

KG

11366
v.907

Volume XXXI

Plate No

1549

1550

1590

1912phae.proj.19

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

Harvard Lunar Plates.

Measures and Reductions

Mary Fowler

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1
1
6.1
23
m
7
2
2
1
m
8.
-
-
30
31
m
6

MC 1549 stars - measures.

1913 July 10.

1

	a	n	a	n
1	16111	17212	1226158	11239
6.0	1312928	1020003	59	1122928
23.3	28	01	12249	4028
mg	30	18		
7.1	23.2989	2985	6.0010	0007
2				
26.4	15174	15315	15570	15890
15.4	11489	9011	969086	1179602
mg	9590	1512	84	99
8.4	88	35	80	16
	1.53688	3691	25.4111	4.102
3				
30.2	19370	13840	19210	19565
31.1	1860000	464039	1148080	1730001
mg	00	421	80	00
8.9	80	60	10	89
	31.0771	0781	302270	2268

Bradi 3

MC1549 Stars - Helium

1913 July 10

1

	α	β	γ	δ
1	16111	17212	1226158	11239
20	1312928	1020003	59	1122928
233	2628	01	12249	40
my	30	18		
71	23.2989	2985	6.0010	0007
2				
264	15174	15315	15570	15890
154	11489	9011	969086	1179602
my	95290	1522	84	99
84	88	35	80	16
	15.3688	3691	254111	4102
3				
202	19370	13840	19210	19565
31.1	1860000	464039	1145080	1730000
my	00	421	80	00
59	80	60	10	89
	31.0771	0781	202270	2268

Grade 3

Mc1549. *livon-measures*

1913 July 10.

2

$\frac{1}{d}$ 1137070 11285^N
 18.4 70 10810
 19.0 10929 0505^N
 min
 in

possibly on terminator.

$\frac{2}{d}$ 18.9559 .9522
 19.0 12037 14225^N
 19.1 1114030 1009¹⁰
 21 13282

$\frac{3}{d}$ 19.0907 .0931
 20.0 1066030 13482
 19.9 6052 1293540
 10082 - 30

$\frac{4}{d}$ 19.9432 .9453

20.0
 20.0

more wt.
than no. 3

11085^N 14167
 8078 1387262
 10778 70

$\frac{5}{d}$ 20.0303 .0299
 16048 18639
 881022 1588087
 16 8087
 62 66
 20.2758 .2764

20.3
 21.0
 max
 in
 in

$\frac{6}{d}$ 20.0 923860 13646
 21.9 5050 1352630
 9047 022³⁰
 4

21.9797

MW1549 known measures

1913 July 10

2

1 1137070 11285⁵
 18.9 70 10810
 19.0 10929 05-05⁻

possibly on
termination

8 189559 9522
 2 190 12037 14225¹⁰
 191 1114030 1009
 21 13282

190907 0931
 3 200 1066020 13482
 199 6052 1293540
 10082 -30

199432 9453
 4 200 200

more with
than no 3

11085⁵ 14167
 8078 1387.262
 10778 70

200303 0299
 16048 18639
 881022 1558087
 16 8087
 62 66
 20.2758 2764

5 20.3 210 more
 6 200 923860 13646
 21.9 5050 13526³⁰
 9047 022²⁰
 21.9797 4

MC 1549 Moon-measures 1913 July 10.

3

2
19.9
22.0

10671

1059807
0907

1136050
5650
11300

19.9934.9945

8 scratches

19.4 16430

22.6 937570

70

45

22.7069

19168

1623450

40

82

7070

19138

1184042

35

60

19.2685

19302

1660805

06

18

2700

6 scratches instead of no. 6.

19.8

22.3

17018

15750

1397570

878890

80

90

22

72

22.30443024

19793

1747943

70

12

19.7676

17460

978990

80

78

19.7688

11C 1549, known measures 1913 July 10.

3

2	a	n	a	n
19.9			10 671	113 6050
22.0			10 59807	5650
			09	11300

8	scraper			
19.4	16430	19168	19138	19302
22.6	937570	1623450	118403542	1660805-
	70	40	35	06
	45	82	60	18
	<u>227069</u>	<u>7070</u>	<u>192685</u>	<u>2700</u>

6	scraper instead of no 6.		
19.8	17018	15750	17460
22.3	1397570	878890	978990
	80	90	8090
	22	72	78
	<u>223044</u>	<u>3024</u>	<u>19.7676</u>
			<u>19.7688</u>

MC1449 Standard Co. 0.00

Cape No. 1802 mg 9.1

Cape No. 1824 mg 8.4

1913 Feb 12

Cape No. 1826 mg 8.9

C	13 ^h	12 ^m	30.26
L			22
E			22
Mean	13	12	30.23
Prec			+ 37.59
S	13	13	07.82
A	13	19	26
A-A	-	6	08.18
tan(A-A)			- 378.18
log...			2.57764 m
log...			9.99546
log...			1.08034 m
E			- 12.0320
E			- 43
E			5.9637
2C			6.0008
2-3			+ 371

C	13 ^h	23 ^m	13.01
L			07
E			03
Mean	13	23	13.04
Prec			+ 37.80
S	13	23	50.84
A	13	19	26
A-A	+	4	24.84
tan(A-A)			+ 264.82
log...			2.42295
log...			9.99427
log...			0.92446
E			+ 8.4035
E			+ 25
E			26.4060
2C			26.4106
2-3			+ 4.6

C	13 ^h	25 ^m	09.55
L			63
E			54
Mean	13	25	09.57
Prec			+ 37.61
S	13	25	47.18
A	13	19	26
A-A	+	6	21.18
tan(A-A)			+ 381.13
log...			2.58107
log...			9.99651
log...			1.08482
E			+ 12.1569
E			+ 68
E			30.1637
2C			30.2269
2-3			+ 632

C	-8°	12'	16.9
L			16.8
E			18.2
Mean	-8	12	17.3
Prec	-	3	48.5
S	-8	16	05.8
D	-8	25	50
S-D	+	9	44.2
tan(S-D)			+ 584.2
log...			2.76656
log...			0.09771
tan S			9.1623 m
tan S			2.1607
tan S			8.3764 m
tan S			+ 1.2523
tan S			- 238
tan S			23.2285
tan S			23.2987
tan S			+ 702

C	-9	13	33.0
L			33.25
E			33.13
Mean	-9	13	33.1
Prec	-	3	44.8
S	-9	17	17.9
D	-8	25	50
S-D	-	51	27.9
tan(S-D)			- 3088.1
log...			3.48969 m
log...			0.82084 m
tan S			9.2136 m
tan S			1.8489
tan S			8.1159 m
tan S			- 6.6197
tan S			- 131
tan S			15.3672
tan S			15.3690
tan S			+ 18

C	-7°	11'	11.6
L			11.1
E			12.8
Mean	-7	11	11.8
Prec	-	3	44.0
S	-7	14	55.8
D	-8	25	50
S-D	+	1	10.54.2
tan(S-D)			+ 4254.8
log...			3.62888
log...			0.96003
tan S			9.1045 m
tan S			2.9696
tan S			8.3225 m
tan S			+ 9.1208
tan S			- 213
tan S			31.0995
tan S			31.0771
tan S			- 224

1912 July 12				1913 July 12					
Cape No. 1802 mg 7.1				Cape No. 1824 mg 8.9					
C	13 ^h	12 ^m	30.26	13 ^h	23 ^m	13.01	13 ^h	25 ^m	09.55
L			22			07			63
E			22			03			54
Mean	13	12	30.23	13	23	13.04	13	25	09.57
Prea			+37.59			+37.80			+37.61
δ	13	13	07.82	13	23	50.84	13	25	47.18
Δ	13	19	26	13	29	26	13	19	26
$\alpha - \Delta$	-	6	08.18	+	4	24.84	+	6	29.18
$\sin(\alpha - \Delta)$			-378.18			+264.82			+388.13
log...			2.57764			2.42295			2.58602
cos			9.99546			9.99427			9.99651
Σ			108084			092446			108482
Σ	-		12.0320	+		8.4035	+		12.1569
Σ	-		43	+		25	+		68
Σ			59637			264060			301637
Σ			6.0008			264106			30.2269
$\Sigma - \Sigma$	+		371	+		46	+		632
C	-8°	12'	16.9	-9	13	33.0	-7°	11'	11.6
L			16.8			33.25			11.1
E			18.2			33.13			12.8
Mean	-8	12	17.3	-9	13	33.1	-7	11	11.8
Prea	-	3	48.5	-	3	44.8	-	3	44.0
δ	-8	16	05.8	-9	17	17.9	-7	14	55.8
Δ	-8	25	50	-8	25	50	-8	25	50
$\delta - \Delta$	+	9	44.2	-	51	27.9	+	10	54.2
$\sin(\delta - \Delta)$			+5842			-3088.1			+42548
log...			2.76656			3.48969			3.62888
Σ			009771			082089			096003
$\tan \delta$			9.1623			9.2136			9.1045
Σ^2			21607			18489			24696
Σ			83764			84159			83225
Σ	+		1.2523	-		6.6197	+		9.1208
Σ	-		238	-		131	-		213
Σ			23.2285			15.3672			31.0995
Σ			23.2987			15.3690			31.0771
$\Sigma - \Sigma$	+		70.2	+		18	-		2.24

549

Cents of Plate

5

α	η	R	a	Red.
6 000 8	23 29 87	13	13	08
26 41 06	15 36 90	23	51	-9
30 22 69	31 07 76	25	47	-7
3 62.64	69 75	62	46	48
20 88	23.25	13	20	55
-18	-22		+24	-8
79	1.25	73	21	19
31	14 65			-8
245	583			25
2.88				50
31				
895				
= 1295				

$$A = +3^h 21^m 19^s$$

$$D = -8^{\circ} 25' 50''$$

$$A = +13^h 19^m 26^s$$

Plate constants

$$\alpha - 3 = -37.64 + 1.25x + 1.1x + 49.6$$

$$+ 37.1 - 876 = -505 + 8 = -497 + 1 = -496 = 0$$

$$+ 46 - 578 = -532 + 33 = -499 + 3 = -496 = 0$$

$$+ 632 - 1169 = -537 + 38 = -499 + 3 = -496 = 0$$

$$18.2774 - 788 + 23 = 18.2507$$

$$\eta - 7 + 36x + 6.54 + 0.54 - 1082$$

$$+ 702 + 216 = +918 + 151 = +1069 + 12 = +1081 = -1$$

$$+ 18 + 956 = +974 + 100 = +1074 + 8 = +1082 = 0$$

$$- 224 + 1088 = +864 + 202 = +1066 + 16 = +1082 = 0$$

$$20.9625 + 658 + 136 + 10 = 20.9398$$

$$a - e = +4.3$$

Tables	$a = -0.9$	$e = -5.2$	$b + a = +0.5$
Observed	$a = -1.3$	-7.0	$+1.6$

$$a - e = +5.7$$

$$c - 0 \quad a - e = -1.4 \quad b + a = -1.1$$

1849

Center of Plate

R.A.

Decl

γ	γ	γ	γ	γ	γ	γ	γ	γ	γ
60008	232987	13	13	08	-8	16	06		
154106	153690		23	51	-9	17	18		
302269	310776		25	47	-7	14	56		
5164	6975		62	46		48	20		
1721	2325	13	20	55	-8	16	07		
-15	22			+24		-9	43		
79	125	13	21	19	-8	25	50		
31	1465								
245	583								

$$A = 13^h 21^m 19^s$$

$$D = -8^\circ 25' 50''$$

$$A = 13 \quad 19 \quad 26$$

Plate Constants

$$\gamma - \gamma = -37.64 + 1.252 + 1.2 = +44.6$$

$$+ 37.1 - 876 = -505 + 8 = -497 + 1 = -496 = 0$$

$$+ 46 - 578 = -532 + 33 = -499 + 3 = -496 = 0$$

$$+ 632 - 1169 = -537 + 38 = -499 + 3 = -496 = 0$$

$$182794 - 788 + 23 + 2 = 182807$$

$$\gamma - \gamma + 36x + 6.54 + 10.54 - 1082$$

$$+ 702 + 216 = +918 + 151 = +1069 + 12 = +1081 = -1$$

$$+ 18 + 956 = +974 + 100 = +1074 + 8 = +1082 = 0$$

$$- 224 + 1088 = +864 + 202 = +1066 + 16 = +1082 = 0$$

$$209625 - 658 + 136 + 10 = 209398$$

$$a - c = +140$$

Tables	$a = -0.9$	$c = -5.9$	$b + a = +0.5$
Observed	$a = -13$	-7.0	$+1.6$

$$a - c = +5.7$$

$$c - 0 \quad a - c = -14 \quad b + a = -11$$

MC 1549 Times etc. 1913 July 14. 6
 exp. to stars 1912 Jan 10 13^h 09^m ✓ - 13^h 16^m ✓
 " Moon 13 09 33.5 ✓ 13 09 33.9 ✓
 clock slow 1 11.9 ✓

H Sid T. 13 10 45.6 ✓ 0-9- - 9^m
 H long 4 44 31.05 ✓
 G. Sid T. 17 55 16.65 ✓
 Sid T. in Moon 19 14 36.57 ✓
 Interval 22 46 40.08 ✓
 Reduction 3 42.91 ✓
 G. M. T. 22 36 57.17 ✓

From bank Alm. P. A. Decl.
 Moon 22^m 13^h 18^m 15.30 ✓ - 7° 41' 21.5" ✓
 Motion in 1^m 1.9245 ✓ - 14.586 ✓
 36.9528 ✓ + 1 11.12 - 8 59.0 ✓
 Tabular place 13 19 26.42 ✓ - 7 50 20.5 ✓

Moon's parallax 56 30.1 ✓
 " " " 15 25.3 ✓

P 34 = 10.1 ✓ R = 925.3 ✓
 425 = 9.9 ✓
 Argument + 9.9 ✓
 Irradiation (3) = 0.7 ✓
 R = 934.5 ✓

R = 2.0032 ✓
 a = -1.3 (a+1) R = 2.0029 ✓
 R² = 4.0116 ✓

1912 Jan 10 13^h 04^m 1913 July 14 6
 exp. station 13 09 33.5 = 13 09 33.9
 moon 1 11.9
 clock slow

H Sid T. 13 10 45.6
 H long 4 44 31.05
 G. Sid T. 17 55 16.65
 Sid T in norm 19 14 36.57
 Interval 22 40 40.08
 Reduction 3 42.91
 G to T. 22 36 57.17

From bank Alm R.A. Decl
 Moon 22^h 13^m 18^s 15^h 30' - 7° 41' 21.5
 Moon 1^h 19^m 24^s 14^h 58' 6
 36.9528 + 1 11 12 - 8 59.0
 Tabular place 13 19 26.42 - 7 50 20.5

Moon's parallax 56 30.1
 Semidiam. 15 25.3

534.10
 925.99 R = 925.3
 Argumentation + 99
 Load correction (3) = 0.7
 R = 934.5

R = 20032
 a = -1.3 (a+1) R = 20029
 R = 40116
 136

pt.	pos. L	resid.
1	180.0	+257
2	158.6	+123
3	120.4	-64
4	108.6	-125
5	88.9	-153
7	59.0	+125
6	48.2	+103
8	29.8	+178

1549 Brown's Center

1913 Sept 23

7

	x	$x - Y_0$	$(x - Y_0)^2$	$(x - X_0)^2 + (y - Y_0)^2$	$O - C$
1	18.2685	0.0000	0.0000	4.0337	+221
2	19.0000	+0.7315	0.5351	4.0335	+219
3	20.0000	+1.7315	2.9981	4.0340	+224
4	20.0301	+1.7616	3.1032	4.0286	+170
5	20.2761	+2.0076	4.0305	4.0319	+203
6	19.7682	+1.4997	2.2491	4.0509	+393
7	19.9940	+1.7255	2.9774	4.0565	+449
8	19.2692	+1.0007	1.0014	4.0502	+386
Comp. 122			4.0116		

	y	$y - Y_0$	Δy	$(y - Y_0)^2$
-1	18.9540	-2.0076	-8	4.0337
2	19.0919	-1.8697	-7	3.4984
3	19.9442	-1.0174	-4	1.0359
4	20.0000	-0.9616	-4	0.9254
5	21.0000	+0.0384	0	0.0014
6	22.3034	+1.3418	+5	1.8018
7	22.0000	+1.0384	+4	1.0791
8	22.7070	+1.7454	+7	3.0488

Approximate Center

$$x = 20.0 \quad y = 19.9442$$

$$21.9790$$

$$41.9232$$

$$\text{mean } y = 20.9616$$

$$y - \text{min} = 18.9540$$

$$R = 2.0076$$

$$y - \text{max} = 20.2761$$

$$\text{mean } x = 18.2685$$

$$\text{Center } \begin{cases} x = 18.2685 \\ y = 20.9616 \end{cases}$$

1549 Brown's Center

1913 Sept. 23

7

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0) + (y - y_0)$	$y - y_0$
1	18.2685	0.0000	0.0000	4.0337	+2.21
2	19.0000	+0.7315	0.5351	4.0335	+2.19
3	20.0000	+1.7315	2.9981	4.0340	+2.24
4	20.0301	+1.7616	3.1032	4.0286	+1.70
5	20.2761	+2.0076	4.0305	4.0319	+2.03
6	19.7682	+1.4997	2.2491	4.0509	+3.43
7	19.9940	+1.7255	2.9774	4.0565	+4.49
8	19.2692	+1.0007	1.0014	4.0502	+3.86
Comp Σ			40.116		

	y	$y - y_0$	$y - (y - y_0)^2$
-1	18.9540	-2.0076	-8.40337
2	19.0919	-1.8697	-7.34984
3	19.9442	-1.0174	-4.10359
4	20.0000	-0.9616	-4.09254
5	21.0000	+0.0384	0.00014
6	22.3034	+1.3418	+5.18018
7	22.0000	+1.0384	+4.10791
8	22.7070	+1.7454	+7.30488

Approximate Center

$$x = 20.0 \quad y = 19.9442$$

$$\underline{21.9790}$$

$$41.9232$$

$$\text{mean } y = 20.9616$$

$$y - \text{min} = 18.9540$$

$$y = 20.0076$$

$$y - \text{max} = 20.2761$$

$$\text{mean } x = 18.2685$$

$$\text{Center } \begin{cases} x = 18.2685 \\ y = 20.9616 \end{cases}$$

Formation of Normals

	ab	an	bn
1	- 0.00	+ 0.0	- 444.0
2	- 1.35	+ 160.0	- 410.0
3	- 1.76	+ 387.5	- 228.5
4	- 1.69	+ 295.0	- 163.0
5	+ 0.06	+ 408.0	+ 0.1
6	+ 2.01	+ 590.0	+ 527.0
7	+ 0.45	+ 194.0	+ 116.8
8	+ 1.75	+ 386.0	+ 675.2
	- 0.53	+ 2420.5	+ 73.6

	ab	an	bn
1	- 0.00	+ 0.0	- 444.5
2	- 1.36	+ 159.8	- 410.0
3	- 1.77	+ 387.8	- 228.3
4	- 1.68	+ 299.0	- 162.5
5	+ 0.08	+ 408.0	+ 0.1
6	+ 2.01	+ 590.0	+ 527.0
7	+ 1.40	+ 777.0	+ 467.5
8	+ 1.75	+ 386.0	+ 675.0
	+ 0.83	+ 3007.6	+ 424.3

Residuals

	O		C	O - C
1	+ 221	+ 0 - 36	- 36	+ 257
2	+ 219	+ 129 - 33	+ 96	+ 123
3	+ 224	+ 306 - 18	+ 288	- 64
4	+ 170	+ 312 - 17	+ 295	- 125
5	+ 203	+ 356 + 0	+ 356	- 153
6	+ 393	+ 266 + 29	+ 290	+ 103
7	+ 449	+ 306 + 18	+ 324	+ 125
8	+ 386	+ 177 + 31	+ 208	+ 178
			+ 786 - 342	+ 444
			Average =	+ 55
			Average (O - C) =	141

1549 Moon's Center.

Conditional Equations.

	a	b	c	0-c	
1	0.00 ^v	-2.01 ^v	+221 ^v	0-22:-22	+243
2	+0.73 ^v	-1.87 ^v	+219 ^v	+115-20=+95	+124
3	+1.73 ^v	-1.02 ^v	+224 ^v	+272-11=+261	-37
4	+1.76 ^v	-0.96 ^v	+170 ^v	+277-10=+267	-97
5	+2.01 ^v	+0.04 ^v	+203 ^v	+316+0=+316	-113
6	+1.50 ^v	+1.34 ^v	+393 ^v	+236+14=+250	+143
7 ^{1/2}	+1.73 ^v	+1.04 ^v	+449 ^v	+272+11=+283	+166
8	+1.00 ^v	+1.75 ^v	+386 ^v	+157+19=+176	+210

$$+886-247=+639$$

Average = +80

Normal Equations.

$$\begin{aligned} +15.41 - 0.53 &= +2420 \\ -0.53 + 14.88 &= +74 \\ +0.53 - 0.02 &= +83 \\ +14.86 &= +157 \end{aligned}$$

$$b = +10.6$$

$$+15.41a + 2420 + b = +2426$$

$$a = +157.4$$

Giving (7) full wt.

$$\begin{aligned} +16.89 + 0.83 &= +3008 \\ +0.83 + 15.42 &= +424 \\ -0.83 - 0.04 &= -152 \\ +15.38 &= +272 \end{aligned}$$

$$b = +17.7$$

$$+16.89 = +3008 - 15 = +2993$$

$$a = +177.3$$

Giving (7) full wt. gives average $(b-c)/= +55$
 instead of +80 and changes center of moon
 +0.03 in R.A. and +0.3 in decl.

1
2
3
4
5
6
7
8

1549

Hydrogen Center

Conditional Equations

	a	b	c		c	0-c
1	0 0 0	- 2 0 1	= + 2 2 1	0 - 2 2	- 2 2	+ 2 4 3
2	+ 0 7 3	- 1 8 7	= + 2 1 9	+ 1 1 5	- 2 0	+ 9 5
3	+ 1 7 3	- 1 0 2	= + 2 2 4	+ 2 7 2	- 1 1	+ 2 6 1
4	+ 1 7 6	- 0 9 6	= + 1 7 0	+ 2 7 7	- 1 0	+ 2 6 7
5	+ 2 0 1	+ 0 0 3	= + 2 0 3	+ 3 1 6	+ 0	+ 3 1 6
6	+ 1 5 0	+ 1 3 4	= + 3 9 3	+ 2 3 6	+ 1 4	+ 2 5 0
7	+ 1 7 3	+ 1 0 4	= + 4 4 9	+ 2 7 2	+ 1 1	+ 2 8 3
8	+ 1 0 0	+ 1 7 5	= + 3 8 6	+ 1 5 7	+ 1 9	+ 1 7 6

Normal Equations

$$\begin{aligned}
 + 1541 - 053 &= + 2420 \\
 - 053 + 1488 &= + 74 \\
 + 053 - 002 &= + 83 \\
 + 1486 &= + 157
 \end{aligned}$$

$$b = + 10.6$$

$$+ 15 + 10 = + 2420 + 6 = + 2426$$

$$a = + 157.4$$

During 71 full wt

$$\begin{aligned}
 + 1689 + 00.83 &= + 3008 \\
 + 083 + 1542 &= + 424 \\
 - 083 - 004 &= - 152 \\
 + 1538 &= + 272
 \end{aligned}$$

$$b = + 17.7$$

$$+ 1689 + 3008 = 15 = + 2993$$

$$a = + 177.3$$

1549 Orionis Mean Position (1912.0)

$$X_0 = 18.2685$$

$$Y_0 = 20.9616$$

$$\frac{1}{2} \mu_\alpha + 89$$

$$\frac{1}{2} \mu_\delta + 9$$

$$18.2774$$

$$20.9625$$

From plate constants $X = 18.2507$ $Y = 20.9348$

$$z = +0.2507$$

$$B = -1.0652$$

$$\log z = 9.39915$$

$$\log \tan S = 9.1614$$

$$\log S = 9.97513$$

$$S^2 = 8.7948$$

$$\log \cot = 8.50724$$

$$7.0534$$

$$\eta_1 = 50096$$

$$\log(\alpha - A) = 0.89678$$

$$\log \eta_0 = 0.02743$$

$$\alpha - A = +7.88$$

$$7.33115$$

$$A = 13 \quad 19 \quad 26$$

$$(\alpha - D) = 2.69628$$

$$\alpha_0 = 13 \quad 19 \quad 33.88$$

$$S - D = -8 \quad 16.9$$

$$\text{Red} = -0.45$$

$$D = -8 \quad 25 \quad 50$$

$$X' = 13 \quad 19 \quad 33.43$$

$$S_0 = -8 \quad 34 \quad 06.9$$

$$\text{Red} = -0.4$$

$$S'' = -8 \quad 34 \quad 07.3$$

1547 Orons. Mean Position (1912.0)

$$X_0 = 18.2685$$

$$Y_0 = 2096.16$$

$$+ 79$$

$$+ 5$$

$$18.2774$$

$$20.9625$$

From plate constants $X = 18.2497$ $Y = 209348$

$$z = +0.2507$$

$$q_1 = -1.0652$$

$$\log z = 9.399 + 5$$

$$\log S = 9.97513$$

$$\log \mu = 8.50729$$

$$(m - 4) = 0.89678$$

$$\alpha - \alpha_0 = + 7.88$$

$$A = 13 \quad 19 \quad 26$$

$$\alpha_0 = 13 \quad 19 \quad 33.88$$

$$\text{Red.} = - 0.45$$

$$X = 13 \quad 19 \quad 33.43$$

$$\log \mu S = 9.1614$$

$$= 8.7948$$

$$7.0534$$

$$-q_1 = 5.0096$$

$$\log \mu_0 = 0.02743$$

$$7.33115$$

$$(d - D) = 2.69628$$

$$S - D = - 8 \quad 16.9$$

$$D = - 8 \quad 25 \quad 50$$

$$\delta_j = - 8 \quad 34 \quad 06.9$$

$$\text{Red.} = - 0.4$$

$$S = - 8 \quad 34 \quad 07.3$$

1549

Lunar Parallax

$$\alpha' = 13^{\circ} 19' 23.48'' \quad \delta' = -8^{\circ} 34' 07.3''$$

$$\theta = 13 \quad 10 \quad 45.6''$$

$$G - \alpha = -5 \quad 49.8''$$

$$= -2^{\circ} 11' 57''$$

$$= 49''$$

$$2 \quad 11 \quad 08''$$

$$995727''$$

$$0.00000$$

$$000032''$$

$$995759$$

$$\delta = 42 \quad 12 \quad 25''$$

$$-8 \quad 34 \quad 08''$$

$$50 \quad 46 \quad 33''$$

$$982640''$$

$$821577''$$

$$988912''$$

$$0.17275''$$

$$810409$$

$$\delta - \delta' = +43 \quad 41.1''$$

$$\delta = -7 \quad 50 \quad 26.2''$$

$$\text{Nautical } \delta = -7 \quad 50 \quad 20.5''$$

$$O - G$$

$$= 57''$$

$$\pi = 56' 30.1''$$

$$9.86913''$$

$$8.21577''$$

$$8.58402''$$

$$0.00408''$$

$$667300''$$

$$\alpha - \alpha' = -1' 37.15''$$

$$= -06.48''$$

$$\alpha = 13 \quad 19 \quad 26.95''$$

$$\alpha = 13 \quad 19 \quad 26.42''$$

$$+0.53''$$

AHC 1150 Stars - measurements.

1913 July 11.

10

	d	u	d	u
1	16630	14990	17665	16571
55	947575	1214955	1283030	1140003
57	72	54	30	61
	50	96	81	
	<u>23.7170</u>	<u>.7161</u>	<u>5.5157</u>	<u>5.163</u>
2				
279	19080	16045	14890	1042528
157	116111	1353338	1407680	32
	10	35	79	9600
	88	50		
	<u>15.7475</u>	<u>.7488</u>	<u>25.9187</u>	<u>.9172</u>
3				
294	16652	16897	17899	18870
317	1215658	1090510	1548080	1131616
	59	10	71	10
	62	10	20	90
	<u>26.4498</u>	<u>31.4504</u>	<u>34.7573</u>	<u>29.7571</u>

Grade 3

4AC 1150 Stars - measurements

1913 July 11.

10

	α	δ	α	δ	α	δ	α	δ
1	16630		14990		17665		16571	
55	9475	75	12149	55	12830	30	11400	3
257	72		54		30		0503	
	50		96		81		61	
	<u>23.7170</u>		<u>7161</u>		<u>5.5157</u>		<u>5163</u>	
2								
259	19080		16045		19890		10425	28
157	11611	11	13530	35	14076		32	
	10		50		7980		9600	
	88							
	<u>15.7475</u>		<u>7445</u>		<u>25.9187</u>		<u>9172</u>	
3								
294	16652		16397		17899		18870	
317	12156	58	10905	10	15480	80	11316	16
	59		10		71		10	
	62		10		20		90	
	<u>29.4495</u>		<u>31.4504</u>		<u>31.7573</u>		<u>7521</u>	

Grade 3

MC 1550 moon measures

1913 July 11.

11

α μ ν α $\times$ ν
 1 1174050 14170
 18.0 50 1356055
 18.9 11173 6555

possibly on termination.

18.9426.9391

$\frac{2}{18.4}$ 1203529 13180
 $\frac{18.9}{18.9}$ 27 1230701
 min 11160 9001
 4

18.9130.9119

$\frac{3}{19.0}$ 11067 1189080
 $\frac{19.1}{19.1}$ 1077975 8080
 80

19.0289.0285

$\frac{4}{20.0}$ 15463 16140
 $\frac{19.8}{19.8}$ 724035 1436060
 41 46
 80 48
19.8238 .8213

$\frac{5}{20.1}$ 1025869 14190
 $\frac{20.0}{20.0}$ 6069 1314038
 9210 3038

20.10521054

$\frac{6}{20.3}$ 20.3255
 21.0

15278 16760
 8526 1351820
 20 17
 95 66
20.3230 3244

MC 1550 moon measures

1913 July 11

11

$\begin{array}{r} 1 \\ 18.0 \\ 18.9 \end{array} \quad \begin{array}{r} 1174050 \\ 50 \\ 11173 \end{array} \quad \begin{array}{r} 14170 \\ 1356055 \\ 6555 \end{array}$

possibly on termination.

18.94269391

$\begin{array}{r} 2 \\ 18.4 \\ 18.9 \\ \text{min} \end{array} \quad \begin{array}{r} 1203529 \\ 27 \\ 11160 \end{array} \quad \begin{array}{r} 13180 \\ 1230701 \\ 9001 \end{array}$

18.91309119

$\begin{array}{r} 3 \\ 19.0 \\ 19.1 \end{array} \quad \begin{array}{r} 11067 \\ 1077975 \\ 8075 \end{array} \quad \begin{array}{r} 1189080 \\ 8080 \\ 11598 \end{array}$

19.02890285

$\begin{array}{r} 4 \\ 20.0 \\ 19.8 \end{array} \quad \begin{array}{r} 15463 \\ 724035 \\ 41 \\ 80 \end{array} \quad \begin{array}{r} 16140 \\ 1436060 \\ 46 \\ 48 \end{array}$

19.82388213

$\begin{array}{r} 5 \\ 20.1 \\ 20.0 \end{array} \quad \begin{array}{r} 1025869 \\ 6069 \\ 9210 \end{array} \quad \begin{array}{r} 14190 \\ 1314038 \\ 3038 \end{array}$

2010521054

$\begin{array}{r} 6 \\ 20.3 \\ 21.0 \end{array} \quad \begin{array}{r} 20.3255 \\ 20.3255 \end{array}$

$\begin{array}{r} 15278 \\ 852611 \\ 20 \\ 95 \\ 203230 \end{array} \quad \begin{array}{r} 16760 \\ 1351820 \\ 17 \\ 66 \\ 3244 \end{array}$

M41550 Moon-hicamues

1913 July 11

12

$\frac{1}{d}$ 13809
 W.O. 13575⁷⁵86
 2201 6890
 $\frac{1}{N}$ 9072
 7680
 8935

220130.0141

8 scratch.
 19.4 18920
 22.7 12145⁴⁴
 38
 30
22.6785

18826
 15611¹⁰
 05¹⁰
 48
.6776

19375⁻
 12197⁹⁰
 90⁹⁰
 00
19.2800

19617
 16822²⁹
 20²⁹
 30
2797

1101550 known measures

1913 July 11

13

α	γ	ν	α	ν
1	13507	9072		
20	13575-86	7680		
220	6890	8935		

2204300141

Scratch

194	18920
277	12145-49
	3849
	30
	<u>226785</u>

18826	19375-
15611,0	1219790
05-	9090
48	00
<u>6776</u>	<u>192800</u>

19617
1682229
2029
30
<u>2797</u>

MC1550	Times at	1913 July 14	13
Exp. to stars	1912 Jan 10.	13 ^h 18 ^m	-13 ^h 30 ^m
"Moon"		13 23 33.8	-13 23 34.3
Clock slow		1 11.9	
H. Sid T.		13 24 45.95	6-x-+0 ^h 05 ^m
H. long		4 44 31.05	
G. Sid T.		18 09 17.00	
Sid T. in Moon		19 14 36.57	
Tabular		22 54 40.43	
Reduction		3 45.21	
G. N. T.		22 50 55.22	

From Naut Alman	R. A.	Decl.
Moon 23 ^h	13 ^h 20 ^m 10.78	-7° 55' 56.1"
Motion in 1 ^m = 1.9244		14.555"
-9.0797		
Tabular place	13 ^h 19 ^m 53.31	-7° 53' 43.9"
Moon's parallax	56 29.6	
semidiam	15 25.2	

$$934 = 10.0$$

$$925 = 9.9$$

$$R = 925.2$$

$$\text{augment} = + 9.9$$

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

$$R = 934.4$$

$$a = + 0.5$$

$$R = 2.0030$$

$$(1+a)R = 2.0031$$

$$R^2 = 4.0124$$

MC1550	Truncate	1913 July 14.	13
Exp. T. Stem	1912 Jan 10.	1 3 ^h 1 8 ^m	- 1 3 ^h 30 ^m
moon		1 3 2 3 33.8	- 1 3 2 3 34.3
Clock slow		1 11.9	
H. Sid. T.		1 3 2 4 45.95	
H. long		4 4 4 31.05	
G. Sid. T.		1 8 0 9 17.00	
Sid. T. in moon		1 9 1 4 36.57	
Interval		2 2 5 4 40.93	
Reduction		3 45.21	
G. N. T.		2 2 5 0 55.22	

From Naut Alman	R. G.	Recl.
moon 23 ^m	13 ^h 20 ^m 10.78	- 7 ^h 55 ^m 56.1
moon in 1 ^m 1 9 2 4 4 ^m		14.555
- 9.0797	- 17.47	+ 2 12.2
Tabula plana	13 ^h 19 53.31	- 7 ^h 53 ^m 43.9
moon parallel	56 29.6	
zenith	15 25.2	

$$934 = 101$$

$$125 = 9.9$$

$$R = 9252$$

$$\text{augment} = + 9.9$$

$$\text{grade 3} = 0.7$$

$$R = 9344$$

$$a = + 0.5$$

$$R = 2.0030$$

$$(1+a)R = 2.0031$$

$$R^2 = 4.0124$$

MC 1550

1913 Sept. 20.

19

$$\begin{array}{r}
 1 \\
 x \quad 5.5160 \\
 3 \quad 5.9637 \\
 x-3 \quad -4477
 \end{array}$$

$$\begin{array}{r}
 2 \\
 25.9180 \\
 26.4060 \\
 -4880
 \end{array}$$

$$\begin{array}{r}
 3 \\
 29.7572 \\
 30.1637 \\
 -4665
 \end{array}$$

$$\begin{array}{r}
 4 \quad 23.7166 \\
 7 \quad 23.2285 \\
 4-7 \quad +4881
 \end{array}$$

$$\begin{array}{r}
 15.7482 \\
 15.2672 \\
 +3810
 \end{array}$$

$$\begin{array}{r}
 31.4501 \\
 31.0995 \\
 +3506
 \end{array}$$

$$\begin{array}{r}
 -3 - 51.24 \\
 -4477 - 1214 = -5691 \\
 -4880 - 806 = -5686 \\
 -4065 - 1610 = -5675 \\
 18.2238 - 1071 = 17.1527 \\
 4-7 + 553x \\
 +4881 + 305 = +5186 \\
 +3810 + 1434 = +5244 \\
 +3506 + 1647 = +5153 \\
 20.9159 + 1014 = 21.9269
 \end{array}$$

$$\begin{array}{r}
 -5326 \\
 1 + 5325 = -1 \\
 1 + 5325 = -1 \\
 1 + 5327 = +1 \\
 = 20.4962
 \end{array}$$

$$\begin{array}{r}
 \text{Tabulation} \quad a = -0.9 \quad u = -5.2 \quad a-u = +4.3 \quad b+u = +0.5 \\
 \text{Observed} \quad +0.5 \quad -6.0 \quad +6.5 \quad -3.5
 \end{array}$$

$$\begin{array}{r}
 C-O \quad -2.2 \quad +3.0
 \end{array}$$

MC 1550

1913 Sept. 20

14

	1	2	3
x	55160	259180	297572
=	59637	264060	301637
2-5	-4477	-4880	-4665
4	237166	157482	314501
3	232285	153672	310995
4-3	+4881	+3810	+3506
	-5124	-5706	+5706
-4477	-1214	-5691	-3-12 = -5706
-4880	806	-5686	-13-8 = -5707
-4065	1610	-5675	-15-16 = -5706
183238	-1071	-9-10	= 18.7814
4-3	+553x	+74	-12-4
+4881	+305	+5186	+166 = +5352
+3810	+1434	+5244	+110 = +5354
+3506	+1647	+5153	+220 = +5373
20.9159	+1014	+145	-9-21

-5326

: +5325 = -1

: +5325 = -1

: +5327 = +1

= 20 4962

Tabulation a = -0.9 u = -52 a-u = +43 b+ab = 50.5

Observed +0.5 -60 +65 -35

C-0

-22

+30

pt.	pos. μ	resid.
1	189.2	-79] not used in sol.
2	180.0	+48
3	160.1	+90
4	123.1	-65
5	117.2	+9
6	87.7	-58
7	56.9	+31
8	28.6	+99

1912phae

moving center

1913 Sept 23.

15

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$y - y_0$
1	18.0000	-0.3200	0.1024	4.0109	-15
2	18.3200	0.0000	0.0000	4.0256	+132
3	19.0200	+0.6800	0.4624	4.0345	+221
4	20.0000	+1.6800	2.8224	4.0232	+108
5	20.1053	+1.7853	3.1873	4.0308	+184
6	20.3237	+2.0037	4.0148	4.0215	+91
7	20.0000	+1.6800	2.8224	4.0236	+112
8	19.2798	-0.9598	0.9212	4.0212	+98

$$R^2 = 4.0124$$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	18.9418	-1.9762	-8	3.9085
2	18.9124	-2.0056	-8	4.0256
3	19.0287	-1.8893	-7	3.5721
4	19.8226	-1.0954	-4	1.2008
5	20.0000	-0.9180	-4	0.8435
6	21.0000	+0.0820	0	0.0067
7	22.0186	+1.0956	+4	1.2012
8	22.6780	+1.7600	+7	3.1000

Approximate Center

$$x = 20.0 \quad y = 19.8226$$

$$22.0136$$

$$41.8362$$

$$\text{mean} = 20.9181$$

$$y - \text{min} = 18.9124$$

$$R = 2.0057$$

$$x - \text{max} = 20.3255$$

$$\text{mean } x = 18.3200$$

$$\text{Center} \begin{cases} x = 18.3200 \\ y = 20.9180 \end{cases}$$

1. The first part of the paper is devoted to a discussion of the general properties of the system. It is shown that the system is a typical example of a binary system, and that the components are of the same type as those found in other systems of this kind. The results of the observations are then presented, and it is shown that they are in good agreement with the theoretical predictions. The paper concludes with a summary of the results and a discussion of the implications of the findings.

2. The second part of the paper is devoted to a detailed discussion of the properties of the components. It is shown that the components are of the same type as those found in other systems of this kind, and that they are in good agreement with the theoretical predictions. The results of the observations are then presented, and it is shown that they are in good agreement with the theoretical predictions. The paper concludes with a summary of the results and a discussion of the implications of the findings.

3. The third part of the paper is devoted to a detailed discussion of the properties of the components. It is shown that the components are of the same type as those found in other systems of this kind, and that they are in good agreement with the theoretical predictions. The results of the observations are then presented, and it is shown that they are in good agreement with the theoretical predictions. The paper concludes with a summary of the results and a discussion of the implications of the findings.

4. The fourth part of the paper is devoted to a detailed discussion of the properties of the components. It is shown that the components are of the same type as those found in other systems of this kind, and that they are in good agreement with the theoretical predictions. The results of the observations are then presented, and it is shown that they are in good agreement with the theoretical predictions. The paper concludes with a summary of the results and a discussion of the implications of the findings.

116153-0

Minimum Center

1913 Sept 23.

15

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	180000	-03200	01024	40109	-15
2	183200	00000	00000	40256	+132
3	190000	+06800	04624	40345	+221
4	200000	+16800	28224	40232	+108
5	201053	+17853	31873	40308	+184
6	203237	+20037	40148	40215	+91
7	200000	+16800	28224	40236	+112
8	192798	+09598	09212	40212	+98

$$R^2 = 40124$$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	189418	-19762	-8	39085
2	189124	-20056	-8	40256
3	190287	-18893	-7	35721
4	198226	-10954	-4	12008
5	200000	-09180	-4	08435
6	210000	+00820	0	00067
7	220136	+10956	+4	12012
8	226780	+17600	+7	31000

Approximate Center

$$x = 20.0 \quad y = 198226$$

$$220136$$

$$418362$$

$$\text{mean} = 20.9181$$

$$y - \text{min} = 189124$$

$$R = 20057$$

$$x - \text{mean} = 203255$$

$$\text{mean } x = 183200$$

$$\text{Center} \begin{cases} x = 183200 \\ y = 209180 \end{cases}$$

Formation of Normals

	ab	an	bn
2	- 0.00	+ 0.0	- 265.3
3	- 1.29	+ 150.3	- 417.7
4	- 1.85	+ 181.4	- 118.8
5	- 1.65	+ 329.4	- 169.3
6	+ 0.16	+ 182.0	+ 73
7	+ 1.85	+ 188.2	+ 123.2
8	+ 1.69	+ 94.1	+ 172.5
	- 1.09	+ 1125.4	- 668.1

MC N50 Morris Center

1913 Sept. 30. 16

Conditional Equations.

	a	b	c	0-c	
1	~~-0.32~~	~~-1.98~~	~~-1.5~~	~~-2.4 + 83 = +59~~	~~-79~~
2	0.00	-2.01	+1.32	0 + 84 = +84	+48
3	+0.68	-1.89	+2.21	+52 + 79 = +131	+90
4	+1.68	-1.10	+1.08	+127 + 46 = +173	-65
5	+1.79	-0.92	+1.84	+136 + 39 = +175	+9
6	+2.00	+0.08	+91	+152 - 3 = +149	-58
7	+1.68	+1.10	+1.12	+127 - 46 = +81	+31
8	+0.96	+1.76	+98	+73 - 74 = -1	+99

Average (0-c) = 57

Normals

$$\begin{array}{rcl}
 +14.23 - 1.09 & = & +11.25 \\
 -1.09 + 13.95 & = & -6.68
 \end{array}$$

$$\begin{array}{rcl}
 +1.09 - 0.08 & = & +0.86 \\
 +13.87 & = & -5.82
 \end{array}$$

$$b = +42$$

$$\begin{array}{rcl}
 -0.09 + 1.09 & = & +0.52 \\
 +14.14 & = & +10.73
 \end{array}$$

$$a = +76$$

VLA 1550 Morris Center

1913 Sept. 30. 16

Conditional Equation

	a	b	c		c	0-c
1	-0.32	+0.98	= +1.5	-0.32	+0.98	= +0.66
2	0.00	-2.01	= +1.32	0.00	+0.84	= +0.84
3	+0.68	-1.89	= +2.21	+0.52	+0.79	= +1.31
4	+1.68	-1.10	= +1.08	+1.27	+0.46	= +1.73
5	+1.79	-0.92	= +1.84	+1.36	+0.39	= +1.75
6	+2.00	-0.08	= +0.91	+1.52	+0.03	= +1.49
7	-1.68	+1.10	= +1.12	+1.27	-0.46	= +0.81
8	+0.96	+1.76	= +0.98	+0.73	-0.74	= +0.01

Average (0-c) = 57

Normals

$$\begin{aligned}
 &+1.423 - 1.09 = +1.125 \\
 &-1.09 + 1.395 = -0.668 \\
 &+1.09 - 0.08 = +0.86 \\
 &-1.387 = -0.582 \quad b = +42 \\
 &-0.09 + 1.09 = +0.92 \\
 &+1.414 \quad +1.073 \quad a = +76
 \end{aligned}$$

1550 Moon's mean Position (1912.0)

$$\begin{array}{rcl}
 X_0 & = & 18.3200'' \\
 Y_0 & = & 20.9180'' \\
 \Delta\alpha & = & +38'' \\
 \Delta\delta & = & -21'' \\
 \hline
 & & 18.3238'' \quad 20.9159''
 \end{array}$$

Greenwich Constants $X = 18.7854''$ $Y = 20.4962''$

$$\begin{array}{rcl}
 Z & = & +0.7854'' \\
 \log \eta & = & 9.89509'' \\
 \cos S & = & 9.99506'' \\
 \text{const} & = & 8.50724''
 \end{array}$$

$$\log(K-A) = 1.39279''$$

$$K-A = +24.71''$$

$$A = 13 \quad 19 \quad 26''$$

$$A_0 = 13^h \quad 19^m \quad 50.71^s$$

$$\text{Red} = -0.45''$$

$$\alpha' = 13 \quad 19 \quad 50.26''$$

$$\eta = -1.5038''$$

$$\begin{array}{rcl}
 \log \tan S & = & 9.1745'' \\
 S^2 & = & 9.7902'' \\
 \eta_1 & = & 6.0181''
 \end{array}$$

$$\eta_1 = -1''$$

$$\eta_0 = -1.5037''$$

$$\log \eta_0 = 0.17716''$$

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

$$(S-1) = 2.84601''$$

$$S-D = -11 \quad 41.5''$$

$$D = 8 \quad 25 \quad 50''$$

$$S_0 = -8^\circ \quad 37' \quad 31.5''$$

$$\text{Red} = -0.4''$$

$$S' = -8 \quad 37 \quad 31.9''$$

1550 Moon's mean Position (1912.0)

$$\begin{array}{rcl}
 X_0 & = & 18\ 3200 \\
 Y_0 & = & 20\ 9180 \\
 \Delta\alpha & = & +38 \\
 \Delta\delta & = & -21 \\
 \hline
 & & 18\ 3238 \qquad 20\ 9159
 \end{array}$$

Sun Plate Constants $X = 18.7854$ $Y = 20.4962$

$$\begin{array}{rcl}
 \beta & = & +0.7854 \\
 \log \gamma & = & 9.89509 \\
 \log S & = & 9.99506 \\
 \text{const} & = & 8.50724
 \end{array}$$

$$(x - A) = 1.39279$$

$$x - A = +24.71$$

$$A = 13\ 19\ 26$$

$$A_0 = 13^h\ 19^m\ 50.71^s$$

$$\text{Red} = -0.91$$

$$x = 13\ 19\ 50.26$$

$$\gamma = -1.5038$$

$$\begin{array}{rcl}
 \log \tan S & = & 9.1745 \\
 \beta^2 & = & 9.7902 \\
 \eta_1 & = & 6.0181
 \end{array}$$

$$\eta_2 = -1$$

$$\eta_0 = -1.5037$$

$$\log \eta_2 = 0.17716$$

$$\text{const} = 7.33115$$

$$(S - 1) = 2.84601$$

$$S - D = -11\ 41.5$$

$$D = 8\ 25\ 50$$

$$S_0 = -8^\circ\ 37\ 31.5''$$

$$\text{Red} = -0.4$$

$$S = -8\ 37\ 31.9$$

1550 Red ad locus aff.

S

-8 38

$$H + X \quad 12 \quad 07 = 181^\circ 45'$$

$$H \quad 22 \quad 47$$

$$X \quad 13 \quad 20$$

$$G \quad 16 \quad 59$$

$$G + d \quad 6 \quad 19 = 94^\circ 45'$$

$$\cos S \quad 9.9950$$

$$L \quad 0.4426$$

$$(L) \quad 0.4376$$

$$\sin S \quad 9.1764$$

$$\cos(H+X) \quad 9.9998$$

$$h \quad 1.3071$$

$$\sin h \quad 8.4848$$

$$\sec S \quad 0.0050$$

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

$$\cos(G+X) \quad 8.9181$$

$$q \quad 0.9102$$

$$\sin q \quad 9.9985$$

$$\tan S \quad 9.1814$$

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

$$(g') \quad 9.8283$$

$$(g) \quad 8.9140$$

$$(h') \quad 0.4833$$

$$(h) \quad 8.6208$$

$$b \quad -0.33$$

$$s \quad -0.08$$

$$h \quad -0.04$$

$$-0.45$$

$$(g') \quad -0.67$$

$$(h') \quad +3.04$$

$$(L) \quad -2.74$$

$$-0.37$$

1550

Lunar Parallax

$$\begin{array}{r}
 \alpha' = 13 \quad 19 \quad 50.26'' \\
 \delta = 13 \quad 24 \quad 45.95'' \\
 + \quad 4 \quad 55.7'' \\
 + \quad 1 \quad 14' \quad 00'' \\
 + \quad 0 \quad 27'' \\
 + \quad 1 \quad 13 \quad 33''
 \end{array}$$

$$\begin{array}{r}
 9.95727'' \\
 0.00000'' \\
 0.00010'' \\
 \hline
 9.95737''
 \end{array}$$

$$\begin{array}{r}
 \delta = 42^\circ \quad 11' \quad 34'' \\
 - \quad 8 \quad 37 \quad 32'' \\
 \hline
 50 \quad 49 \quad 06''
 \end{array}$$

$$\begin{array}{r}
 9.82640'' \\
 8.21571'' \\
 9.88938'' \\
 0.17287'' \\
 \hline
 8.10436''
 \end{array}$$

$$S - S' = +43 \quad 43.0''$$

$$S = -7 \quad 53 \quad 48.9''$$

$$\text{Mantala } S = -7 \quad 53 \quad 43.9''$$

$$O - C = -50''$$

$$\delta = -8^\circ \quad 37' \quad 31.9''$$

$$\pi = 56' \quad 29.6''$$

$$\begin{array}{r}
 9.86913'' \\
 8.21571'' \\
 8.33292'' \\
 0.00413'' \\
 \hline
 6.42189''
 \end{array}$$

$$\begin{array}{r}
 \alpha - \alpha' = +0' \quad 54.50'' \\
 = + \quad 3.63''
 \end{array}$$

$$\alpha \quad 13 \quad 19 \quad 53.89''$$

$$\alpha = 13 \quad 19 \quad 53.31''$$

$$+ 0.58''$$

1550

Lunar Parallel

$$\begin{array}{r}
 \alpha = 13^{\circ} 19' 50.26 \\
 \delta = 13^{\circ} 29' 45.95 \\
 + 4' 55.7 \\
 + 1^{\circ} 14' 00 \\
 + 0' 27 \\
 + 1' 13' 33
 \end{array}$$

$$\begin{array}{r}
 995727 \\
 000000 \\
 000010 \\
 \hline
 995737
 \end{array}$$

$$\begin{array}{r}
 \delta = 42^{\circ} 11' 39 \\
 - 8^{\circ} 37' 32 \\
 \hline
 50^{\circ} 49' 06
 \end{array}$$

$$\begin{array}{r}
 982640 \\
 821571 \\
 988938 \\
 017287 \\
 \hline
 810436
 \end{array}$$

$$S - \delta = +43^{\circ} 43' 0$$

$$S = -7^{\circ} 53' 48.9$$

$$\text{Mantle } S = -7^{\circ} 53' 43.9$$

$$O-C = -50$$

$$\delta = -8^{\circ} 37' 31.9$$

$$\pi = 56' 29.6$$

$$\begin{array}{r}
 986913 \\
 821571 \\
 833292 \\
 000413 \\
 \hline
 642189
 \end{array}$$

$$\begin{array}{r}
 \alpha - \alpha' = +0^{\circ} 54.50 \\
 = +3.63
 \end{array}$$

$$\alpha = 13^{\circ} 19' 53.89$$

$$\alpha = 13^{\circ} 19' 53.31$$

$$+0.58$$

15

MC1590

Stars - measures

1913 July 14

19

	d	4	2	d	N
4	16580	15895	17032	17100	
11.5	9709	12782	11695	12431	29
23.7	09	8685	0100	38	
mag	81	01	32	02	
6.0	<u>23.6871</u>	<u>.6886</u>	<u>11.4667</u>	<u>.4668</u>	
2	15660	19750	15959	16060	
19.7	9350	16050	13615	8380	
9.6	4852	4142	1518	8680	
mag	58	44	42	60	
6.4	<u>9.6309</u>	<u>.6297</u>	<u>19.7661</u>	<u>.7678</u>	
3					
24.7	16621	15260	18599	18331	
23.7	8510	13377	16600	9321	31
mag	07	82	95	20	
6.0	21	58	96	28	
	<u>23.8112</u>	<u>.8118</u>	<u>24.7997</u>	<u>.8002</u>	

Electric lights ~~were~~ off and direct
and reversed measures were made
on different days.

Grade 3

MC1590

Stars - measures

1913 July 17

19

	d	$\frac{d}{N}$	d	$\frac{d}{N}$	d	$\frac{d}{N}$	d	$\frac{d}{N}$
4	16580		15895		17032		17100	
11.5	9709	11	12782	85	11695	00	12431	29
23.7	09		8685		01		38	
mg	81		01		32		02	
60	<u>23.6871</u>		<u>6886</u>		<u>114667</u>		<u>4668</u>	
2	15660		19750		15959		16060	
17	9350	52	16050	42	13615	18	8380	80
16	48		41		15		86	
mg	58		44		42		60	
64	<u>9.6309</u>		<u>6297</u>		<u>197661</u>		<u>7678</u>	
47	16621		15260		15599		15331	
37	8510	10	13377	76	16600	90	73213	1
mg	07		52		95		30	
60	21		58		96		28	
	<u>23.8112</u>		<u>8118</u>		<u>24.7997</u>		<u>8002</u>	

Electric lights ~~went~~ off and direct
and repeated measures were made
on different days.

Grade 3

ML1570 Known Measures

1913 July 14

20.

	d	N
1	1238590	15432
19.5	90	1428999
19.9	11275	0199
mm		
in		
1	<u>19.8888</u>	<u>.8864</u>
19.0	1048090	12220
19.9	0070	1206967
	10338	58

Possibly on
terminator.

	<u>19.9853</u>	<u>9845</u>
3		
18.0	15110	17478
20.6	843030	1412320
	31	0621
	10	68
	<u>20.6677</u>	<u>.6645</u>

4			17173	18522
17.7			15002	1068680
21.0			0915	99
			70	10
			<u>17.7837</u>	<u>7824</u>
5			16078	18595
17.6			11550	1309995
22.0			50	9495
mm			70	86
in			<u>17.5478</u>	<u>5494</u>
20			14995	17660
6			13220	942220
17.8			0913	22
23.0			83	56
			<u>17.8221</u>	<u>8236</u>

M61590 known measures

1913 July 14

20

	d	1	n
1	1238590	15432	
195	90	1428999	
199	11275	0199	
mm			
19.8888		8864	
19.0	1048090	12220	
199	0070	1206967	
	10338	58	

possibly on
terminator.

19.9853	9845
180	15110
20.5	843030
	31
	10
20.6677	6645

177	17173	18522
21.0	15002	1068680
	09	99
	70	10
	17.7837	7824
	16078	18595
	11550	1309995
	50	94
	70	86
	17.5478	5994
	14995	17660
	13220	942220
	09	22
	83	56
	17.8228	8236

2
13
2
3
1
2

MC 1590 Morgan Measures.

1913 July 14.

21

	α	ν
2	19488	15376
18.0	1692220	7945
23.3	11	3047
	60	78
	<u>23.2565</u>	<u>2565</u>

8, scratch.

18.7	17969	15415	18570	15130
23.8	1016960	1324945	1480990	883853
	59	49	00	46
	55	20	66	18
	<u>23.7795</u>	<u>7831</u>	<u>18.6232</u>	<u>6277</u>

2
13
2
8
1
2

MG 1590 Moon measures.

1913 July 14

21

$\begin{array}{r} d \\ 2 \quad 19488 \\ 180 \quad 16922 \\ 233 \quad 11 \\ \quad 60 \\ \hline 232563 \end{array}$
 $\begin{array}{r} n \\ 15376 \\ 7945 \\ 3047 \\ 78 \\ \hline 2563 \end{array}$

8/ scratch.

$\begin{array}{r} 18.7 \quad 17969 \\ 238 \quad 10169 \\ \quad 59 \\ \quad 55 \\ \hline 237795 \end{array}$
 $\begin{array}{r} 15415 \\ 13249 \\ \quad 49 \\ \quad 20 \\ \hline 7831 \end{array}$
 $\begin{array}{r} 18570 \\ 14809 \\ \quad 00 \\ \quad 66 \\ \hline 186232 \end{array}$
 $\begin{array}{r} 15130 \\ 8838 \\ \quad 4653 \\ \quad 18 \\ \hline 6277 \end{array}$

MC1590 Times etc. 1913 July 14 22
 exp to star 1912 Jan 27 $5^h 05^m$ ✓ $- 5^h 17^m$ ✓
 Moon $5^h 10^m$ 38.5 ✓ $- 5^h 10^m$ 38.8 ✓
 clock slow 1 25.1 ✓

H Sid T. $5^h 12^m$ 03.75 ✓ $\theta - \alpha = +2^h 22^m$
 # long 4 44 31.05 ✓
 G Sid T. 9 56 34.80 ✓
 Sid T. in Moon 20 21 38.05 ✓
 Intervals 13 34 56.75 ✓
 Reduction 2 13.51 ✓
 G.M.T. 13 32 43.24 ✓

From Harkness. R.A. Decl
 Moon 13^h $2^h 48^m$ $36^s 62^v$ + $18^\circ 02'$ $59'.6$ ✓
 motion in $2^s 22 60^v$ $12^s 72 8^v$ ✓
 32.7207^v 1 12.84^v 16 56.5^v ✓
 Tabular place $2^h 49^m$ $49^s 46^v$ + $18^\circ 09'$ $56'.1$ ✓

Moon's parallax $58' 18".1$ ✓
 semidiameter $15. 54.8^v$

$R = 954.8^v$
 $955. + 13.0$ augmentation = $+13.0$ ✓
 Irradiation $- 0.7^v$
 $R = 967.1^v$
 $R = 2.0731^v$
 $a = +0.2$ $(1+a) R = 2.0731^v$
 $R = 4.2977^v$ ✓

MC1590 Times etc. 1913 July 14 22
 Exp. to star 1912 Jan 27 5^h 05^m - 5^h 17^m
 Moon 5^h 10 38.5 - 5^h 10 38.8
 clock slow 1 25.1

H. Sid. T. 5^h 12 03.75
 along 4 44 31.05
 G. Sid. T. 9 56 34.80
 Sid. T. in Moon 20 21 38.05
 Interval 13 34 56.75
 Reduction 2 13.51
 G. in T. 13 32 43.24

From hour glass. R. G. Decl
 Moon 13^h 2^m 48^s 36^s 2 + 18° 02' 59" 6
 Moon in 2^h 22 60 12' 72" 8
 32.7207 1 12 84 76 56.5
 Tabular place 2^h 49^m 49^s 46 + 18° 09' 56.1

Moon parallax 58' 18.1
 semidiam 15' 54.8

39.2 + 12.4 R = 954.8
 1.5 + 13.0 augmentation + 13.0
 Translational - 0.7
 R = 967.1
 R = 2.0731
 (1 + e) R = 2.0731
 R = 4.2977

MC 1540, Standard coords

1913 June 15

Cape no. 410 mag. 6.0

Cape no. 419 mag. 6.4

Cape no. 427 mag. 6.0 23

2^h 42^m 55^s 622^h 47^m 37^s 522^h 50^m 11^s 25

59

53

23

60

52

24

mean 2 42 55 60

2 47 37 52

2 50 11 24

Prec +40.27

+39.97

+40.36

1 2 43 35.87

2 48 17.49

2 50 51.60

A 2 47 14

2 47 14

2 47 14

A-A -3 38.13

+1 03.49

+3 37.60

sin(A-A) -2 18.12

+63.49

+217.59

log. 2.33870

1.80276

2.33764

cos 9.97841

9.98257

9.97827

-30 0.82435

0.29252

0.82315

30 -6.6734

+1.9612

+6.6550

31 -

+1.0

+8

32 11.3259

19.9622

24.6558

33 11.4668

19.7670

24.8000

34 +1.409

-1.952

+1.442

35

36

37

38

39

40

41

42

43

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MCN 40				Standalone				1913 May 11			
Café m 410 mag 6.0				Café m 419 mag 6.4				Café m 427 mag 6.6			
L	2	42	55.62	2	47	37.52		2	50	11.25	
L			59			53				23	
E			60			52				24	
mean	2	42	55.60	2	47	37.52		2	50	11.24	
Proc			+40.27			+39.97				+40.36	
X	2	43	35.87	2	48	17.49		2	50	51.60	
A	2	47	14	2	47	14		2	47	14	
X-A		-3	38.13		+1	03.49			+3	37.60	
ln(X-A)		-2	18.12			+63.49			+2	17.59	
log		2	33870			180276			2	33764	
cos		9	97841			998257			9	97827	
30		0	82435			029252			0	82315	
E ₀		-6	6734			+19612			+6	6550	
E ₁		-	7			+10			+8		
E ₂		1	13259			199622			-4	6558	
E ₃		1	14668			197670			2	48000	
X-E ₃			+1409			-1952				+1442	
L		+17	52	02'0	+16	04	31.1	+17	55	35'6	
L				02.2			31.1			34.9	
E				01.6			31.8			34.7	
mean	+17	52	01.9	+16	04	31.3	+17	55	35.1		
Proc		+3	01.8		+2	58.8		+2	56.9		
S	+17	55	03.7	+16	07	38.1	+17	58	32.0		
D	+17	53	22	+17	53	22	+17	53	22		
S-D		+1	41.7	-1	45	51.9		+5	10.0		
ln(S-D)			+101.7			-6353.9			+310.0		
log		2	00732			380304			2	49136	
log		9	33847			113419			9	82251	
Tan S		9	5096			94610			9	5111	
E ₂		1	6487			05850			1	6463	
log		8	2117			70994			8	2108	
log		+0.2	180			-136203			-0.6	645	
E ₁		+1	63			+13			+1	62	
log		2	22343			83810			2	26807	
log		-3	6878			96303			2	38115	
X-E ₁		+1	4535			+12493			+1	1308	

MC 1590

Centre of Plate

1913 July 21

24

x	y	R.A.	Decl.
114668	236878	$2^h 43^m 36^s$	$+17^\circ 55' 04''$
197670	96303	48 17	16 07 30
248000	238115	50 52	17 58 32
5603	57.13	142 45	21 61 06
1868	19.04	2 47 35	17 30 22
-18	-22	- 21	+ 23 00
.68	2.96	$2^h 47^m 14^s$	$+17^\circ 53' 22''$
31	465		
21 ³	1380		

$$A = 2^h 47^m 14^s$$

$$D = +17^\circ 53' 22''$$

Plate constants

$x - 3$	-2394	-22	-29	$+4259$
$+1409$	-5661	-4252	-2	$5 = -4259 = 0$
-1952	-2301	-4253	-4	$2 = -4259 = 0$
$+1442$	-5691	-4249	-5	$5 = -4259 = 0$

$y - 11$	$+2422$	-2.34	-1.7255
$+1.4535$	$+2775$	$+1.7310$	$-54 = +1.7256 = +1$
$+1.2493$	$+4784$	$+1.7277$	$-22 = +1.7255 = 0$
$+1.1308$	$+6002$	$+1.7310$	$-55 = +1.7255 = 0$

Tabulated	$a = +0.1$	$x = -0.2$	$a - x = +0.3$	$b + a = -1.8$
Observed	$+0.2$	$+23$	-2.1	-2.8

C = 0

+24

+1.0

MC1590

Center of Plate

1913 July 21

24

x	y	$R.A.$	$Decl.$
114668	236878	$2^h 43^m 26^s$	$+17^\circ 55' 04''$
197670	96303	48 17	16 07 30
298000	238115	50 52	17 58 32
5603	5713	142 45	21 61 06
1868	1904	2 47 35	17 30 22
-18	-22	- 21	+ 23 00
68	296	$2^h 47^m 14^s$	$+17^\circ 53' 22''$
31	465		
21	1380		

$$A = 2^h 47^m 14^s$$

$$D = +17^\circ 53' 22''$$

Plate constants

$$\begin{aligned} x - 3 & - 2394 & - & - 22 - 29 & + 4259 \\ + 1409 & - 5661 & - & 4252 - 2 - 5 & - 4259 & = 0 \\ - 1952 & - 2301 & - & 4253 - 4 - 2 & - 4259 & = 0 \\ - 1442 & - 5691 & - & 4249 - 5 - 5 & - 4259 & = 0 \end{aligned}$$

$$\begin{aligned} y - 4 & + 2422 & - & 234 & - & 17255 \\ + 14535 & + 2775 & = & + 17310 - 54 & = & + 17256 & = + 1 \\ + 12493 & + 4784 & = & + 17277 - 22 & = & + 17255 & = 0 \\ + 11308 & + 6002 & = & + 17310 - 55 & = & + 17255 & = 0 \end{aligned}$$

$$\begin{aligned} \text{Tabulated} & a = +0.1 & x = -0.2 & c - a = +0.3 & b + a = -1.8 \\ \text{observed} & +0.2 & +2.3 & -2.1 & -2.8 \end{aligned}$$

$$C = 0$$

$$+2.4$$

$$+1.0$$

pt.	pos L	resid
1	180.00	+ 50
2	197.5	- 51
3	231.2	+ 45
4	242.2	+ 4
5	271.1	- 80
6	300.2	+ 70
7	308.8	- 4
8	331.2	0

17C1590

1913 Sept. 23

Moon's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$o - c$
1	19.6222	0.0000	-4	0.0000	4.2998	+21
2	19.0000	-0.6222	-4	0.3876	4.2934	-43
3	18.0000	-1.6222	-2	2.6322	4.3095	+118
4	17.7830	-1.8392	-2	3.3834	4.3074	+94
5	17.5486	-2.0736	+0	4.2998	4.3013	+36
6	17.8228	-1.7994	+2	3.2374	4.3162	+185
7	18.0000	-1.6222	+2	2.6309	4.3082	+105
8	18.6254	-0.9968	+3	0.9930	4.3058	+81

$$\text{Comp. } R^2 = 4.2977$$

	y	$(y - y_0)$	Δy	$(y - y_0)^2$
1	19.8876	-2.0736	0	4.2998
2	19.9849	-1.9763		3.9058
3	20.6661	-1.2951		1.6773
4	21.0000	-0.9612		0.9237
5	22.0000	+0.0388		0.0015
6	23.0000	+1.0388		1.0791
7	23.2563	+1.2951		1.6773
8	23.7813	+1.8201		3.3128

Approximate center

$$x = 18.0 \quad y = 20.6661$$

$$\quad \quad \quad 23.2563$$

$$\quad \quad \quad \hline \quad \quad \quad 43.9224$$

$$\text{mean } y = 21.9612$$

$$y - \text{min} = 19.8876$$

$$R = 2.0736$$

$$x - \text{min} = 17.5486$$

$$\text{mean } x = 19.6222$$

$$\text{Center } \begin{cases} x_0 = 19.6222 \\ y_0 = 21.9612 \end{cases}$$

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Moving Center

	x	$x - X_0$	Δx	$(x - X_0)^2$	$(x - X_0)(y - Y_0)$	$y - Y_0$
1	19.6222	0.0000	-4	0.0000	4.2998	+2.1
2	19.0000	-0.6222	-4	0.3876	4.2934	-4.3
3	18.0000	-1.6222	-2	2.6322	4.3085	+1.8
4	17.7830	-1.8392	-2	3.3834	4.3054	+4.4
5	17.5486	-2.0736	0	4.2998	4.3013	+3.6
6	17.8228	-1.7994	+2	3.2374	4.3462	+1.5
7	18.0000	-1.6222	+2	2.6309	4.3082	+10.5
8	18.6254	-0.9968	+3	0.9930	4.3058	+8.1

$$\text{Comp. } R^2 = 4.2977$$

	y	$(y - Y_0)$	Δy	$(y - Y_0)^2$
1	19.8876	-2.0736	0	4.2998
2	19.9849	-1.9763		3.9058
3	20.6661	-1.2951		1.6773
4	21.0000	-0.9612		0.9237
5	22.0000	+0.0388		0.0015
6	23.0000	+1.0388		1.0791
7	23.2563	+1.2951		1.6773
8	23.7813	+1.8201		3.3128

Approximate center

$$x = 18.0 \quad y = 20.6661$$

$$23.2563$$

$$43.9224$$

$$\text{mean } y = 21.9612$$

$$y - \text{min} = 19.8876$$

$$R = 20.736$$

$$x - \text{min} = 17.5486$$

$$\text{mean } x = 19.6222$$

$$\text{Center } \left\{ \begin{array}{l} X_0 = 19.6222 \\ Y_0 = 21.9612 \end{array} \right.$$

Formation of Normal

	ab	am	bm
1	-0.00	+ 0.0	- 43.5
2	+ 1.23	+ 26.6	+ 85.1
3	+ 2.10	- 191.0	- 153.2
4	+ 1.77	- 173.0	- 90.3
5	- 0.08	- 74.6	+ 1.4
6	- 1.87	- 333.0	+ 192.2
7	- 2.10	- 170.0	+ 136.5
8	- 1.82	- 81.0	+ 147.5
	- 0.77	- 996.0	+ 275.7

Normal Equations

$$+ 17.56a - 0.77b = -996$$

$$- 0.77a + 16.88b = +276$$

$$+ 0.77a - 0.03b = -44$$

$$+ 16.85b = +232$$

$$b = +13.8$$

$$+ 17.56a = -996 + 11 = -985$$

$$a = -56.0$$

Residuals

	a	b	a-b
1	+21	-0-29 = -29	+50
2	-43	+35-27 = +8	-51
3	+118	+91-18 = +73	+45
4	+94	+103-13 = +90	+4
5	+36	+116+0 = +116	-80
6	+185	+101+14 = +115	+70
7	+105	+91+18 = +109	-4
8	+81	+56+25 = +81	0

Average = 38

M 61590 Moon's Center

1913 Sept. 29

Conditional Equations

	a	b	c		c	0-c
1	0.00	0.07	+21	0-15	-15	+36
2	-0.62	-1.98	-43	+36-15	+21	-64
3	-1.62	-1.30	+118	+94-10	+84	+34
4	-1.84	-0.96	+94	+107-7	+100	-6
5	-2.07	+0.04	+36	+120+0	+120	-84
6	-1.80	+1.04	+185	+104+8	+112	+73
7	-1.62	+1.30	+105	+94+10	+104	+1
8	-1.00	+1.82	+81	+58+13	+71	+10

Average = 36

$$-408 - 6.31 = +190$$

$$-6.49 + 42.0 = +407$$

$$+408 - 264 = -256$$

$$-8.95 = 66 \quad k = +667.4$$

$$-6.49 + 407 - 31 = +376 \quad a = -58.0$$

$$X = 19.6222$$

$$Y = 21.9612$$

$$\frac{1}{2}a = -28$$

$$\frac{1}{2}b = +7$$

$$19.6194$$

$$21.9619$$

$$-239.2 = -52.53$$

$$+242.2 = +47.48$$

$$-1.22 = 4$$

$$-2.34 = 51$$

$$+42.59$$

$$-1.7255$$

$$Y = 19.5196$$

$$Y = 20.7081$$

M 61570 *Lucas's Asteroid*

1913 Sept 29

Conditional Equations

	a	b	c	u-c
1	0 0 0 = 2 0 7 =	+ 21	0 - 15 = - 15	+ 36
2	- 0 6 2 = 1 9 8 =	- 43	+ 36 - 15 = + 21	- 64
3	- 1 6 2 = 1 3 0 =	+ 118	+ 94 - 10 = + 84	+ 34
4	- 1 8 4 = 0 9 6 =	+ 94	+ 107 - 7 = + 100	- 6
5	- 2 0 7 = 0 0 4 =	+ 36	+ 120 + 0 = + 120	- 84
6	- 1 8 0 = 1 0 4 =	+ 185	+ 104 + 8 = + 112	+ 73
7	- 1 6 2 = 1 3 0 =	+ 105	+ 94 + 10 = + 104	+ 1
8	- 1 0 0 = 1 8 2 =	+ 81	+ 58 + 13 = + 71	+ 10

Average = 36

$$- 4 0 8 - 6 3 1 = + 1 9 0$$

$$- 6 4 9 + 4 2 0 = + 4 0 7$$

$$+ 4 0 8 - 2 6 4 = + 2 5 6$$

$$- 8 7 5 = - 6 6 \quad b = + 6 6 7 4$$

$$- 6 4 9 + 4 0 7 - 3 1 = + 3 7 6 \quad a = - 5 8 0$$

$$\begin{array}{r} X = 196222 \\ \frac{1}{2}a = -28 \\ \hline 196194 \\ -23924 = -5243 \\ -2x = 9 \\ + 4259 \\ \hline Y = 195295 \end{array}$$

$$\begin{array}{r} Y_0 = 219612 \\ \frac{1}{2}b = +7 \\ \hline 219619 \\ +242x = 44748 \\ -239 = 51 \\ -17255 \\ \hline Y = 207068 \end{array}$$

MC 15790

1913 Sept. 29

Luvon's Mean Position (1411.0)

$$S = +1.5196$$

$$\eta = -1.293.9$$

$$\log S = 9.18173$$

$$\log \tan S = 9.5085$$

$$\log S = 9.97589$$

$$\sqrt{S^2} = 0.3640$$

$$\log \cos S = 8.50724$$

$$\eta_1 = 69259$$

$$(x-A) = 1.69560$$

$$\eta_1 = +$$

$$(x-A) + 49.61 \quad \eta_0 = -1.2947$$

$$A = 2^h 47 14 \quad \log \eta_0 = 0.11217$$

$$\log \cos S = 7.33115$$

$$x_0 = 2^h 48^m 03.61$$

$$(x-D) = 27810.2$$

$$Red = -0.11$$

$$S-D = -10 04.0$$

$$x' = 2 48 03.50$$

$$D = +17 53 22$$

$$S = +17 43 18.0$$

$$Red = +6.0$$

$$d' = +17 43 24.0$$

16 1590

19.3 Sept 29

Lunar Mean Position 1911.0

$$S = +15.296$$

$$\eta = -12939$$

$$\log S = 0.8173$$

$$\log \tan S = 9.5085$$

$$\log S = 9.97589$$

$$\sqrt{S^2}$$

$$0.3640$$

$$\log S = 8.50724$$

$$\eta_1$$

$$69259$$

$$(x-A) = 1.69588$$

$$\eta_1 = +$$

$$81$$

$$x - \eta_1 = + 4965$$

$$\eta_0 = -12949$$

$$A = 2^h 47 14$$

$$\log \eta_0 = 0.11183$$

$$\log \eta_1 = 7.33115$$

$$x_0 = 2^h 48^m 03.68$$

$$(x-D) = 2780.68$$

$$S-D = -10004.6$$

$$D = +17 53 22$$

$$S = +17 43 18.0$$

1590

Red. ad l. aph.

$$\delta_0 = +17 \quad 43$$

 $H + \alpha$

$$0 \quad 30'' = 7^{\circ} 30'$$

H

$$21 \quad 42$$

 $\alpha_0 =$

$$2 \quad 48$$

G

$$17 \quad 30$$

 $G + \alpha$

$$20 \quad 18 = 304^{\circ} 30'$$

$$l \cos(G + \alpha) \quad 9.7531$$

eg

$$9.9110$$

sin "

$$9.9160m$$

tan S

$$9.5044$$

X₁₀

$$8.8239$$

g'

$$0.6641$$

g

$$9.1553m$$

$$h \quad -0.15$$

$$g \quad -0.14$$

$$h \quad +0.18$$

$$-0.11$$

$$l \cos S \quad 9.9789$$

.. i

$$0.6886m$$

.. (i)

$$0.6675m$$

$$l \sin S$$

$$9.4833$$

$$.. \cos(H + \alpha)$$

$$9.9963$$

.. h

$$1.2944$$

sin "

$$9.1157$$

sec S

$$0.0211$$

T₁₀

$$= 8.8239$$

h'

$$0.7780$$

h

$$9.2591$$

g'

$$+4.61$$

g

$$+6.00$$

i

$$-4.65$$

$$+5.95$$

1590

Red ad 2 aph

$$\delta_0 = +17 \quad 43$$

H+x

$$0 \quad 30 = 7' 30''$$

H

$$21 \quad 42$$

a =

$$2 \quad 48$$

G

$$17 \quad 30$$

G+x

$$20 \quad 18 = 304' 30''$$

$$l \cos(G+x) \quad 9 \quad 7 \quad 5 \quad 31$$

g

$$0 \quad 9 \quad 1 \quad 10$$

sin

$$9 \quad 9 \quad 1 \quad 6 \quad 0 \quad m$$

l sin S

$$9 \quad 5 \quad 0 \quad 49$$

l sin

$$8 \quad 8 \quad 2 \quad 39$$

g'

$$0 \quad 6 \quad 6 \quad 4 \quad 1$$

g

$$9 \quad 1 \quad 5 \quad 5 \quad 3 \quad m$$

$$b \quad -0.15$$

$$g \quad -0.14$$

$$h \quad +0.18$$

$$-0.11$$

$$l \cos S \quad 9 \quad 9 \quad 7 \quad 89$$

i

$$0 \quad 6 \quad 8 \quad 86 \quad m$$

i

$$0 \quad 6 \quad 6 \quad 7 \quad 5 \quad m$$

$$l \sin S$$

$$9 \quad 4 \quad 8 \quad 33$$

$$l \cos(H+x)$$

$$9 \quad 9 \quad 9 \quad 63$$

h

$$1 \quad 2 \quad 9 \quad 1 \quad 4$$

$$l \sin$$

$$9 \quad 1 \quad 1 \quad 5 \quad 7$$

$$l \cos S$$

$$0 \quad 0 \quad 2 \quad 1 \quad 1$$

i

$$8 \quad 8 \quad 2 \quad 39$$

h'

$$0 \quad 7 \quad 7 \quad 8 \quad 0$$

h

$$9 \quad 2 \quad 5 \quad 9 \quad 1$$

$$g' \quad +461$$

$$h' \quad +600$$

$$i \quad -465$$

$$+595$$

1590

Lunar Parallaxes

$$\alpha' = 2^{\circ} 48' 03.50''$$

$$\delta = 5^{\circ} 12' 03.75''$$

$$+ 2^{\circ} 24' 00.2''$$

$$= + 36^{\circ} 00' 03''$$

$$+ 13' 20''$$

$$+ 35' 46' 43''$$

$$9.95727''$$

$$0.50000$$

$$0.09082''$$

$$0.04809''$$

$$f = 48' 09' 58''$$

$$17' 43' 24''$$

$$30' 26' 34''$$

$$9.82640''$$

$$8.22938''$$

$$9.70473''$$

$$0.12779''$$

$$7.88830''$$

$$\delta - \delta' = + 26' 34.9''$$

$$S = 18' 09' 58.9''$$

$$\alpha = 2^{\circ} 49' 50.23''$$

$$\text{Mant. Allen } \delta = + 18' 09' 56.1''$$

$$\alpha = 2^{\circ} 49' 49.46''$$

$$o - c = + 2.8''$$

$$+ 0.77$$

$$\delta' = + 17^{\circ} 48' 24.0''$$

$$T.D. = 58' 18.1''$$

$$9.86913''$$

$$8.22938''$$

$$9.76923''$$

$$0.02221''$$

$$7.88995''$$

$$\alpha - \alpha' = + 26' 40.96''$$

$$= + 1'' 46.73''$$

1590

Lunar Parallaxes

$$\alpha = 2 \quad 48 \quad 03.54$$

$$\delta = 5 \quad 12 \quad 03.75$$

$$+ 2 \quad 24 \quad 00.2$$

$$= + 36 \quad 00 \quad 03$$

$$+ 13 \quad 20$$

$$+ 30 \quad 46 \quad 43$$

$$995727$$

$$000000$$

$$009082$$

$$004809$$

$$\alpha = 48 \quad 09 \quad 58$$

$$17 \quad 43 \quad 24$$

$$30 \quad 26 \quad 34$$

$$982640$$

$$822938$$

$$970473$$

$$012779$$

$$788830$$

$$S - S' = + 26 \quad 34 \quad 9$$

$$S = 18 \quad 09 \quad 59.4$$

$$\alpha = 2 \quad 49 \quad 50.27$$

$$\text{Mant. Allen } S = + 18 \quad 09 \quad 56.1$$

$$\alpha = 2 \quad 49 \quad 49.16$$

$$O - C = + 3.3$$

$$T 0.81$$

$$S = + 17 \quad 43 \quad 29.5$$

$$T = 5.8 \quad 181$$

$$9.86913$$

$$822938$$

$$976923$$

$$002221$$

$$788995$$

$$\alpha - \alpha' = + 26 \quad 40 \quad 96$$

$$+ 1 \quad 46 \quad 73$$

