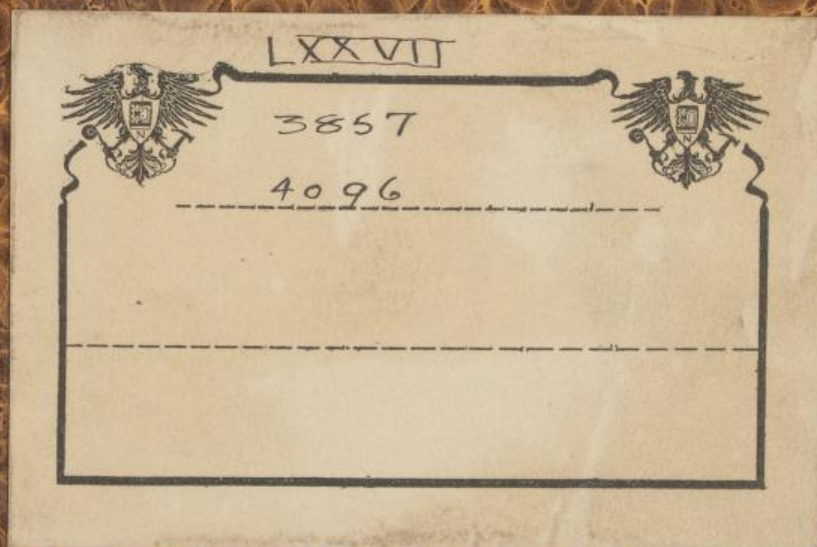


KG
11366
v.954



Harvard Lunar Plates

Measures and Reductions

Many foci

Volume LXXVII

Plate no.	Date	Page
3857	1913 Sept. 15	1
4096	1913 Oct 21	15

MC 3857 Stars Measures -

1914 May 26

1

μ	μ	μ	μ
1 16645	17841	16789	18700
68 12221	1224953	1538172	10074
21.5 2721	47	82	7679
35	26	80	90
<u>21.4418</u>	<u>4417</u>	<u>6.8590</u>	<u>8625</u>
2 15738	16991	17256	15960
165 10410	1231910	1264040	1057672
285 0915	16	49	70
31	81	60	50
<u>28.5324</u>	<u>5329</u>	<u>16.5385</u>	<u>5381</u>
3 15460	14695	10239	977474
11.4 1234640	781910	960000	80
41	15	94	9150
58	87		
<u>11.3117</u>	<u>3126</u>	<u>27.9359</u>	<u>9374</u>

Grade 1.

star to be used instead of (2)

277 15350	15897	16741	14671
215 1230704	8920	13925	7465
0504	1111	2829	50
28	87	49	18635
<u>21.3038</u>	<u>3024</u>	<u>27.7184</u>	1141927
			20
			12
			<u>7197</u>

MC 3857 Star Measures -

1914 May 26

1

1 16645
68 12221
21.5 2721
35
21.4418

17841
1224953
47
26
4417

16789
1538172
82
80
6.8590

18700
10074
7679
90
8625

2 15738
16.5 10410
28.5 0915
31
28.5324

16991
1231910
16
81
5329

17256
1764040
49
60
16.5385

15960
1057672
70
50
5381

3 279 15460
11.4 1234640
41
58
11.3117

14695
781910
11
87
3126

10239
960000
94
77.9359

977474
80
9150
9379

Grade 1.

Star to be used in class of (2.)

27.7 15350
21.5 1230704
05
28
21.3038

15897
8920
1111
87
3024

16741
13925
2829
49
277184

18671
7461
18635
114172
20
12
7197

3857 Moon's Measures

2

$$\begin{array}{r} \frac{1}{200} \\ 153 \end{array} \quad \text{hole}$$

$$\begin{array}{r} \frac{1}{20.9} \\ 19.0 \end{array}$$

$$\begin{array}{r} \frac{2}{210} \\ 19.1 \end{array} \quad \begin{array}{r} 10305 \\ 9400 \\ 0521 \end{array}$$

$$\underline{19.0896}$$

$$\begin{array}{r} \frac{3}{21.2} \\ 198 \\ \text{max} \\ \text{in} \\ \mu \end{array}$$

$$\begin{array}{r} \frac{4}{21.2} \\ 20.0 \end{array}$$

$$\begin{array}{r} \frac{5}{21.0} \\ 206 \end{array} \quad \begin{array}{r} 20235 \\ 1323034 \\ 40 \\ 35 \end{array}$$

$$\underline{20.7000}$$

$$\begin{array}{r} 14135 \\ 12019 \\ 13240 \end{array}$$

$$\underline{0885}$$

$$\begin{array}{r} 20089 \\ 1708101 \\ 81 \\ 80 \end{array}$$

$$\underline{7002}$$

$$\begin{array}{r} 10545 \\ 1007571 \\ 79 \end{array}$$

$$\underline{20.9530}$$

$$\begin{array}{r} 1292639 \\ 1030 \\ 12466 \end{array}$$

$$\underline{.9540}$$

very oblique
intersection.

$$\begin{array}{r} 15518 \\ 736053 \\ 50 \\ 06 \end{array}$$

$$\underline{21.1846}$$

$$\begin{array}{r} 15512 \\ 1737320 \\ 20 \\ 98 \end{array}$$

$$\underline{21.1817}$$

$$\begin{array}{r} 19041 \\ 1716072 \\ 6872 \\ 40 \end{array}$$

$$\underline{1873}$$

$$\begin{array}{r} 20059 \\ 1821827 \\ 21 \\ 48 \end{array}$$

$$\underline{1835}$$

very oblique

3857 Moon's Measures

d

4

n

d

n

n

$$\begin{array}{r} 1 \\ 200 \\ 153 \\ \hline \end{array} \quad \text{Roll}$$

$$\begin{array}{r} 1 \\ 20.9 \\ 19.0 \end{array}$$

$$\begin{array}{r} 10545 \\ 1007571 \\ 79 \end{array}$$

$$\begin{array}{r} 1292639 \\ 1030 \\ 12466 \end{array}$$

$$\underline{20.9530}$$

$$\underline{.9540}$$

$$\begin{array}{r} 2 \\ 10305 \\ 210 \\ 191 \end{array} \quad \begin{array}{r} 940021 \\ 05 \end{array}$$

$$\begin{array}{r} 14135 \\ 1 \\ 13240 \end{array}$$

$$\underline{190896}$$

$$\underline{0885}$$

very oblique
interaction

$$\begin{array}{r} 3 \\ 212 \\ 198 \\ \text{max} \\ 1 \end{array}$$

$$\begin{array}{r} 15518 \\ 736053 \\ 50 \\ 06 \\ \hline 21.1846 \end{array}$$

$$\begin{array}{r} 17041 \\ 1716072 \\ 68 \\ 40 \\ \hline 1873 \end{array}$$

$$\begin{array}{r} 4 \\ 216 \\ 200 \end{array}$$

$$\begin{array}{r} 15512 \\ 1731320 \\ 20 \\ 98 \\ \hline 21.1817 \end{array}$$

$$\begin{array}{r} 20059 \\ 1821827 \\ 21 \\ 48 \\ \hline 1835 \end{array}$$

$$\begin{array}{r} 5 \\ 21020235 \\ 2061323034 \\ 40 \\ 35 \\ \hline 20.7000 \end{array}$$

$$\begin{array}{r} 20089 \\ 1708101 \\ 81 \\ 80 \\ \hline 7002 \end{array}$$

very oblique

3857 Moon measures

$$\begin{array}{r} 6 \\ 20.7 \\ \hline 21.0 \end{array}$$

$$\begin{array}{r} 19247 \\ 1740004 \\ \hline 80 \end{array}$$

$$\begin{array}{r} 14277 \\ 611910 \\ \hline 16 \end{array}$$

$$\begin{array}{r} 25 \\ 208158 \\ \hline \end{array}$$

$$\begin{array}{r} 67 \\ 8154 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ 20.0 \\ 21.6 \\ \hline 17991 \\ 11971 \\ 6771 \\ 91 \\ \hline 21.6021 \end{array}$$

$$\begin{array}{r} 13080 \\ 910590 \\ 99 \\ 69 \\ \hline 6020 \end{array}$$

$$\begin{array}{r} 8 \\ 19.5 \\ 21.6 \\ \hline 17001 \\ 986764 \\ 6064 \\ 89 \\ \hline 21.7129 \end{array}$$

$$\begin{array}{r} 15060 \\ 1219900 \\ 97 \\ 49 \\ \hline 7142 \end{array}$$

$$\begin{array}{r} 9 \\ 19.0 \\ 21.8 \\ \hline 17015 \\ 1024530 \\ 3845 \\ 00 \\ \hline 21.6765 \end{array}$$

$$\begin{array}{r} 15060 \\ 1182315 \\ 2015 \\ 40 \\ \hline 6765 \end{array}$$

$$\begin{array}{r} 10 \\ 18.4 \\ 21.4 \\ \hline 17109 \\ 1285947 \\ 4947 \\ 05 \\ \hline 21.4256 \end{array}$$

$$\begin{array}{r} 17261 \\ 1153030 \\ 27 \\ 65 \\ \hline 4266 \end{array}$$

$$\begin{array}{r} 18529 \\ 1234250 \\ 5050 \\ 19 \\ \hline 283824 \end{array}$$

$$\begin{array}{r} 16425 \\ 1257973 \\ 78 \\ 10 \\ \hline 3842 \end{array}$$

3857

moon - measures

d

4

~

d

N

19247

19277

1740004

611910

60

16

25

67

20.81588154

2

20.0

17991

13080

21.6

11971

910590

6771

99

91

69

21.60216020

8

17001

15060

19.5

986764

1219900

21.0

60

97

max

89

49

21.71297142

8

17015

15060

19.0

1029530

1182515

21.0

38415

20

00

40

21.67656765

10

17109

17261

18529

16425

18.4

1285947

11530

1234250

1257973

21.9

49

27

50

7873

05

65

19

10

21.925642662138243842

3857

Trines etc.

Exp to star 1913 Sept. 15 21^h 51^m - 22^h 03^m
 " " noon 21 57 04.6 - 21 57 04.9
 clock fast 2 33.7

H. Sid T	21	54	31.05	$\Theta - \alpha = -2^{\circ} 01^{\circ}$
H. hor	4	44	31.05	
G. Sid T	26	39	02.10	
Sid T in noon	11	35	22.09	
Interval	15	03	40.01	
Red:		2	28.04	
G. in T.	15	01	11.97	

From Naut. Alman.	R. A	Decl.
noon 15 ^h	23 55 47.65	+ 0 02 31.4
motion in 1 ^h = 1.7317		14 236
" 1 ^h 2	+ 2.08	+ 17.1
Tabular Place	23 55 49.73	+ 0 02 48.5

Moon's age 15 days.

" parallax 53' 58.45
 " semidiameter 14 44.1
 R = 8841

934 = +10.1
 884 + 9.0

Augmentation + 9.0
 Irradiation (1) + 0.2
 R = 893.3

a = -501.2

24

477.2

alt = 1.9149

alt = -914

(1+a)R = 18235

R² = 33251

3857

Transits

Epoch Time 1913 Sept. 15 21^h 51^m - 22^h 03^m
 noon 21 57 04.6 - 21 57 04.9
 clock fast 2 33.7

H. Sid T. 21 54 31.05 - 22 - 2^m 01^s
 H. long 4 44 31.05
 S. Sid T. 26 39 02.10
 Sid T. to noon 11 35 22.09
 Interval 15 03 40.01
 Red 2 28.04
 S. Sid T. 15 01 11.97

From Naut Alman

R A

Decl.

Uncon 15^h 23 55 47.65 + 0 02 31.4
 Uncon - 15^h 17317 14236
 15^h 2 209 + 171
 Tabular Place 23 55 49.73 + 0 02 48.5

Uncon's Age . 15 days.

parallax. 53' 58.45

semisolarium 14 44.1

R 884.1

734 = +10.1

584 + 7.0

Augmentation + 9.0

Irradiation (1) + 0.2

R = 893.3

alt = 1.9149

alt = - 91.4

a = - 501.2

(1 + a) R = 1.8235

177.2

R = 3325.1

x
3
2-
4
m
4-
x
c
1

3857

Plate Constants

5

x	6.8602	27.7190	27.9366
y	6.0808	27.9868	28.3352
z	+7794	-2678	-3986

y	21.4418	21.3031	11.3122
z	22.3021	22.3939	11.9022
y-z	-8603	-10908	-5900

$$\begin{array}{rclclclcl}
 x - \bar{x} & +500x & & -120y & & +1.2z & & -8659 \\
 +7794 + 3430 = & +11224 & -2573 = & +8651 & +8 = & +8659 & = & 0 \\
 -2678 + 13860 = & +11182 & -2556 = & +8626 & +33 = & +8659 & = & 0 \\
 -3986 + 13964 = & +9982 & -1357 = & +8625 & +34 = & +8659 & = & 0 \\
 193641 + 9682 = & & -2387 & & +23 = & 192300 & &
 \end{array}$$

$$\begin{array}{rclclclcl}
 y - \bar{y} & +500y & & +1138x & & +3.6y & & -2976 \\
 -8603 + 10721 = & +2118 & +781 = & +2899 & +77 = & +2976 & = & 0 \\
 -10908 + 10652 = & -256 & +3154 = & +2898 & +77 = & +2975 & = & -1 \\
 -5900 + 5656 = & -244 & +3179 = & +2935 & +41 = & +2976 & = & 0 \\
 198917 + 9946 & & +2204 & & +72 & = & 208163 &
 \end{array}$$

$$\begin{array}{rclclcl}
 \text{Tables } a = -1.0 & c = -3.3 & a - c = +2.3 & b + a = +3.8 \\
 \text{Obs } a = -501.2 & c = -503.6 & & +2.4 & +6.2 \\
 b - c & -500.2 & -500.3 & & +2.4
 \end{array}$$

3857

Plate constants

x	6.8602	27.7190	27.9366
y	6.0808	27.9868	28.3352
z	+7794	-2678	-3986

4	21.4418	21.3031	11.3122
5	22.3021	22.3939	11.9022
4-5	-8603	-10908	-5900

$$\begin{aligned}
 x - \bar{x} & \quad +1207 \quad -1207 \quad +1.27 \quad -86. \\
 +7794 + 3430 & = +11224 - 2573 + 8651 + 8 = +8659 \\
 -2678 + 13860 & = +11182 - 2556 + 8626 + 33 = +8619 \\
 -3986 + 13968 & + 9982 - 1357 = +8625 + 34 = +8659 \\
 193641 + 9682 & \quad -2387 \quad +23 = 192300
 \end{aligned}$$

$$\begin{aligned}
 y - \bar{y} & \quad +1207 \quad +11387 \quad +369 \quad -2976 \\
 -8603 + 10721 & = +2118 + 781 + 2899 + 77 = +2976 \\
 -10908 + 10652 & = -256 + 3154 + 2898 + 77 = +2976 \\
 -5900 + 5656 & = -244 + 3179 + 2935 + 41 = +2976 \\
 198917 + 9946 & \quad +2204 \quad +72 \quad = 20.8163
 \end{aligned}$$

$$\begin{aligned}
 \text{Table } a_1 & = -1.0 & e & = -3.3 & a & = -6 & +2.3 & +1.4 & +2.8 \\
 \text{Obs } a & = -5.12 & & = -5.36 & & & +2.4 & & +6.2
 \end{aligned}$$

1
2
3
4
5
6
7
8
9
10

1
2
3
4
5
6
7
8
9
10

3857

Motions Center

	x	x - X ₀	Δy	(x - X ₀) ²	(x - X ₀) ² + (y - Y ₀) ²	0 - c
1	20.9535	+1.5865	+3	2.5180	3.3194	-57
2	21.0000	+1.6330	+3	2.6677	3.3176	-85
3	21.1860	+1.8190	0	3.3088	3.3088	-163
4	21.1826	+1.8156	0	3.2964	3.3074	-177
5	21.0000	+1.6330	-3	2.6657	3.3142	-109
6	20.8156	+1.4486	-4	2.0975	3.3189	-62
7	20.0000	+0.6330	-6	0.3999	3.3147	-104
8	19.3670	0.0000	-6	0.0000	3.3088	-163
9	19.0000	-0.3670	-6	0.1351	3.3103	-148
10	18.3833	-0.9837	-5	0.9687	3.3139	-112

$$R^2 = 3.3251$$

	y	y - Y ₀	Δx	(y - Y ₀) ²	
1	19.0000	-0.8950	-2	0.8014	120
2	19.0890	-0.8060	-2	0.6499	116
3	19.8950	0.0000	0	0.0000	90
4	20.0000	+0.1050	0	0.0110	87
5	20.7001	+0.8051	+2	0.6485	64
6	21.0000	+1.1050	+2	1.2214	53
7	21.6026	+1.7070	+3	2.9148	20
8	21.7136	+1.8186	+4	3.3088	0
9	21.6765	+1.7815	+4	3.1752	348
10	21.4261	+1.5311	+3	2.3452	327

Range 15-2

Approx. Center

$$x = 21.0 \quad y = 19.0890$$

$$\frac{20.7001}{19.7891}$$

$$Y_0 = 19.8946$$

$$y_{\text{max}} = 21.7136$$

$$R = 1.8190$$

$$x_{\text{max}} = 21.1860$$

$$X_0 = 19.3670$$

$$\text{Center } \begin{cases} X_0 = 19.3670 \\ Y_0 = 19.8950 \end{cases}$$

1
2
3
4
5
6
7
8
9
10

1
2
3
4
5
6
7
8
9
10

3857

Munroe Center

	x	x - $\bar{x}_0$	Δx	(x - $\bar{x}_0$) ²	(x - $\bar{x}_0$) + (y - $\bar{y}_0$)	O - C
1	20.9535	+1.5865	3	2.5180	3.3194	-3.7
2	21.0000	+1.6330	3	2.6677	3.3176	-4.5
3	21.1860	+1.8190	0	3.3088	3.3088	-16.3
4	21.1826	+1.8156	0	3.2964	3.3074	-17.7
5	21.0000	+1.6330	3	2.6657	3.3142	-10.9
6	20.8156	+1.4486	4	2.0975	3.3189	-6.2
7	20.0000	+0.6330	6	0.3799	3.3147	-10.4
8	19.3670	0.0000	6	0.0000	3.3088	-16.2
9	19.0000	-0.3670	6	0.1351	3.3103	-14.8
10	18.3833	-0.9837	5	0.9657	3.3139	-11.2

$$R^2 = 3.3251$$

	y	y - $\bar{y}_0$	Δy	(y - $\bar{y}_0$) ²	
1	19.0000	-0.8950	-3	0.8010	12.0
2	19.0890	-0.8060	-2	0.6496	11.6
3	19.8950	0.0000	0	0.0000	29.0
4	20.0000	+0.1050	0	0.0110	8.7
5	20.7201	+0.8051	+2	0.6481	6.5
6	21.0000	+1.1050	+2	1.2210	5.3
7	21.6020	+1.7070	+3	2.9149	2.0
8	21.7136	+1.8186	+4	3.3088	0
9	21.6765	+1.7815	+4	3.1752	34.8
10	21.4261	+1.5311	+3	2.3452	32.8

Range 15.2

Approx. Center

$$\bar{x} = 21.0 \quad \bar{y} = 19.0890$$

$$\frac{20.7201}{2}$$

$$\frac{19.7851}{2}$$

$$\bar{y}_0 = 19.8946$$

$$y_{\text{max}} = 21.7136$$

$$R = 1.8190$$

$$x_{\text{min}} = 21.1860$$

$$x_0 = 19.3670$$

$$\text{Center } \bar{x}_0 = 19.3670$$

$$\bar{y} = 19.0890$$

Formation of Normals.

1	- 1.43	- 90.5	+ 51.3
2	- 1.32	- 138.5	+ 68.9
3	+ 0.00	- 296.5	- 0.0
4	+ 0.18	- 322.0	- 17.7
5	+ 1.32	- 177.8	- 88.4
6	+ 1.60	- 89.9	- 68.2
7	+ 1.08	- 65.5	- 178.0
8	+ 0.00	- 0.0	- 296.5
9	- 0.66	+ 54.8	- 263.0
10	- 1.50	+ 109.8	- 171.2
	- 0.73	- 1016.1	- 962.8

	a	b	c	new a-c
	- 62	+ 33	+ 78 ^v	+ 21 ^v
	- 64	+ 30	+ 39 ^v	- 4 ^v
a	- 39	- 71	0	+ 2 ^v
b	- 37	- 71	- 4	- 57 ^v
c	+ 73	- 64	- 30	- 2 ^v
		- 57	- 41	- 21 ^v
		- 25	- 63	- 26 ^v
		0	- 67	+ 73 ^v
		+ 14	- 66	+ 32 ^v
		+ 38	- 57	- 35 ^v
				- 30 ^v
				- 17 ^v

3857

Moon's Center

7

Conditional Equations

	a	b	c				c	0-c
1	+1.5.9	-0.902	-57	-	94	+ 60	= -34	-23
2	+1.63	-0.81	-85	-	96	+ 54	= -42	-43
3	+1.82	+0.00	-163	-	107	- 0	= -107	-56
4	+1.82	+0.10	-177	-	107	- 7	= -114	-63
5	+1.63	+0.80	-109	-	96	- 54	= -150	+41
6	+1.45	+1.10	-62	-	86	- 74	= -160	+98
7	+0.63	+1.71	-104	-	37	- 114	= -151	+47
8	0.00	+1.82	-163	+	0	- 122	= -122	-41
9	-0.37	+1.78	-148	+	22	- 119	= -97	-51
10	-0.98	+1.53	-112	+	58	- 102	= -44	-68

+186-345

Average: 1.3

Normal Equations

$$\begin{aligned}
 +18.06 - 0.73 &= -1016 & +9.22 \\
 -0.73 + 15.08 &= -963 & +7.25 \\
 +0.73 - 0.03 &= -4.1 & +0.37 \\
 +15.05 &= -1004 & +7.62
 \end{aligned}$$

$$b = -66.8 + 0.57$$

$$+18.06 = -1016 - 49 = -1065$$

$$a = -59.0 + 0.53$$

Arc measured: 152° Average (0-c) = -16

$$\frac{pc}{n} = \frac{17}{16}$$

$$-\frac{16}{17} = -0.94$$

$$\Delta n = -1.0$$

$$-2RC = +3.65$$

100

$$\text{Cover} = 1.0$$

$$\Delta b = +1.86$$

$$\Delta \delta = +0.9$$

$$\Delta R = -0.1$$

$$\Delta a = +1.93$$

$$\Delta \alpha = +0.06$$

3857 Moon's Mean Position (1913.0)

$$\begin{array}{r} x_0 = 19.3670 \\ \frac{1}{2}a = -29 \\ \hline 19.3641 \end{array}$$

$$\begin{array}{r} y_0 = 19.8950 \\ \frac{1}{2}b = -33 \\ \hline 19.8917 \end{array}$$

From plate constant $x = 19.2300$ $y = 20.8163$

$$\begin{array}{r} \xi = +1.2300 \\ \log \xi = 0.08991 \\ \cos \xi = 9.99998 \\ \hline 8.50724 \\ 1.58269 \\ -(x-A) + \end{array}$$

$$a-A + 38.26$$

$$A \quad 23 \quad 56 \quad 30$$

$$x_0 = 23 \quad 57 \quad 08.26$$

$$\text{Red. add. app.} + 3.54$$

$$x' = 23 \quad 57 \quad 11.80$$

$$\eta = -1.1837$$

$$\begin{array}{r} \log \eta = 0.07324 \\ \hline 7.33115 \\ 2.74209 \end{array}$$

$$\delta-D = -9 \quad 12.2$$

$$D = -0 \quad 24 \quad 50$$

$$\delta_0 = -0 \quad 34 \quad 02.2$$

$$\text{Red.} + 22.9$$

$$\delta' = -0 \quad 33 \quad 39.3$$

3857 Orion Mean Position (1913.0)

$$X_0 = 19.3670$$

$$Y_0 = 19.8910$$

$$\Delta X = -29$$

$$\Delta Y = -33$$

$$19.3641$$

$$19.8917$$

From plate constant $X = 19.2300$ $Y = 20.8163$

$$\xi = +1.2300$$

$$\eta = -1.1837$$

$$\log 3 = 0.05991$$

$$\cos 3 = 9999978$$

$$8.50724$$

$$1.58269$$

$$(X-A) =$$

$$\log 7 =$$

$$0.07324$$

$$7.33115$$

$$2.74309$$

$$\alpha - A = + 38.26$$

$$\delta - D = - 9.122$$

$$A = 23.56.30$$

$$D = 0.24.50$$

$$\alpha_0 = 23.57.08.26$$

$$\delta_0 = 0.34.02.2$$

$$\text{Reduct. app.} = 3.54$$

$$\text{Red.} = + 2.29$$

$$\alpha = 23.57.11.80$$

$$\delta = 0.33.39.3$$

3857 Lunar Parallax.

$$\alpha' = 23^{\circ} 57' 11.50''$$

$$\delta = 21^{\circ} 54' 31.05''$$

$$\begin{aligned} \theta - \alpha' &= -2^{\circ} 02' 40.75'' \\ &= -30^{\circ} 40' 11'' \end{aligned}$$

$$- \quad \quad \quad 10 \quad 11$$

$$-30 \quad 30 \quad 00$$

$$9.95727$$

$$0.00000$$

$$\underline{0.06468}$$

$$0.02195$$

$$\gamma = 46 \quad 26 \quad 50$$

$$- \quad 0 \quad 33 \quad 39$$

$$47 \quad 00 \quad 29$$

$$9.82640$$

$$8.19595$$

$$9.86419$$

$$\underline{0.13982}$$

$$8.02636$$

$$\delta - \delta' = +36 \quad 31.7$$

$$\delta + 0 \quad 02 \quad 52.4$$

$$\text{Ann. Eph. } \delta = +0 \quad 02 \quad 48.5$$

$$O-C \quad \quad \quad + \quad 3.9$$

$$\text{Corr. of Plate} \quad +0.8$$

$$\text{2nd Ord. ref.} \quad +0.0$$

$$\text{Sur} \quad +0.9$$

$$\delta = +0 \quad 02 \quad 53.3$$

$$O-C \quad +4.8$$

$$\delta' = -0^{\circ} 33' 39.3''$$

$$\mu = 53' \quad 58.85''$$

$$9.86913$$

$$8.19595$$

$$9.70765$$

$$\underline{0.00000}$$

$$7.77273$$

$$\alpha - \alpha' = -20 \quad 22.25$$

$$= -1^{\text{m}} \quad 21.48$$

$$\alpha = 23 \quad 55 \quad 50.32$$

$$\alpha = 23 \quad 55 \quad 49.73$$

$$\text{Curr.} \quad +0.59$$

$$-0.01$$

$$\text{Sur} \quad +0.06$$

$$\alpha = 23 \quad 55 \quad 50.38$$

$$O-C = +0.65$$

3857 Lunar Parallax.

$$\begin{aligned} \alpha &= 23^{\circ} 57' 11.80'' \\ \delta &= 21^{\circ} 54' 31.05'' \\ \theta - \alpha &= -2^{\circ} 02' 40.75'' \\ &= -30'' 40' 11'' \end{aligned}$$

$$- \quad 10 \quad 11$$

$$- 30 \quad 30 \quad 00$$

$$\begin{array}{r} 995727 \\ 000000 \\ \hline 006418 \\ 0.02195 \end{array}$$

$$\gamma = 46 \quad 26 \quad 50$$

$$- \quad 0 \quad 33 \quad 39$$

$$47 \quad 00 \quad 29$$

$$\begin{array}{r} 982640 \\ 8.19595 \\ 986419 \\ \hline 0.13982 \\ 8.02636 \end{array}$$

$$\delta - \delta' = 136 \quad 31.7$$

$$\delta + 0 \quad 02 \quad 52.4$$

$$\text{Ann. Eph. } \delta' + 0 \quad 02 \quad + 8.5$$

$$O-C \quad 3.9$$

$$\begin{array}{l} \text{Corr. of Plate} + 0.9 \\ \text{2nd Obs. Ref.} + 0.0 \\ \text{Err.} + 0.9 \end{array}$$

$$\begin{array}{r} \delta - \quad + \quad 0 \quad 12 \quad 53.3 \\ O-C \quad + 4.8 \end{array}$$

$$\delta' = -0^{\circ} 33' 39.3''$$

$$\mu = 53' 58.85''$$

$$\begin{array}{r} 986913 \\ 8.19595 \\ 970765 \\ \hline 000000 \\ 777273 \end{array}$$

$$\alpha - \alpha' = -20 \quad 22.25$$

$$- \quad 1'' \quad 21.4$$

$$\alpha = 23 \quad 55 \quad 50.32$$

$$\alpha = 23 \quad 55 \quad 49.73$$

$$\begin{array}{r} \text{Curr.} + 0.59 \\ - 0.01 \end{array}$$

$$\text{Err.} + 0.06$$

$$\alpha = 23 \quad 55 \quad 50.38$$

$$O-C. + 0.65$$

4096 stars - measures

1914 May 27

1 14829
 28.9 7379 77
 28.9 29
28.7448

19570
 19020
 15-19
 70
7448

995156
 49
 9821
90131

19561
 14412
 151
0148

2 19750
 224 1763648
 93 46
 50
9.2907

18671
 10789
 79
 80
2105

19468
 12415
 1018
 70
22.2945

19610
 16650
 50 40
 26
2968

3 18005
 24 13300
 275 9505
 10
27.4808

17498
 1220104
 9904
 06
4699

18440
 11818
 2919
 40
25.3382

18428
 1502020
 2520
 30
3407

grade 5

4096 Stars - measures

1914 May 27

1 14529 19570
 289 7375 17020
 289 2077 1519
 29 70
287448 7448

995156 19561
 49 144121
 9821 1511
90131 0148

2 19750 18671
 224 1763648 10789
 93 46 7981
 50 80
92807 2105

19468 19610
 12415 16650
 1018 50 40
 70 26
222945 2968

3 18005 17998
 274 13300 1220104
 275 9505 9904
 10 06
274708 4699

18440 18928
 11818 1502020
 2919 2520
 40 30
253382 3407

Grade 3

4096 Moon - Measures.

16

$$\begin{array}{r}
 \text{d} \quad 4 \quad \text{v} \\
 \hline
 1 \quad 17629 \quad 17245 \\
 18.6 \quad 103000 \quad 1458680 \\
 18.7 \quad \quad 0600 \quad 81 \\
 \text{min} \quad \quad 25 \quad 55 \\
 \text{u} \quad 18.7324 \quad .7334 \\
 \hline
 \end{array}$$

possibly on
phase limb.

$$\begin{array}{r}
 \hline
 2 \quad 16620 \quad 17254 \\
 19.0 \quad 8991 \quad 1488684 \\
 18.7 \quad \quad 8991 \quad 89 \\
 \quad \quad 12 \quad 67 \\
 \hline
 18.7624 \quad .7628
 \end{array}$$

$$\begin{array}{r}
 \hline
 3 \\
 19.6 \\
 19.0
 \end{array}$$

$$\begin{array}{r}
 18169 \\
 1470413 \\
 15 \\
 56 \\
 \hline
 14.6546
 \end{array}$$

$$\begin{array}{r}
 18818 \\
 1225061 \\
 61 \\
 27 \\
 \hline
 65-67
 \end{array}$$

$$\begin{array}{r}
 \hline
 4 \\
 20.0 \quad 14689 \quad 18041 \\
 19.3 \quad 1216159 \quad 1056926 \\
 \quad \quad 60 \\
 \quad \quad 92 \quad 50 \\
 \hline
 19.2530 \quad .2517
 \end{array}$$

$$\begin{array}{r}
 \hline
 5 \\
 20.5 \\
 20.0
 \end{array}$$

$$\begin{array}{r}
 16735 \\
 1170010 \\
 95 \\
 29 \\
 \hline
 20.4970
 \end{array}$$

$$\begin{array}{r}
 19055 \\
 1406070 \\
 63 \\
 63 \\
 \hline
 4995
 \end{array}$$

$$\begin{array}{r}
 \hline
 6 \\
 20.6 \\
 20.7 \\
 \text{max} \\
 \text{u} \\
 \text{L}
 \end{array}$$

$$\begin{array}{r}
 16700 \\
 1292119 \\
 31 \\
 09 \\
 \hline
 20.6220
 \end{array}$$

$$\begin{array}{r}
 19069 \\
 1284841 \\
 41 \\
 76 \\
 \hline
 .6230
 \end{array}$$

4096 Moon - Measures

16

$\frac{1}{186}$ 17629 17245
 18.7 10300 1458680
 0600 81
 21 55

possibly on phase limb

$\frac{2}{18.7}$ 187324 7334

$\frac{2}{19.0}$ 16620 17254
 18.7 8991 1458684
 8991 89
 12 67
 187624 7628

$\frac{3}{19.6}$
 190

18169
 1470413
 15
 56
 14.6546

18818
 1225061
 61
 27
 65-67

$\frac{4}{20.0}$ 14689 18041
 19.3 1316159 1056966
 60
 92 50
 19.2530 2517

$\frac{5}{20.5}$
 200

16735
 1170010
 95
 29
 20.4970

19055
 1906070
 63
 63
 4995

$\frac{6}{20.6}$
 207
 max
 2

16700
 1292119
 31
 09
 20.6220

19069
 12848
 4141
 76
 .6230

4096

Moon measures

$$\begin{array}{r} 7 \\ 20.6 \\ 21.0 \end{array}$$

$$\begin{array}{r} 15680 \\ 11641 \\ 3941 \\ 86 \\ \hline 205957 \end{array}$$

$$\begin{array}{r} 19120 \\ 13136 \\ 3148 \\ 27 \\ \hline 5987 \end{array}$$

$$\begin{array}{r} 8 \\ 20.1 \\ 22.0 \end{array}$$

$$\begin{array}{r} 15655 \\ 685162 \\ 53 \\ 55 \\ \hline 201200 \end{array}$$

$$\begin{array}{r} 20187 \\ 1897151 \\ 70 \\ 90 \\ \hline 1213 \end{array}$$

$$\begin{array}{r} 9 \\ 20.0 \\ 22.7 \end{array}$$

$$\begin{array}{r} 19798 \\ 1857480 \\ 75 \\ 95 \\ \hline 221222 \end{array}$$

$$\begin{array}{r} 19600 \\ 1082931 \\ 27 \\ 00 \\ \hline 1229 \end{array}$$

10 scratch

$$\begin{array}{r} 19.3 \\ 22.5 \\ 18820 \\ 1309390 \\ 86 \\ 29 \\ \hline 225734 \end{array}$$

$$\begin{array}{r} 17098 \\ 1283939 \\ 2839 \\ 04 \\ \hline 5734 \end{array}$$

$$\begin{array}{r} 17965 \\ 1197379 \\ 75 \\ 71 \\ \hline 192006 \end{array}$$

$$\begin{array}{r} 17840 \\ 1582721 \\ 26 \\ 40 \\ \hline 2015 \end{array}$$

1913phae.proj.19

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1913phae.proj.19

1913phae.proj.19

409.6

a

Known measures

4

v

d

v

$$\begin{array}{r} 7 \\ 20.6 \\ 21.0 \end{array}$$

$$\begin{array}{r} 8 \\ 20.1 \\ 22.0 \end{array}$$

$$\begin{array}{r} 9 \\ 20.0 \\ 22.7 \\ 19798 \\ 1857480 \\ 75 \\ 95 \\ \hline 221222 \end{array}$$

$$\begin{array}{r} 19600 \\ 1082931 \\ 27 \\ 00 \\ \hline 1229 \end{array}$$

$$\begin{array}{r} 10 \text{ scratch} \\ 193 \\ 22.5 \\ 18820 \\ 1309390 \\ 86 \\ 29 \\ \hline 225734 \end{array}$$

$$\begin{array}{r} 17098 \\ 1283939 \\ 2839 \\ 09 \\ \hline 5734 \end{array}$$

$$\begin{array}{r} 17965 \\ 1197379 \\ 7579 \\ 71 \\ \hline 192006 \end{array}$$

$$\begin{array}{r} 17840 \\ 158272 \\ 26 \\ 40 \\ \hline 2015 \end{array}$$

$$\begin{array}{r} 15680 \\ 1164141 \\ 3941 \\ 86 \\ \hline 205957 \end{array}$$

$$\begin{array}{r} 19120 \\ 1313648 \\ 3148 \\ 27 \\ \hline 5987 \end{array}$$

$$\begin{array}{r} 15655 \\ 685162 \\ 53 \\ 55 \\ \hline 201200 \end{array}$$

$$\begin{array}{r} 20187 \\ 1897151 \\ 7051 \\ 90 \\ \hline 1213 \end{array}$$

4096	Times etc.					
Sept 1913 Oct 21	6 ^h 52 ^m			- 7 ^h 04 ^m		
" " moon	6 58	1 39 ^v	- 6 58	14.1 ^v		
clock fast	3	05.8 ^v				
A. Sid T.	6 55	08.2 ^v		6-X = -0 ⁿ 41 ^m		
A. hour	4 44	31.05 ^v				
A. Sid T.	11 39	39.25 ^v				
Sid T. in moon	13 57	18.03 ^v				
Interval	21 42	212.2 ^v				
Reduction		3. 33.36 ^v				
G.M.T.	21 38	47.86 ^v				
From Kant. Alman	R.A.			Decl.		
Moon 22 ^h	7 ^h 36 ^m	49.89 ^v		+ 26° 14' 37.2"		
Motion in 1 ^m = 2.4462				6.870		
" " - 21.202		- 51.86		+ 1 25.7		
Tabular place	7 35	58.03 ^v		+ 26 17 02.9		

moon's age	22 days	
" parallax	57"	46.63
" semidiameter	15	46.2 ^v
R		94.62 ^v
Augmentation		+15.0 ^v
Irradiation (3)		- 0.3 ^v
R		96.09 ^v
R		2.0598 ^v
aR		- 989 ^v
(1+a)R		1.9610 ^v
R ²		3.8455

934 = 14.6
946 = 15.2

a = -503.7
24
479.7

4096 Times etc.
 Exp. 1913 Oct 21 $6^h 52^m - 7^h 04^m$
 Moon $6^h 58^m 13.9 - 6^h 58^m 14.1$
 Clock fast 3 058

6.10.1. $6^h 55^m 08.2$ $6^h 58^m 14.1$
 11.10.1. $4^h 44^m 31.05$
 6.10.1. $1^h 39^m 29.25$
 sid. time hour $1^h 37^m 18.03$
 Interval $2^h 42^m 21.22$
 Reduction $3^h 33^m 36$
 S.M.T. $2^h 38^m 47.86$

Transit Alt. R.A. Decl.
 Moon 22^h $7^h 36^m 49.89$ $+26^\circ 14' 37.2$
 Moon 1^h $2^h 46^m 2$ 6890
 -21.202 -51.86 226.1
 Tabular place $7^h 35^m 58.03$ $-26^\circ 17' 03.3$

Moon age 22 days
 parallax $57'' 46'' 63$
 semichan. $15'' 46'' 20$
 R 9462
 Augmentation $+15.0$
 Irradiation (3) -0.3
 R 960.9
 R 2.0598
 AR -988
 (1-a) R 19610
 R² 38455

934.46
 $936.15.0$

$a = -503.7$
 -24
 479.7

	ξ	η	$\Delta \xi$	-3ξ	$+7 \eta$	$+D$
1	-9.62	+7.03	-34	+29	$-5 + 5 =$	0 +0
2	+9.79	-13.33	+23	-13	$+10 - 9 =$	+1 +1
3	+7.53	+5.85	+17	-23	$-6 + 7 =$	-2 -2
M	+0.57	-1.29	0	-2	-9	<u>-3</u>

	$\Delta \eta$	-9.2η	$+3 \xi$	$+6$
+26	-29	$-3 - 3 =$	-6	0
-62	+56	$-6 + 1 =$	-5	+1
+16	-25	$-9 + 2 =$	-7	-1
0	+5	+0	+11	

4096

Standard Coordinates

Cape W. 1066 mag. +3	Cape W. 1081 mag. 7.0	Cape W. 1087 mag. 8.0
C 7° 29' 45.67	7° 37' 56.11	7° 39' 44.73
L 45.70		79
E 45.68		74
Mean 7 29 45.68		7 39 44.75
Proc + 48.13	+ 47.13	+ 47.95
x 7 30 33.81	7 38 43.24	7 40 32.70
A 7 36 10	7 36 10	7 36 10
x-A - 5 36.19	+ 2 33.24	+ 4 22.70
ln(d-A) - 3 36.16	+ 1 53.24	+ 2 62.68
log .. 2.52655	2.18537	2.41943
wsb 9.94953	9.95919	9.95013
T ₀ 0.98332	0.65180	0.87680
T ₀ - 9.6232	+ 4.4854	+ 7.5302
T ₁ - 34	+ 23	+ 17
T 8.3734	22.4877	25.5219
x 9.0140	22.2917	25.3394
x-S + 6406	- 1920	- 1925

C + 27° 07' 04.8	- 24° 28' 53.6	+ 26° 58' 02.2
L 04.2		02.1
E 04.8		02.3
Mean + 27 07 04.6		+ 26 58 02.2
Proc - 1 41.3	- 1 48.4	- 1 50.3
S + 27 05 23.3	+ 24 27 05.2	+ 26 56 11.9
D - 26 10 42	- 26 10 42	+ 26 10 42
S-D + 54 41.3	- 1 43 36.8	+ 45 29.9
ln(d-b) + 3281.6	- 6218.7	+ 2730.1
log .. 3.51609	3.79370	3.43618
yo 0.84724	1.12485	0.76733
T ₀ 9.7088	9.65777	9.7060
T ₁ 1.9666	1.3036	1.7536
T 8.7288	8.0147	7.5130
yo + 7.0347	- 13.3306	+ 5.8524
T ₁ + 536	+ 103	+ 326
T 29.0883	8.6797	27.8850
y 28.7448	9.2106	27.4704
y-y - 3435	+ 5309	- 4146

4096	Plate Center -	R. A.	Decl.
x	4		
90140	28.7448	7 30 33.8	+27 05 23
22.2957	92106	7 38 43.2	+24 27 05
25.3394	27.4704	7 40 32.7	+26 56 12
356.65	6543	108 109.7	177 88 40
18.88	21.81	7 36 36.6	+26 09 13
-18	-22	- 27	+ 1 29
0.88	0.19	7 36 10	+26 10 42
31	465		
27 ⁶	89"		

$$\text{Center } \left\{ \begin{array}{l} A = 7^h 36^m 10^s \\ D = +26 \quad 10 \quad 42 \end{array} \right.$$

$$\begin{array}{rclclcl} x-3 & +500x & -83.74 & +3.7x & -8540 & \\ +6406 + 4507 = +10913 & -2406 = +8507 + 33 = +8540 & = & 0 & \\ -1920 + 11148 = +9228 & -771 = +8457 + 82 = +8539 & = & -1 & \\ -1925 + 12670 = +10745 & -2299 = +8446 + 94 = +8540 & = & 0 & \\ 18.6617 + 9331 = & -1732 + 69 = 18.5745 & & & \end{array}$$

$$\begin{array}{rclclcl} y-m & +1204 & +82.9x & +4y & -11399 & \\ -3435 + 14372 = +10937 & +747 = +11684 + 115 = +11799 & = & 6 & \\ +5309 + 4605 = +9914 & +1848 = +11762 + 37 = +11799 & = & 0 & \\ -4146 + 13735 = +9589 & +2101 = +11690 + 110 = +11800 & = & +1 & \\ 20.6906 + 10345 = & +1546 + 83 = 20.7081 & & & \end{array}$$

$$\begin{array}{rclclcl} \text{Tables } a = -1.0 & e = -1.0 & a-e = 0.0 & b+d = & 0.0 & \\ \text{Obs } a = -503.7 & e = -504.0 & a-e = +0.3 & b+d = & +0.8 & \\ b-c & -502.7 & -503.0 & & +0.8 & \end{array}$$

4096	Plate Center -	R. A.	Decl.
x	y		
90140	287448	7 30 33.8	+27 05 23
222957	92106	7 38 43.2	+24 27 05
253394	274704	7 40 32.7	+26 56 12
356.65	6543	108 109.7	77 88 40
1888	2181	7 36 36.6	+26 09 13
18	22	27	1 29
088	019	7 36 10	+26 10 42
31	65		
27	99		

$$\text{Center } \left\{ \begin{array}{l} A = 7^{\circ} 36' 10'' \\ D = +26^{\circ} 10' 42'' \end{array} \right.$$

$$\begin{array}{rclclcl} x-3 & +5004 & -83.74 & +3.7x & -8540 & \\ +6406 + 4507 = +10913 & -2406 = +8507 + 32 = +8540 & & & = 0 & \\ -1920 + 11148 = +9228 & -771 = +8457 + 82 = +8539 & & & = -1 & \\ -1925 + 12670 = +10745 & -2299 = +8446 + 94 = +8540 & & & = 0 & \\ 186617 + 9331 = & -1733 & & +69 & = 185745 & \end{array}$$

$$\begin{array}{rclclcl} y-4 & +5244 & +82.9x & +4y & -11799 & \\ -3435 + 14372 = +10937 & +747 = 11684 + 115 = +11799 & & & = 0 & \\ +5309 + 4605 = +9914 & +1848 = 11762 + 37 = +11799 & & & = 0 & \\ -4146 + 13735 = +9589 & +2101 = 11690 + 110 = +11800 & & & = +10 & \\ 206906 + 10345 = & +1546 & & +83 & = 207081 & \end{array}$$

$$\begin{array}{lclcl} \text{Tables } a = -1.0 & a = -1.0 & a = a + 0.0 & b + d = & 0.0 \\ \text{Obs } a = -503.7 & a = -504.0 & a = a + 0.3 & b + d = & +6 \end{array}$$

4096

Moon's Center

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	18.6680	0.0000	0.0000	3.8224	-231
2	19.0000 + 0.3320	0.1102	0.1102	3.8174	-281
3	19.6556 + 0.9876	0.9753	0.9753	3.8246	-209
4	20.0000 + 1.3320	1.7742	3.8351	3.8351	-104
5	20.4982 + 1.8302	3.3496	3.8229	3.8229	-226
6	20.6225 + 1.9545	3.8200	3.8200	3.8200	-255
7	20.5972 + 1.9292	3.7218	3.8191	3.8191	-264
8	20.1206 + 1.4526	2.1100	3.8313	3.8313	-142
9	20.0000 + 1.3320	1.7742	3.8323	3.8323	-132
10	19.2010 + 0.5330	0.2441	3.8388	3.8388	-67

$$R^2 = 3.8455$$

	y	$y - y_0$	$(y - y_0)^2$	
-1	18.7329	-1.9551	3.8224	180 ✓
2	18.7626	-1.9254	3.7072	171 ✓ 170
3	19.0000	-1.6880	2.8493	150 ✓
4	19.2524	-1.4356	2.0609	137 ✓
5	20.0000	-0.6880	0.4733	111 ✓
6	20.6880	0.0000	0.0000	90 ✓
7	21.0000 + 0.3120	0.0973	0.0973	99 ✓ 81
8	22.0000 + 1.3120	1.7213	48	✓
9	22.1226 + 1.4346	2.0581	43 ✓	
10	22.5734 + 1.8854	3.5547	16 ✓	

Range 164

Approx. Center

$$x = 20.0 \quad y = 19.2524$$

$$22.1226$$

$$41.3750$$

$$y_0 = 20.6875$$

$$y - \text{mean} = 18.7329$$

$$R = 1.9546$$

$$x - \text{mean} = 20.6225$$

$$x_0 = 18.6679$$

$$\text{Center} \left\{ \begin{array}{l} x_0 = 18.6680 \\ y_0 = 20.6880 \end{array} \right.$$

4096

Lunar Center

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	O-C
1	18.6680	0.0000	0.0000	3.8224	-231
2	19.0000 + 0.3320	0.1102	0.0121	3.8174	-281
3	19.6556 + 0.9876	0.5752	0.3308	3.8246	-209
4	20.0000 + 1.3320	1.7742	3.1481	3.8351	-104
5	20.4982 + 1.8302	3.3496	11.224	3.8229	-226
6	20.6265 + 1.9545	3.5200	12.390	3.8200	-255
7	20.5972 + 1.9292	3.7218	13.851	3.8191	-264
8	20.1206 + 1.4526	2.1100	4.452	3.8513	-142
9	20.0000 + 1.3320	1.7742	3.148	3.8323	-132
10	19.2010 + 0.5330	0.2441	0.0596	3.8388	-67

R² 38455

	y	$y - y_0$	$(y - y_0)^2$	
-1	18.7329	-1.9551	3.8224	180
2	18.7626	-1.9254	3.7072	171
3	19.0000	-1.6880	2.8493	150
4	19.2524	-1.4356	2.0609	137
5	20.0000	-0.6880	0.4733	111
6	20.6880	0.0000	0.0000	90
7	21.0000 + 0.3120	0.0973	0.0094	99
8	22.0000 + 1.3120	1.7213	2.963	48
9	22.1226 + 1.4346	2.0581	4.235	43
10	22.5734 + 1.8854	3.5547	12.635	16

Range 164

Approx. Center

$$\begin{aligned}
 x &= 20.0 \quad y = 19.2524 \\
 &\quad \underline{22.1226} \\
 &\quad 41.3750 \\
 y &= 20.6875 \\
 x &= 18.7329 \\
 R &= 1.9546 \\
 x &= 20.6225 \\
 x_0 &= 18.6679
 \end{aligned}$$

$$\begin{aligned}
 \text{Center } \{ & x_0 = 18.6680 \\
 & y_0 = 20.6880
 \end{aligned}$$

Formation of Normals

1	- 0.00	- 0.0	+ 452.5
2	- 0.64	- 92.6	+ 543.0
3	- 1.67	- 206.6	+ 353.0
4	- 1.91	- 138.2	+ 149.8
5	- 1.26	- 414.0	+ 156.0
6	+ 0.00	- 497.3	- 0.0
7	+ 0.60	- 509.5	- 81.9
8	+ 1.90	- 206.0	- 186.0
9	+ 1.90	- 175.6	- 188.9
10	+ 1.00	- 35.6	- 126.6
	- 0.08	- 2275.4	+ 1070.9

		a	b	c	new U-C
		- 0	- 4	+ 12	- 117
a	- 10	- 3	- 4	+ 9	- 129
b	+ 2	- 10	- 3	+ 3	+ 7
c	+ 16	- 13	- 3	0	+ 139
		- 18	- 1	- 3	+ 39
		- 19	+ 0	- 3	- 11
		- 19	+ 1	- 2	- 37
		- 18	+ 3	+ 5	- 21
		- 13	+ 3	+ 6	- 33
		- 5	+ 4	+ 15	- 87

4096 Moons Center Conditional Equations

	a	b	c	0-c	
1	+0.00	-1.96	= -231	-102 = -102	-129
2	+0.33	-1.93	= -281	-42 - 101 = -143	-138
3	+0.99	-1.69	= -209	-123 - 88 = -213	+4
4	+1.33	-1.44	= -104	-168 - 75 = -243	+139
5	+1.53	-0.69	= -226	-232 - 36 = -268	+42
6	+1.95	+0.00	= -255	-247 + 0 = -247	-8
7	+1.93	+0.31	= -264	-245 + 16 = -229	-35
8	+1.45	+1.31	= -142	-184 + 68 = -116	-26
9	+1.33	+1.43	= -132	-168 + 75 = -93	-39
10	+0.53	+1.89	= -67	-67 + 99 = +32	-99
					+185-474
					Average = 66

Normal Equations.

Normal Equations

$$\begin{aligned}
 +17.92 - 0.08 &= -2275 & +11.67 \\
 -0.08 + 20.34 &= +1071 & -2.87
 \end{aligned}$$

$$\begin{aligned}
 +0.08 - 0.00 &= -10 \\
 +20.34 &= +1061
 \end{aligned}$$

$$b = +523 - 0.14$$

$$\begin{aligned}
 -0.00 + 0.08 &= +4 \\
 +17.92 &= -2271
 \end{aligned}$$

$$a = -126.7 + 0.65$$

Arc measured 164° Average $(b-c) = -28.9$

$$\frac{pc}{m} = 0.22$$

$$\begin{aligned}
 -28.9 \\
 \hline
 22 &= -1.31 & \Delta z = -1.4 \\
 & & -1.6
 \end{aligned}$$

$$-2RC = +0.78$$

$$\Delta \theta = -0.11 \quad \Delta \delta = -0.1$$

$$\Delta \alpha = +0.51 \quad \Delta \alpha = +0.02$$

$$\text{Corr} = -0.2$$

$$\Delta R = -1.4$$

4096 Woods Center Conditional Equation

	a	b	0	c	0-c	
1	+000	-196	= -231	-	0 - 102 = -102	-129
2	+033	+193	= -281	-	42 - 101 = -143	-138
3	+099	+169	= -209	-	123 - 88 = -213	+4
4	+133	-144	= -104	-	168 - 75 = -243	+139
5	+188	-069	= -226	-	232 - 36 = -268	+42
6	+195	+000	= -255	-	247 - 0 = -247	-8
7	+193	+031	= -264	-	245 - 16 = -229	-35
8	+145	+131	= -142	-	184 - 68 = -116	-26
9	+133	+143	= -132	-	168 - 75 = -93	-39
10	+053	+189	= -67	-	67 - 99 = -32	-99

T 185-474
Average = 46

Normal Equation

$$+1792 - 008 = -2275$$

$$- 008 + 2034 = +1071$$

$$+ 008 - 000 = -10$$

$$+ 2034 = +1061$$

$$b = +523$$

$$- 000 + 008 = +4$$

$$+1792 = -2271$$

$$a = -126.7$$

Ans measured. 164° Average (0-c) = -28.9

$$\frac{pc}{m} = 0.22$$

$$\frac{-289}{22} = -1.31 \quad \Delta 2 = -14$$

$$\begin{array}{rcl}
 4096 & \text{Observed Mean Position (1913.0)} & \\
 X_0 = 18.6680 & Y_0 = 20.6880 & \\
 \hline
 -63 & +246 & \\
 \hline
 18.6617 & 20.6906 &
 \end{array}$$

$$\text{Trom plate Constants } X = 18.5745 \quad Y = 20.7081$$

$$Z = +0.5745$$

$$\eta = -1.2919$$

$$\begin{array}{r}
 \log 3 = 9.75929 \\
 \cos S \quad 9.95362 \\
 \hline
 8.50724 \\
 1.29843
 \end{array}$$

$$\begin{array}{r}
 \log \tan S = 9.6930 \quad 9.6884 \\
 9.5186 \quad 9.5186 \\
 \hline
 7.0534 \quad 7.0534 \\
 6.2650 \quad 6.2604
 \end{array}$$

$$X - A = + \quad 19.88$$

$$\eta_1 = +2$$

$$A = 7 \quad 36 \quad 10$$

$$\eta_0 = -1.2921$$

$$X_0 \quad 7 \quad 36 \quad 29.88$$

$$\begin{array}{r}
 \log \eta_0 = 0.11129 \\
 7.33115 \\
 \hline
 7.78014
 \end{array}$$

$$\text{Redmt. ad locum app } 334$$

$$X' = 7 \quad 36 \quad 33.22$$

$$S - D = -10 \quad 02.8$$

$$D = +26 \quad 10 \quad 42$$

$$S_0 = +26 \quad 00 \quad 39.2$$

$$\text{Red.} \quad - \quad 03$$

$$S' = +26 \quad 00 \quad 38.9$$

1. The first part of the paper is devoted to a discussion of the general properties of the system. The second part is devoted to a discussion of the properties of the system in the case of a particular model.

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10096 Moon's Mean Position (1913.0)
 $X_0 = 18.6680''$ $Y_0 = 20.6880''$
 $\Delta X = -0.0063$ $\Delta Y = +0.0026$
 $18.6617''$ $20.6906''$

Transit plate constants $X = 18.5745''$ $Y = 20.7081''$

$z = +05745''$

$\eta = -12919''$

$\log S = 9.75929$
 $\cos S = 9.95362$
 8.71291
 1.29853

$\log \cos S = 9.6930$
 1.5186
 7.0534
 6.2650

$X - X_0 = +0.0888''$ ✓

$\eta_1 = +2''$

$A = 7.3610$

$\eta_0 = -12921''$

$\alpha_0 = 7.362988$

$\log \eta_0 = 0.11129$
 7.33115
 2.78014

Reduction from epoch 334

$\eta = 7.3633.22$

$S - D = -10.028$

$D = +26.1042$

$\alpha_0 = 7.2600.39.2$

Red. = 0.3

$S = 26.509.38.9$

4097

Red. ad. locum rph.

$$H + \alpha \quad 11^{\circ} \quad 32.1 = 173^{\circ} 02'$$

$$H \quad 3 \quad 55.6$$

$$\alpha \quad 7 \quad 36.5$$

$$\delta \quad 22 \quad 3.6$$

$$\odot + \alpha \quad 29 \quad 40.1 = 85^{\circ} 02'$$

$$\cos(H + \alpha) \quad 8.9374$$

$$\sin \quad 1.2810$$

$$\cos \quad 9.9944$$

$$\tan \delta \quad 9.6882$$

$$8.8239$$

$$\delta' \quad 0.2184$$

$$\delta \quad 97.915$$

$$\delta \quad +2.55$$

$$\delta \quad +0.62$$

$$\delta \quad +0.17$$

$$+3.34$$

$$\delta = +26^{\circ} 00'$$

$$\cos \delta \quad 9.9537$$

$$\sin \quad 0.8529$$

$$(1) \quad 0.8066$$

$$\sin \delta \quad 9.6418$$

$$\cos(H + \alpha) \quad 9.9968m$$

$$\sin \quad 1.2831$$

$$\cos \quad 9.0838$$

$$\sec \delta \quad 0.0463$$

$$8.8239$$

$$\delta' \quad 0.9217m$$

$$\delta \quad 9.2371$$

$$\delta' \quad +1.65$$

$$\delta' \quad -8.35$$

$$\delta' \quad +6.41$$

$$-0.29 \checkmark$$

4097

Red. ad locum aph.

$$\begin{array}{rcl}
 H + \alpha & 11 & 32.1 = 173^\circ 02' \\
 H & 3 & 55.6 \\
 \alpha & 7 & 36.5 \\
 \phi & 22 & 3.6 \\
 \oplus \alpha & 29 & 40.1 = 85^\circ 02'
 \end{array}$$

$$\begin{array}{rcl}
 \cos(H + \alpha) & 8 & 9374 \\
 \sin & 8 & 12810 \\
 \cos & 9 & 9954 \\
 \sin & 9 & 6882 \\
 \cos & 8 & 8239
 \end{array}$$

$$\begin{array}{rcl}
 \delta & 0 & 2184 \\
 \delta & 9 & 7415
 \end{array}$$

$$\begin{array}{rcl}
 \delta & + & 255 \\
 \delta & + & 0.62 \\
 \delta & + & 0.17 \\
 \hline
 & + & 334
 \end{array}$$

$$\delta = +26^\circ 00'$$

$$\begin{array}{rcl}
 \cos & 9 & 9537 \\
 \sin & 0 & 8529 \\
 \hline
 (1) & 0 & 8066
 \end{array}$$

$$\begin{array}{rcl}
 \cos & 9 & 6418 \\
 \cos(H + \alpha) & 9 & 9968 \\
 \sin & 1 & 2831 \\
 \sin & 9 & 0838 \\
 \cos & 0 & 0463 \\
 \cos & 8 & 8239
 \end{array}$$

$$\begin{array}{rcl}
 \delta & 0 & 4217 \\
 \delta & 9 & 2371
 \end{array}$$

$$\begin{array}{rcl}
 \delta & + & 1.65 \\
 \delta & - & 835 \\
 \delta & + & 641 \\
 \hline
 & - & 0.29 \checkmark
 \end{array}$$

4096

Lunar Parallax.

$$\begin{aligned}
 \alpha' &= 7^h 36^m 33.22'' \\
 \theta &= 6 \quad 55 \quad 08.2'' \\
 \alpha - \alpha' &= -41 \quad 25.1'' \\
 &= -10^\circ 21' 16''
 \end{aligned}$$

$$- \quad \quad \quad 4 \quad 17''$$

$$-10 \quad 17' \quad 50''$$

$$\begin{aligned}
 9.95727'' \\
 0.00000'' \\
 \hline
 0.00703'' \\
 9.96430''
 \end{aligned}$$

$$\gamma = 42 \quad 38 \quad 53.0''$$

$$\delta = 26 \quad 00 \quad 38.9''$$

$$16 \quad 38 \quad 14''$$

$$\begin{aligned}
 9.82640'' \\
 8.22546'' \\
 9.45684'' \\
 \hline
 0.16910'' \\
 7.67740''
 \end{aligned}$$

$$\delta - \delta' = +16 \quad 22.3''$$

$$\delta = +26 \quad 17 \quad 01.2''$$

$$\text{Ann Eph } \delta = +26 \quad 17 \quad 03.3''$$

$$\begin{aligned}
 O-C &= - \quad \quad \quad 2.1 \\
 \text{Cur. of Plate} &+ 0.5 \\
 \text{2nd ord. ref.} &0.0 \\
 \text{Dev.} &- 0.1
 \end{aligned}$$

$$\begin{aligned}
 \delta &+26 \quad 17 \quad 01.1 \\
 O-C &- 0.2.2
 \end{aligned}$$

$$\delta' = +26 \quad 00 \quad 38.9''$$

$$\pi \quad 59' \quad 46.63''$$

$$\begin{aligned}
 9.86913'' \\
 8.22546'' \\
 9.25463'' \\
 \hline
 0.04739'' \\
 7.39661''
 \end{aligned}$$

$$\alpha - \alpha' = - \quad 8' \quad 34.08''$$

$$= - \quad \quad \quad 34.27''$$

$$\alpha = 7 \quad 35 \quad 58.95''$$

$$\alpha = 7 \quad 35 \quad 58.03''$$

$$\begin{aligned}
 \text{Curv.} &+ 0.92 \\
 &- .01
 \end{aligned}$$

$$\text{Dev.} \quad + 0.02$$

$$\alpha = 7 \quad 35 \quad 58.97''$$

$$O-C = + 0.94$$

4096

Lunar Parallax.

$$\begin{array}{r}
 \alpha' = 7^h 36^m 33.27 \\
 0 = 6 \quad 55 \quad 08.2 \\
 \alpha - \alpha' = -41 \quad 25.1' \\
 \quad \quad -10 \quad 21' \quad 16''
 \end{array}$$

$$- \quad \quad \quad 4 \quad 17''$$

$$-10 \quad 17 \quad -0.$$

$$9.95727$$

$$0.00000$$

$$0.00703$$

$$9.96430$$

$$\delta' = +26 \quad 00 \quad 38.9$$

$$\pi \quad 59' \quad 46.63$$

$$9.86913$$

$$822546$$

$$925463$$

$$004734$$

$$7.39551$$

$$\alpha - \alpha' = -8' \quad 34.88$$

$$- \quad 34.29$$

$$y = 42 \quad 38 \quad 53.$$

$$\delta = 26 \quad 00 \quad 38.9$$

$$16 \quad 39 \quad 01$$

$$9.82640$$

$$822546$$

$$9.45689$$

$$0.16980$$

$$7.67720$$

$$\delta - \delta' \quad \quad \quad \pi \quad 16 \quad 28.5$$

$$\delta = +26 \quad 17 \quad 01.2 \quad \lambda = 7 \quad 35 \quad 58.43$$

$$\text{Ann Ephs } \delta = +26 \quad 17 \quad 03.3 \quad \alpha = 7 \quad 35 \quad 58.03$$

$$O-C \quad \text{Cur. of Plate} \quad - \quad 2.5$$

$$\text{2nd ord ref.} \quad 0.0$$

$$\text{Dev.} \quad -0.1$$

$$\delta = +26 \quad 17 \quad 01.1$$

$$O-C \quad 0.2.2$$

$$\text{Curv.} \quad = +0.2$$

$$-0.01$$

$$\text{Dev.} \quad +0.12$$

$$\alpha = 7 \quad 35 \quad 58.97$$

$$O-C \quad +0.94$$

