

Formation of normals.

	ab	am	bm
1	-0.19	+ 12.9	- 298.9
2	+0.50	- 37.0	- 320.3
3	+2.10	- 213.3	- 290.7
4	+2.02	- 346.3	- 230.8
5	+0.33	- 56.2	- 9.3
6	-1.60	- 128.0	+ 56.3
7	-1.85	- 140.9	+ 77.8
	<u>+1.31</u>	<u>- 908.8</u>	<u>-1010.9</u>

$$[aa] = +16.00 \quad [bb] = +14.64$$

MC 1519

1913 Sept. 20.

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Conditional Equations.

	a	b	c		C	0 - C
1	+0.09	-2.09	= +143	-	5 + 135 = +130	+13
2	-0.24	-2.08	= +154	+	12 + 134 = +146	+8
3	-1.24	-1.69	= +172	+	64 + 109 = +173	-1
4	-1.74	-1.16	= +199	+	90 + 75 = +165	+34
5	-2.08	-0.16	= +27	+	107 + 10 = +117	-90
6	-1.91	+0.84	= +67	+	99 - 54 = +45	+22
7	-1.83	+1.01	= +77	+	95 - 65 = +30	+47
						+124 - 91

Normal Equations.

Average = 31

$$\begin{aligned}
 &+16.00 + 1.31 = -909 \\
 &+1.31 + 14.64 = -1011 \\
 &-1.31 - 0.11 = +74 \\
 &\quad +14.53 = -937 \\
 &-0.12 - 1.31 = +90 \\
 &+15.88 = -819
 \end{aligned}$$

$$b = -64$$

$$a = -52$$

1913-15-19

19.3 Sept. 20

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Conditional Equations

	a	b	c		C	U-C
1	+0.09	-2.09	+1.43	-	5 + 1.35 = +1.30	+1.3
2	-0.24	-2.08	+1.54	+	12 + 1.34 = +1.46	+1.3
3	-1.24	-1.69	+1.72	+	64 + 1.09 = +1.73	+1.1
4	-1.74	-1.16	+1.99	+	90 + 7.5 = +1.65	+3.4
5	-2.08	-0.16	+2.7	+	107 + 1.0 = +1.17	-9.0
6	-1.91	+0.84	+6.7	+	99 - 5.4 = +4.5	+2.2
7	-1.83	+1.01	+7.7	+	95 - 6.5 = +3.0	+4.7
						+12.4 - 9.1

Normal Equation

Average = 3.1

$$+1.600 + 1.31 = -9.09$$

$$+1.31 + 1.464 = -19.11$$

$$-1.31 - 0.11 = +7.4$$

$$+14.53 = -9.37$$

$$b = -6.4$$

$$-0.12 - 1.31 = +9.0$$

$$+1.588 + 1.11 = -8.19$$

$$a = -5.2$$

1161519

1913 Sept 26.

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Moon's mean Position (1911.0)

$$\begin{array}{r}
 X_0 = 18.2370 \\
 \frac{1}{2}a = -26 \\
 -56.4 = -1241 \\
 -3x = -55 \\
 \hline
 +1832 \\
 X = 18.2880
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 22.1588 \\
 \frac{1}{2}b = -32 \\
 +56.6x = +1032 \\
 +0.3y = +7 \\
 \hline
 +6726 \\
 Y = 22.9321
 \end{array}$$

$$\bar{z} = +0.2880$$

$$\bar{m} = +0.9321$$

$$\begin{array}{r}
 \log S = 9.45939 \\
 -\cos S = 9.98766 \\
 -\cos t = 8.50724
 \end{array}$$

$$\begin{array}{r}
 \log \tan S = 9.3820 \\
 -3^2 = 8.9188 \\
 -\eta_1 = 5.3542
 \end{array}$$

$$(x-4) = 0.96449$$

$$\begin{array}{r}
 \log m_0 = 9.96946 \\
 -\cos t = 7.33115
 \end{array}$$

$$(x-4) + 0.921$$

$$(y-13) = 26.3831$$

$$A = 2^h 12^m 29^s$$

$$S-D = +0.7148$$

$$A_0 = 2 12 38.21$$

$$D = +13 28 21$$

$$Red = +3.25$$

$$S_0 = 7.13 35 35.8$$

$$\alpha = 2 12 41.46$$

$$Red = +21.5$$

$$S' = +13 35 57.3$$

1161519

1913 Sept 26

26

Provisional mean Position (1911.0)

$$\begin{array}{r}
 X_0 = 182370 \\
 \frac{1}{2}a = -26 \\
 -56y = -1241 \\
 -3x = -55 \\
 \hline
 +1832 \\
 X = 182880
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 221588 \\
 \frac{1}{2}b = -32 \\
 +56.6x = +1032 \\
 +0.3y = +7 \\
 \hline
 +6726 \\
 Y = 229321
 \end{array}$$

$$\bar{z} = +02880$$

$$\bar{y} = +0.9321$$

$$\begin{array}{r}
 \log 5 = 9.45939 \\
 \cos 5 = 9.98766 \\
 \sin 5 = 8.50724
 \end{array}$$

$$\begin{array}{r}
 \log \tan 5 = 9.3820 \\
 3^2 = 8.9188 \\
 \eta_1 = 5.3542
 \end{array}$$

$$(1-A) = 0.96449$$

$$\begin{array}{r}
 \log \eta_0 = 9.96946 \\
 \text{const.} = 7.33115
 \end{array}$$

$$(1-A) + 0.921$$

$$(1-D) = 2.63831$$

$$A = 2^h 12^m 29^s$$

$$S-D = +07 14.8$$

$$\alpha_0 = 2 12 38.21$$

$$D = +13 28 21$$

$$\text{Red.} = +325$$

$$S_0 = 713 35 35.8$$

$$\alpha = 2 12 41.46$$

$$\text{Red.} = +21.5$$

$$S' = +13 35 57.3$$

1519

Red and brown app.

 $S + 13^{\circ} 36'$

$$H + \alpha \quad 1 \quad 43 = 25^{\circ} 45'$$

$$H \quad 23 \quad 30$$

$$\alpha \quad 2 \quad 13$$

$$G \quad 22 \quad 23$$

$$G + \alpha \quad 0 \quad 36 = 9^{\circ}$$

$$\cos(G + \alpha) \quad 9.9946$$

$$S \quad 1.2687$$

$$\sin \quad 9.1943$$

$$\tan S \quad 9.3837$$

$$8.8239$$

$$\begin{array}{r} 8' \\ 8 \end{array} \quad \begin{array}{r} 1.2633 \\ 8.6706 \end{array}$$

$$\begin{array}{r} 1 \\ 8 \\ 6 \end{array} \quad \begin{array}{r} + 2.59 \\ + 0.05 \\ + 0.61 \\ \hline + 3.25 \end{array}$$

$$\begin{array}{r} \cos S \quad 9.9876 \\ 6 \quad 0.0670 \\ (6) \quad 0.0546 \end{array}$$

$$\sin S \quad 9.3713$$

$$\cos(H + \alpha) \quad 9.9546$$

$$h \quad 1.3099$$

$$\sin \quad 9.6379$$

$$\tan S \quad 0.0124$$

$$8.8239$$

$$h' \quad 0.6358$$

$$h \quad 9.7841$$

$$\begin{array}{r} 8' \\ 8 \\ 6 \end{array} \quad \begin{array}{r} + 18.34 \\ + 432 \\ - 1.13 \\ \hline + 21.53 \end{array}$$

1519

Red and brown app

S + 13° 36'

$$H + \alpha \quad 1 \quad 43 = 25^{\circ} 41'$$

$$H \quad 23 \quad 30$$

$$\alpha \quad 2 \quad 13$$

$$G \quad 22 \quad 23$$

$$G + \alpha \quad 0 \quad 36 = 9^{\circ}$$

$$\log(G + \alpha) \quad 99946$$

$$S \quad 12687$$

$$\log \quad 91943$$

$$\log S \quad 93837$$

$$S \quad 88239$$

$$S' \quad 12633$$

$$S \quad 86706$$

$$S' \quad + 259$$

$$S \quad + 005$$

$$S \quad + 061$$

$$+ 325$$

$$\log S \quad 99876$$

$$S \quad 00676$$

$$S \quad 00546$$

$$\log S \quad 93913$$

$$\log(H + \alpha) \quad 99146$$

$$H \quad 13099$$

$$\log \quad 96379$$

$$\log S \quad 00124$$

$$S \quad 88239$$

$$S' \quad 06358$$

$$S \quad 97841$$

$$S' \quad + 1834$$

$$S \quad + 432$$

$$S \quad - 113$$

$$+ 2153$$

1.519 Lunar Parallax
 $\delta = 2^h 12^m 41.46^s$
 $\delta = 2^h 21^m 55.55^s$
 $\delta - \alpha = + 9^m 14.09^s$
 $= + 2^h 18^m 31.11^s$

$$+ 54$$

$$+ 2 \quad 17 \quad 37$$

$$\begin{array}{r} 9.95727 \\ 0.00000 \\ 0.00035 \\ \hline 9.95762 \end{array}$$

$$f = 42 \quad 12 \quad 32$$

$$13 \quad 35 \quad 57$$

$$28 \quad 36 \quad 35$$

$$\begin{array}{r} 9.82640 \\ 8.23203 \\ 9.68019 \\ 0.17274 \\ \hline 7.91136 \end{array}$$

$$\delta - \delta' = +28 \quad 01.8$$

$$\delta = +14 \quad 03 \quad 59.1 \quad \alpha = 2 \quad 12 \quad 48.67$$

hambden $\delta = +14 \quad 03 \quad 57.1 \quad \alpha = 2 \quad 12 \quad 48.03$

$$\delta - \alpha = + 2.0 \quad + 0.64$$

$$\delta = +13^{\circ} 35' 57.3''$$

$$\pi = 58' 39.5''$$

$$\begin{array}{r} 9.86913 \\ 4.23203 \\ 8.60511 \\ 0.01322 \\ \hline 6.71949 \end{array}$$

$$\alpha - \alpha' = +1' 48.12''$$

$$= + 07.21''$$

1517

Lunar Parallax

W = 2 12 41 46

G = 2 21 55 55

O - α = + 9 14 09

= + 2 18 31

r 54

+ 2 17 37

995727

000000

000035

995762

f = 42 12 32

13 35 57

28 36 35

982640

823203

968019

017274

791136

S - S = + 28 01.8

J = + 14 03 59.2

Lambert J = + 14 03 57.1

O - C = 2.0

S = + 13 35 57.3

II = 58 39.5

986913

823203

860511

001322

671949

X - α = + 1 48.12

= + 07 21

α = 2 12 48.67

X = 2 12 48.03

064

