

KG
11366
v. 964

LXXXVII

	4503	

	4554	
	4555	

1
10
24

23

12
26
16

8
14
134

45-03

Stars - Measures

1915 Mar. 26

d

x

N

d

N

1 20087

20140

17990

10890

10.5 1606358
24.1 611417474
80741762919
211910533
808689
10.402749
403124.03670352

2 20134

18261

18540

18746

23.8 1226061
9.2 5916143
39401689085-
68851040894
949430
23.787176
1787730
29.165056
1642

3 18545

19943

18661

19785

30.2 1626568
16.8 761023740
39401004142
31421839400
9553
30.127655
128561
16.862394
8610

Density 3

extra

14.9 13710

12827

17230

17965

13.4 0711

12188
8080

13731

1146459

13059

2221

6959

20

20

61

14.9350935613.35013502

4503

Stars - Measure

1915 Mar 26

α	δ	α	δ	α	δ	α	δ
1 20087		201.40		17990		10890	
105 16063	58	14174	74	17629	19	10533	86
24.1 61		80		21			
89		49					
<u>104027</u>		<u>4031</u>		<u>24.0367</u>		<u>0352</u>	
2 20134		18261		18540		18746	
238 12260	61	16143		16890	85	10404	91
12 59		39	40	68		94	
30		76		30		56	
<u>23.7871</u>		<u>7877</u>		<u>29.1650</u>		<u>1642</u>	
3 17545		19943		18661		19785	
202 16260	64	18237		10041	42	18394	00
168 76		39	40	31		95	
53		55		61		94	
<u>30.1276</u>		<u>1285</u>		<u>16.8623</u>		<u>4610</u>	

Density 3

α	δ	α	δ	α	δ	α	δ
4 13710		12827		17230		17965	
154 07	11	12188		13731		11464	50
136	59	80	80	22	21	69	1
				20		61	
<u>14.9350</u>		<u>9356</u>		<u>13.3501</u>		<u>3502</u>	

4502
dmoon-measures
x1915 May. 26
4

2

$$\frac{1}{21.5}$$

$$\frac{13.1}{\text{min}}$$

$$\frac{1}{\text{in}}$$

$$\frac{1}{\text{r}}$$

$$\frac{2}{22.0}$$

$$\frac{13.2}{\text{min}}$$

$$\frac{3}{23.0}$$

$$\frac{13.6}{\text{min}}$$

$$\frac{4}{23.3}$$

$$\frac{14.0}{\text{min}}$$

$$\frac{5}{23.5}$$

$$\frac{15.0}{\text{max}}$$

$$\frac{1}{\text{in}}$$

$$\frac{1}{\text{r}}$$

$$\frac{6}{23.3}$$

$$\frac{16.0}{\text{min}}$$

$$\frac{1}{16251}$$

$$\frac{1}{13935}$$

$$\frac{1}{4148}$$

$$\frac{1}{54}$$

$$\frac{1}{382811}$$

$$\frac{1}{19137}$$

$$\frac{1}{1403939}$$

$$\frac{1}{39}$$

$$\frac{1}{31}$$

$$\frac{1}{23.5095}$$

$$\frac{1}{19229}$$

$$\frac{1}{16732}$$

$$\frac{1}{3930}$$

$$\frac{1}{46}$$

$$\frac{1}{23.2500}$$

$$\frac{1}{18009}$$

$$\frac{1}{102969}$$

$$\frac{1}{87}$$

$$\frac{1}{13}$$

$$\frac{1}{2272}$$

$$\frac{1}{19469}$$

$$\frac{1}{1456574}$$

$$\frac{1}{60}$$

$$\frac{1}{71}$$

$$\frac{1}{5096}$$

$$\frac{1}{19389}$$

$$\frac{1}{1193926}$$

$$\frac{1}{19}$$

$$\frac{1}{99}$$

$$\frac{1}{2531}$$

$$\frac{1}{14749}$$

$$\frac{1}{14549}$$

$$\frac{1}{5140}$$

$$\frac{1}{130202}$$

$$\frac{1}{13661}$$

$$\frac{1}{12850}$$

$$\frac{1}{4549}$$

$$\frac{1}{130}$$

$$\frac{1}{130813}$$

$$\frac{1}{17747}$$

$$\frac{1}{10820}$$

$$\frac{1}{0919}$$

$$\frac{1}{45}$$

$$\frac{1}{136930}$$

$$\frac{1}{1332220}$$

$$\frac{1}{21}$$

$$\frac{1}{13139}$$

$$\frac{1}{0182}$$

$$\frac{1}{1500006}$$

$$\frac{1}{0906}$$

$$\frac{1}{14180}$$

$$\frac{1}{0825}$$

$$\frac{1}{17878}$$

$$\frac{1}{1482111}$$

$$\frac{1}{111}$$

$$\frac{1}{88}$$

$$\frac{1}{6933}$$

4.1-0.2

d

moon - measurements

1911 Mar. 26

2

1

215

131

111

111

111

2

220

136

3

250

116

4

332

110

16251

13935

4148

54

5523115

235

150

110

110

110

19137

14039

3939

31

2350956

233

160

19229

16732

3930

46

232500

18209

10296

8769

13

2272

19469

14565

74

60

71

5096

19389

11939

1926

99

2531

14749

14549

5140

130202

13661

12850

4549

130

130213

17747

10820

0919

45

136920

1332220

21

13139

0192

15000

0906

14180

0825

17878

14821

111

88

6933

4503

d

x Moon Measures

1911 Mar. 26

3

7

23.0

16.4

18671

1511920

19

71

16.3552

19000

1252120

20

95

.35238 scratch

22517716

16712165

7062

29

22.5556

17190

1276669

667

99

5573

18249

11034

4548

45

16.7204

18940

1616169

707

39

.7227

4103

Moon Measures

1911 Mar. 26.

3

d

N

d

N

7

230

164

18671

1511920

19

71

16.3552

19000

1292120

20

95

13123

8 scratch

22517716

14712165

7062

29

22.5556

17190

1276669

669

99

5573

15249

11034

4128

45

16.7204

18940

1416169

709

39

7227

4503 Times etc.
 Exp. station 1913 Dec 18 $12^h 03^m$ - $12^h 15^m$
 moon $12 09$ 05.5 - $12 09 05.8$
 clock fast 0 07.8

H. Sid T. $12 08$ 59.85 $\theta - \alpha = +1^h 18^m$
 H. horq $4 44$ 31.05
 G. Sid T. $16 53$ 28.9
 Sid T. in moon $17 45$ 58.36
 Interval $23 07$ 30.54
 Reduction 3 47.37
 G. m. T. $23 03$ 43.23

From hankalem R.A. Decl.
 Moon 23^h $10^h 51^m$ 11.08 +8 01 35.1
 motion in 1^m 2.1034 16.158
 3.6205 + 7.62 - 58.5
 Tabula place $10 51$ 18.70 +8 00 36.6

Moon's age 28 days.
 parallel $59' 03'' 37$
 semidiam $16 07.1$

934 - 12.3
 967 - 13.2

R 967.1
 Augmentation (3) +1.2
 Irradiation (3) - 0.3

$a = -502.0$
 + 24
 478.0

R 980.0
 R 2.1008
 ak - 1004
 (1+a)R 2.0004
 R² 4.0016

4503 Times etc
 Exp. station 1913 Dec 18 12^h 03^m - 12^h 15^m
 moon 12 09 05.5 - 12 09 05.8
 clock fast 0 078

H. dist. 12 08 5785 G-X + 1^h 18^m
 H. long 4 44 31.05
 G. S. dist. 16 53 28.9
 S. dist. in moon 17 45 58.36
 Interval 23 07 30.54
 Reduction 3 47.37
 G. M. T. 23 03 43.23

From Hank Allen R. A. Dec 6
 Moon 23^h 10^m 51^s 11.08 + 8 01 35.1
 motion = 1^h 21034 16.158
 3.6205^m + 7.62 - 58.5
 Tabular place 10 51 18.70 + 8 00 36.6

Moon's age 20 days

- parallax 59' 03" 37

- semidiam 16' 07" 1

R 9671

Augmentation (31) + 182

Irradiation (31) - 0.3

R 980.0

R 2.1008

alt - 1004

(17a) R 20004

R² 4.0016

934-113

767-132

2-5020

770

4503

Center of plate

5

$$\begin{array}{r}
 \times \\
 104029 \\
 23.7874 \\
 30.1280 \\
 \hline
 3 \overline{) 6432} \\
 2144 \\
 \hline
 -22 \\
 \hline
 1.56 \\
 31 \\
 \hline
 17.5
 \end{array}$$

$$\begin{array}{r}
 4 \\
 240360 \\
 9.1646 \\
 168616 \\
 \hline
 5006 \\
 16.69 \\
 \hline
 -18. \\
 \hline
 1.31 \\
 4665 \\
 \hline
 611'' \\
 = 10' 11''
 \end{array}$$

$$\begin{array}{r}
 \text{RA.} \\
 10 \quad 44 \quad 11 \\
 51 \quad 30 \\
 55 \quad 01 \\
 \hline
 150 \quad 42 \\
 10 \quad 50 \quad 14 \\
 \hline
 + \quad 1 \quad 17 \\
 \hline
 10 \quad 50 \quad 31
 \end{array}$$

$$\begin{array}{r}
 \text{Decl.} \\
 +8 \quad 40 \quad 46 \\
 6 \quad 39 \quad 00 \\
 7 \quad 41 \quad 28 \\
 \hline
 120 \quad 74 \\
 +7 \quad 40 \quad 25 \\
 \hline
 +10 \quad 11 \\
 \hline
 +7 \quad 50 \quad 36
 \end{array}$$

$$\begin{array}{l}
 \text{Center } \left\{ \begin{array}{l} A = 10^h 50' 30'' \\ D = +7^\circ 50' 40'' \end{array} \right.
 \end{array}$$

$$\begin{array}{r}
 X-3 \quad +500X \quad +55.4Y \quad +2.X \quad -11002 \\
 +4450 + 5201 = +9651 + 1331 = +10982 + 21 = +11003 = +1 \\
 +2764 + 7468 = +10232 + 740 = +10972 + 30 = +11002 = 0 \\
 -1446 + 11894 = +10448 + 508 = +10956 + 48 = +11004 = +2 \\
 -5057 + 15064 = +10007 + 934 = +10941 + 60 = +11001 = -1 \\
 215077 + 10754 \quad + 832 \quad + 43 \quad = 215706
 \end{array}$$

$$\begin{array}{r}
 Y-7 \quad +500Y \quad -56.4X \quad +3.8Y \quad -7115 \\
 -4416 + 12018 = +7602 - 587 = +7015 + 91 = +7106 = -9 \\
 +1258 + 6675 = +7933 - 842 = +7091 + 51 = +7142 = +7 \\
 +3835 + 4582 = +8417 - 1342 = +7075 + 35 = +7110 = -5 \\
 +326 + 8431 = +8757 - 1699 = +7058 + 64 = +7122 = +7 \\
 150203 + 8510 \quad - 1213 \quad + 57 \quad = 149442
 \end{array}$$

$$\begin{array}{r}
 \text{Tables } a = -1.2 \quad c = -2.9 \quad a-c = +1.7 \quad b+a = -1.3 \\
 \text{Obs } a = -2.0 \quad c = -3.8 \quad a-c = +1.8 \quad b+a = +1.0 \\
 a-c \quad -500.8'' \quad 500.9'' \quad +0.1 \quad +23''
 \end{array}$$

4503

Center of plate:

5

$$\begin{array}{r} \times \\ 104029 \\ 23.7874 \\ 30.1280 \end{array}$$

$$\begin{array}{r} 4 \\ 24.0360 \\ 9.1646 \\ 16.8616 \end{array}$$

$$\begin{array}{r} RA \\ 10 \quad 44 \quad 11 \\ 51 \quad 30 \\ 55 \quad 01 \end{array}$$

$$\begin{array}{r} Decl \\ +8 \quad 40 \quad 46 \\ 6 \quad 39 \quad 00 \\ 7 \quad 41 \quad 28 \end{array}$$

$$\begin{array}{r} 3 \overline{) 6432} \\ 2144 \\ \hline 22 \end{array}$$

$$\begin{array}{r} 50.06 \\ 16.69 \\ \hline 18 \end{array}$$

$$\begin{array}{r} 150 \quad 42 \\ 10 \quad 50 \quad 14 \\ + \quad \quad 17 \end{array}$$

$$\begin{array}{r} 120 \quad 74 \\ +7 \quad 40 \quad 25 \\ +10 \quad 11 \end{array}$$

$$\begin{array}{r} 2.56 \\ 31 \end{array}$$

$$\begin{array}{r} 131 \\ 4665 \end{array}$$

$$\begin{array}{r} 10 \quad 50 \quad 31 \end{array}$$

$$\begin{array}{r} +7 \quad 50 \quad 36 \end{array}$$

$$\begin{array}{r} 17.5 \\ 1-26 \end{array}$$

$$\begin{array}{r} 611'' \\ = 10' 11'' \end{array}$$

$$\begin{array}{l} \text{Center} \left\{ \begin{array}{l} A = 10^{\circ} 50' 30'' \\ D = +7^{\circ} 50' 40'' \end{array} \right. \end{array}$$

$$\begin{array}{r} 2-3 \quad +5204 \quad +15544 \quad +21 \quad -11002 \\ +4450 + 5201 + 9651 + 1331 + 10982 + 21 - 711003 = +1 \\ +2764 + 7468 + 10232 + 740 + 10972 + 30 - 711002 = 0 \\ -1446 + 11294 + 10448 + 508 + 10956 + 48 - 711004 = +2 \\ -5057 + 15064 + 710007 + 934 + 10941 + 60 + 711001 = -1 \\ 215077 + 10754 + 832 + 43 = 215706 \end{array}$$

$$\begin{array}{r} 4-7 \quad +1207 \quad -15642 \quad +3.84 \quad -7110 \\ -4416 + 12018 + 7602 - 587 + 7015 + 91 - 71106 = -9 \\ +1238 + 6675 + 7913 - 842 + 7071 + 51 - 71122 = +7 \\ +3835 + 4582 + 8417 - 1342 + 7075 + 35 - 71110 = -5 \\ +526 + 8431 + 8757 - 1699 + 7058 + 64 - 71122 = +7 \\ 114203 + 7510 - 1213 + 57 = 1149442 \end{array}$$

$$\begin{array}{r} \text{Tables } a = -12 \quad c = -2.9 \quad a-c = +1.7 \quad A+a = -1.3 \\ \text{Tables } a = -20 \quad c = -3.8 \quad a-c = +1.8 \quad A+a = +1.0 \\ a-c = -0.8 \quad = 0.9 \quad +0.1 \quad = 1.3 \end{array}$$

Cenke no 1476 my 8.5-

10 45 59.21
30
26

10 45 59.26
40.64

10 46 39.90

10 50 20

-3 50.10

-230.09

236190m

999654

0.86568m

-7.3397

-14

14.6589

14.9353

+2764

+7 17 36.8

36.9

36.9

+7 17 36.9

-4 07.3

+7 13 29.6

7 50 40

-37 104

-2230.5

3.34840m

0.67955m

9.1030

17314

78878

-4.7813

+77

13.2264

13.3502

+1238

Curvature

AS -2.83

M

M

+1.7m

+1.7m

+1.7m

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4503

Standard Coordinates

6

Caheno 1471 mag 8.4				Caheno 1486 mag 6.1				Caheno 1492 mag 8.5			
C	10	43	30.43	10	50	49.96	10	54	20.45		
L			.50			.56			.47		
E			.44			.97			.47		
mean	10	43	30.46	10	50	49.96	10	54	20.46		
Pare		+	40.84		+	40.52		+	40.45		
q	10	44	11.29	10	51	30.48	10	55	00.91		
A	10	50	30	10	50	30	10	50	30		
A-A		- 6	18.74		+	1 00.48		+	4 30.91		
sin(A)			- 378.68		+	60.48		+	270.89		
log.			2.57828			1.78161			2.43279		
cos			9.99499			9.99707			9.99608		
Σ			1.08052			0.28592			0.93611		
Σ			-12.0362			+ 1.9316			+ 8.6320		
Σ ₁			= 54			+			17		
Σ			9.9579			23.9320			30.6337		
Σ ₂			10.4029			23.7874			30.1280		
Σ-Σ			+ 44.50			- 14.46			- 50.57		

C	+ 8	44	56.1	+ 6	43	08.1	+ 7	45	40.8
L			55.8			08.6			41.5
E			56.9			08.6			41.1
mean	+ 8	44	56.3	+ 6	43	08.4	+ 7	45	41.1
Pare		- 4	06.4		- 4	08.6		- 4	12.7
S	+ 8	46	49.9	+ 6	38	59.8	+ 7	41	28.4
D	+ 7	50	40	+ 7	50	40	+ 7	50	40
S-D	+ 50	09.9	- 1	11	40.2	- 09	11.6		
tan(S-D)	+ 30	40.1	- 4	30.8	- 55.16				
log.			3.47858			3.63355			2.74162
no			0.80973			0.96470			0.07277
tan			9.1837			9.0667			9.1305
3			2.1610			0.5718			1.8722
3.			8.3981			6.6919			8.0561
3.			+ 6.4526			- 9.2194			- 1.1824
3.			+ 250			+		+	114
3.			24.4786			8.7811			16.8290
4			24.0360			9.1646			16.8616
4-3			- 44.16			+ 38.35			+ 3.26

4503.

Standard Coordinates

6

Cacheco 1471 mag 8.4	Cacheco 1486 mag 6.1	Cacheco 1492 mag 8.5
C 10 ^h 43 30.43	10 50 49.96	10 54 20.45
L .50	.96	.47
B .44	.97	.47
mag 10 43 30.46	10 50 49.96	10 54 20.46
Phase + 40.84	+ 40.52	+ 40.45
d 10 44 11.27	10 51 30.48	10 55 00.91
A 10 50 30	10 50 30	10 50 30
A-A - 6 1878	+ 1 00.48	+ 4 30.91
Sub-A - 378.68	+ 1 60.48	+ 270.89
log 2.57828	1.28161	2.43272
cos 9.99499	9.99707	9.99605
E 1.08052	0.28592	0.93611
3. -12.0342	+ 1.9316	+ +8.6320
5. -	+ 14	+ + 17
3 9.9579	23.9320	30.6337
2 10.4029	23.7874	30.1280
1-3 + 44.50	- 14.46	- 50.57
C + 8 44 56.1	+ 6 43 08.1	+ 7 45 40.8
L 15.8	08.6	41.1
B 56.9	08.6	41.1
mag 10 43 56.8	+ 6 43 08.4	+ 7 45 41.1
Phase - 4 0.64	- 4 08.6	- 4 12.7
B + 8 40 49.9	+ 6 38 59.8	+ 7 41 28.4
D + 7 50 40	+ 7 50 40	+ 7 50 40
S-D + 50 09.9	- 1 11 40.2	- 09 11.6
mag-D + 30 40.1	- 4 30.8	- 55.16
log 3.47858	3.63355	2.74162
log 0.80973	0.96470	0.07277
mag 9.1837	9.0667	9.1305
2 21610	0.5718	1.8222
3 8.3981	6.6918	8.0561
70 + 6.4524	- 9.2194	- 1.1824
71 + 250	+ 35	+ 114
7 24.4886	8.7811	16.8290
4 24.0360	9.1646	16.8616
5 - 44.26	+ 38.35	+ 326

4503 Moon's Center

	x	y	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	21.5080		0.0000	-2	0.0000	4.0040	+24
2	22.0000	+0.4920		-2	0.2419	3.9989	-27
3	23.0000	+1.4920		-1	2.2258	3.9891	-125
4	23.2292	+1.7212		-1	2.9622	4.0028	+12
+5	23.5096	+2.0016		0	4.0064	4.0068	+52
6	23.2516	+1.7436		+1	3.0404	4.0010	-6
7	23.0000	+1.4920		+1	2.2264	4.0057	+41
8	22.5564	+1.0484		+2	1.0996	3.9957	-59
4.0016							

	x	y	$x - x_0$	Δx	$(x - x_0)^2$	
-1	13.0192	-2.0008		-2	4.0040	180 ✓
2	13.0819	-1.9381		-2	3.7570	166 ✓
3	13.6932	-1.3278		-1	1.7633	132 ✓
4	14.0000	-1.0200		-1	1.0406	121 ✓
5	15.0000	-0.0200		0	0.0004	92 ✓ 90
6	16.0000	+0.9800		+1	0.9606	60 ✓ 61
7	16.3538	+1.3338		+1	1.7793	48 ✓
8	16.7216	+1.7016		+2	2.8961	31 ✓
						Range 149

Approx Center

$$\begin{aligned}
 x_0 &= 23.0 & y &= 13.6932 \\
 & & & \underline{16.3538} \\
 & & & 30.0470 \\
 y_0 &= 15.0235 \\
 y_{\text{min}} &= 13.0192 \\
 R &= 20043 \\
 x_{\text{max}} &= 23.5096 \\
 x_0 &= 21.5053
 \end{aligned}$$

$$\text{Center } \left\{ \begin{aligned} x_0 &= 21.5080 \\ y_0 &= 15.0200 \end{aligned} \right.$$

4503

Moons Center

	y	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$O - C$
1	21.5050	0.0000	-2	0.0000	4.0040	+24
2	22.0000 + 0.4920		-2	0.2419	3.9989	-27
3	23.0000 + 1.4920		-1	2.2258	3.9891	-125
4	23.2292 + 1.7212		-1	2.9622	4.0028	+12
5	23.5096 + 2.0016		0	4.0064	4.0068	+12
6	23.2516 + 1.7436		+1	3.0404	4.0010	-6
7	23.0000 + 1.4920		+1	2.2264	4.0057	+11
8	22.5564 + 1.0484		+2	1.0996	3.9957	-59
					4.0016	

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	13.0192 - 2.0008		-2	4.0040	180
2	13.0819 - 1.9381		-2	3.7570	166
3	13.6932 - 1.3278		-1	1.7623	132
4	14.0000 - 1.0200		-1	1.0406	127
5	15.0000 - 0.2000		0	0.0004	92
6	16.0000 + 0.9800		+1	0.9606	60
7	16.3538 + 1.3338		+1	1.7793	48
8	16.7216 + 1.7016		+2	2.8961	31
					Range 149

Approx Center

$$\begin{aligned}
 x &= 230 & y &= 13.6932 \\
 & & & \underline{16.3538} \\
 & & & 30.0470 \\
 y_0 &= 15.0235 \\
 y_{\text{mean}} &= 13.0192 \\
 R &= 20048 \\
 x_{\text{mean}} &= 23.5096 \\
 x_0 &= 24.5053
 \end{aligned}$$

$$\begin{aligned}
 \text{Center } x_0 &= 21.5050 \\
 y_0 &= 15.0200
 \end{aligned}$$

Formation 6 normals

1	- 0.00	+ 0.0	- 48.0
2	- 0.95	- 13.2	+ 52.4
3	- 1.98	- 156.0	+ 166.0
4	- 1.75	+ 20.6	- 12.2
5	- 0.04	+ 104.0	- 0.0
6	+ 1.70	- 10.4	- 5.9
7	+ 1.98	+ 61.2	+ 54.6
8	+ 1.79	- 62.0	- 100.2
	<u>+ 0.75</u>	<u>- 85.8</u>	<u>+ 106.7</u>

- a	- b	+ 16	+ ΔC
- 0	- 6	+ 10	✓
- 5	- 6	+ 5	✓
- 15	- 4	- 3	✓
- 17	- 3	- 4	✓
- 20	- 0	- 4	✓
- 17	+ 3	+ 2	✓
- 15	+ 4	+ 5	✓
- 10	+ 5	+ 11	✓

45-03

Moor's Center.
Conditional Equations

	a	b	c	0-c	Corr
1	+0.00	-2.00	= +24	-0-14 = -14	+38 +48
2	+0.49	-1.94	= -27	-3-13 = -16	-11-6
3	+1.49	-1.33	= -125	-9-9 = -18	-107-110
4	+1.72	-1.02	= +12	-10-7 = -17	+29+25
5	+2.00	-0.02	= +52	-12-0 = -12	+64+60
6	+1.74	+0.98	= -6	-10+7 = -3	-3-2
7	+1.49	+1.33	= +41	-9+9 = 0	+41+46
8	+1.05	+1.70	= -59	-6+12 = +6	-66-55
					+172-187
					Average = 45

Normal Equations

$$\begin{aligned}
 +15.60 + 0.75 &= -86 & +9.98 \\
 +0.75 + 16.20 &= +107 & -2.30 \\
 -0.75 - 0.04 &= +4 & -0.47 \\
 +16.16 &= +110 & -2.77 \quad b = +6.8 - 0.17 \\
 +15.80 &= -86 - 5 = -91 & a = -5.8 + 0.63
 \end{aligned}$$

Arc measured = 149° Average (0-c) = -2.0

$$\frac{pc}{n} = 15$$

$$\frac{-2.0}{15} = -0.13$$

$$\Delta r = -0.2$$

$$-2\pi C = +0.80 + 16$$

$$\text{Corr} = -0.3$$

$$\Delta b = -0.14$$

$$\Delta \delta = -0.1$$

$$\Delta R = +0.0$$

$$\Delta a = +0.50$$

$$\Delta \alpha = +0.02$$

4503

Mosaic Counter

Conditioned Equations

	a	b	c	0	c	0-c	
1	+0.00	-2.00	=	+2.4	-0-1.4	= -1.4	+3.8
2	+0.49	-1.94	=	-2.7	-3-1.3	= -1.6	-1.1
3	+1.49	-1.33	=	-1.25	-9-9.2	= -1.8	-1.07
4	+1.72	-1.02	=	+1.2	-10-7.2	= -1.7	+2.9
5	+2.00	-0.02	=	+5.2	-12-0	= -1.2	+6.4
6	+1.74	+0.98	=	-6	-10+7	= -3	-3
7	+1.49	+1.33	=	+4.1	-9+9	= 0	+4.1
8	+1.05	+1.70	=	-5.9	-6+1.2	= +6	-6.6
							+1.72-1.87
							Range 45

Normal Equations

$$+15.80 + 0.75 = -8.6$$

$$+ 0.75 + 1.620 = +10.7$$

$$- 0.75 = 0.04 + 4$$

$$+ 1.616 = +11.0$$

$$+15.80 = -8.6 - 1 = -9.1$$

$$b = + 6.8$$

$$a = - 5.8$$

4503 Moon's Mean Position (1911.0)

$$x_0 = 21.5080$$

$$y_0 = 15.0200$$

$$\begin{array}{r} - 3 \\ \hline 21.5077 \end{array}$$

$$\begin{array}{r} + 3 \\ \hline 15.0203 \end{array}$$

From plate constants $x = 21.5706$ $y = 14.9442$

$$\xi = -0.4294$$

$$\eta = -3.0558$$

$$\begin{array}{r} \log \xi = 9.63286m \\ - \cos S = 9.99632 \\ \hline 8.50724 \end{array}$$

$$\begin{array}{r} \log \tan S = 9.1194 \\ 9.2657 \\ \hline 7.0534 \\ \hline 5.4385 \end{array}$$

$$\alpha - A = 1.12930m$$

$$\alpha - A = -1.347$$

$$A = 10 \quad 50 \quad 30$$

$$\alpha_0 = 10 \quad 50 \quad 16.53$$

$$\text{Red} = +3.62$$

$$\alpha' = 10 \quad 50 \quad 20.15$$

$$\begin{array}{r} \log \eta_0 = 0.48512m \\ \hline 7.33115 \\ \hline 3.15397m \end{array}$$

$$S - D = -23 \quad 45.5$$

$$D = +7 \quad 50 \quad 40$$

$$S_0 = +7 \quad 26 \quad 54.5$$

$$\text{Red} = -19.3$$

$$S' = +7 \quad 26 \quad 35.2$$

$$\begin{array}{r}
 4503 \quad \text{Moon's Mean Position (1911.0)} \\
 X_0 = 215080 \quad Y_0 = 150200 \\
 \quad \quad \quad - 3 \quad \quad \quad - 3 \\
 \hline
 215077 \quad \quad \quad 150203
 \end{array}$$

From plate constants $X = 215706 \quad Y = 149442$

$$\beta = -0.4294$$

$$\eta = -3.0558$$

$$\begin{array}{r}
 \log \beta = 9.63286 \\
 - \log S = 9.99632 \\
 \hline
 8.50724
 \end{array}$$

$$\begin{array}{r}
 \log \tan S = 9.1194 \\
 9.2657 \\
 \hline
 7.0534 \\
 5.7385
 \end{array}$$

$$\alpha - A = 1.12930$$

$$\alpha - H = -1.347$$

$$A = 10 \quad 50 \quad 30$$

$$\alpha = 10 \quad 50 \quad 16.53$$

$$\text{Red.} = +3.62$$

$$\alpha' = 10 \quad 50 \quad 20.15$$

$$\begin{array}{r}
 \log \eta = 0.48512 \\
 7.33112 \\
 \hline
 3.15397
 \end{array}$$

$$S - D = 23 \quad 45.5$$

$$D = +7 \quad 50 \quad 40$$

$$S = +7 \quad 26 \quad 54.5$$

$$\text{Red.} = -19.3$$

$$S' = +7 \quad 26 \quad 35.2$$

$$\begin{array}{r}
 10 \quad 44 \quad 44.88 \\
 \underline{41.16} \\
 + 3.72
 \end{array}$$

$$\begin{array}{r}
 + 10^{\circ} 59' 60.6'' \\
 \underline{0 \quad 20.7} \\
 - 20.1
 \end{array}$$

$$\begin{array}{r}
 10 \quad 56 \quad 07.61 \\
 \underline{04.08} \\
 + 3.53
 \end{array}$$

$$\begin{array}{r}
 + 4 \quad 04 \quad 46.8 \\
 \underline{5 \quad 05.3} \\
 - 18.5
 \end{array}$$

45 50 55 0

!

'2

15

10

5

0

4503

Red. ad l. app.

 $S: +7^{\circ} 27'$

$$H+\alpha \quad 11^h \quad 01^m = 165^{\circ} 16'$$

$$N \quad 0 \quad 00.8$$

$$\alpha \quad 10 \quad 50.3$$

$$\delta \quad 22 \quad 30.4$$

$$g+\alpha \quad 9 \quad 20.7 = 140^{\circ} 10'$$

$$l \cos S \quad 9.9963$$

$$l \quad 9.6150$$

$$(i) \quad 96113$$

$$l \cos (G+\alpha) \quad 9.8853 m$$

$$1.3480$$

$$\sin \delta \quad 9.8066$$

$$\tan S \quad 9.1165$$

$$8.8239$$

$$l \sin S \quad 9.1128$$

$$\cos (H+\alpha) \quad 9.9855 m$$

$$h \quad 1.3110$$

$$\sin \delta \quad 9.4054$$

$$\sec S \quad 0.0037$$

$$8.8239$$

$$s' \quad 1.2333 m$$

$$s \quad 90950$$

$$h' \quad 0.4093 m$$

$$h \quad 95440$$

$$f \quad +31.5$$

$$g \quad +012$$

$$h \quad +035$$

$$+362$$

$$s' \quad -17.11$$

$$h' \quad -2.57$$

$$i \quad +0.41$$

$$-19.27$$

4503

Red ad. l. aph

S: +7° 27'

H + α 11 0/1: 105° 16'

H 0 0.8

 α 10 50.3 β 22 30.4G + α 9 20.7 - 140° 10'

L cos 99963

i 96150

(1) 96113

L cos(G + α) 98853 m

13480

8 98066

L sin 91165

88239

8 12333 m

8 90950

f +31.5

8 +012

h +035

+262

L sin 91128

cos(H + α) 99855 m

h 13110

L sin 94054

L cos 00037

88239

L' 04093 m

h 95440

8 -17.11

h -2.57

i +0.51

-19.27

4503

Lunar parallax

$$\alpha' = 10^h 50^m 20^s 15$$

$$\delta = 12 \quad 08 \quad 57.85$$

$$G\alpha' = +1 \quad 18 \quad 37.70$$

$$= +19^{\circ} 39' 40''$$

$$+ \quad \quad \quad 7 \quad 25$$

$$+ 19 \quad 32 \quad 15$$

$$9.95727$$

$$0.00000$$

$$0.02575$$

$$\hline 9.98302$$

$$\delta = 43 \quad 52 \quad 50$$

$$7 \quad 26 \quad 35$$

$$36 \quad 26 \quad 15$$

$$9.82640$$

$$8.23497$$

$$9.77374$$

$$0.15913$$

$$\hline 7.99424$$

$$\delta - \delta' = +33 \quad 55.5$$

$$\delta = +8 \quad 00 \quad 30.7$$

$$\text{Ann Eph } \delta = +8 \quad 00 \quad 36.6$$

$$O - C = -5.9$$

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

$$\text{Dir} - 0.1$$

$$\delta = +8 \quad 00 \quad 30.6$$

$$O - C = -6.0$$

$$S = +7^{\circ} 26' 35.2$$

$$\Pi \quad 59' 103.37$$

$$9.86913$$

$$8.23497$$

$$9.52693$$

$$0.00426$$

$$\hline 7.63529$$

$$\alpha - \alpha' = +14' 50.67$$

$$+ \quad 59.38$$

$$\alpha = 10 \quad 51 \quad 19.53$$

$$\alpha = 10 \quad 51 \quad 18.70$$

$$+ 0.83$$

$$\text{Curv} - 0.03$$

$$\text{Dir} + 0.02$$

$$\alpha = 10 \quad 51 \quad 19.55$$

$$O - C = +0.85$$

4503 Linear parallax

$$\begin{array}{r} \alpha - 10^h 50^m 20^s 15'' \\ \delta \quad 12 \quad 08 \quad 57.85'' \\ G-\alpha \quad +1 \quad 18 \quad 37.70'' \\ \quad \quad + 19^{\circ} 39' 40'' \end{array}$$

$$+ \quad \quad \quad 7 \quad 21''$$

$$- 19 \quad 32 \quad 15''$$

$$\begin{array}{r} 995727 \\ 000000 \\ 002575 \\ \hline 998302 \end{array}$$

$$1 \quad 43 \quad 52 \quad 50''$$

$$7 \quad 26 \quad 35''$$

$$36 \quad 26 \quad 15''$$

$$\begin{array}{r} 982640 \\ 823497 \\ 977374 \\ 015913 \\ \hline 799424 \end{array}$$

$$S-\delta = \quad + 33 \quad 55.5''$$

$$S = +8 \quad 00 \quad 30.7''$$

$$\text{Circ. Eph. } S = +8 \quad 00 \quad 36.6''$$

$$G-C = \quad - 5.9''$$

$$\begin{array}{r} \text{Circ.} \\ S = +8 \quad 00 \quad 30.6'' \end{array}$$

$$G-C = \quad - 6.0''$$

$$S = +7^{\circ} 26' 35.2''$$

$$\Pi \quad 59' 03.37''$$

$$\begin{array}{r} 986913 \\ 823497 \\ 952693 \\ 000426 \\ \hline 763529 \end{array}$$

$$\alpha - \alpha' = +14' 50.67''$$

$$- \quad - \quad 59.38''$$

$$\alpha \quad 10 \quad 51 \quad 19.53''$$

$$\alpha \quad 10 \quad 51 \quad 18.70''$$

$$+ 0.83''$$

Circ.

$$\text{Circ.} \quad + 0.12''$$

$$\alpha \quad 10 \quad 51 \quad 19.55''$$

$$G-C \quad + 2.85''$$

L
12
25

3
23
4

3
31
21

4554

Stars Measures

1915 Apr. 23.

λ	d	x	n	d	y	n
1	15520		14540	16569		18544
120	15120		5150	14820		10276
292	2920		14160	1516		6269
				40		28
	<u>120397</u>		<u>0387</u>	<u>29.1746</u>		<u>.1738</u>

λ	d	x	n	d	y	n
239	15300		12757	20029		16530
57	9999		12550	12249		14289
	15097		5052	5160		7984
				00		42
	<u>23.9798</u>		<u>9794</u>	<u>29.7770</u>		<u>.7752</u>

λ	d	x	n	d	y	n
3	16754		17120	19000		18101
305	1100100		12870	10470		16600
218	0100		6970	8171		9402
	48		30	62		18
	<u>305750</u>		<u>5746</u>	<u>21.8495</u>		<u>8495</u>

Density 2.

4554 Stars Measured 1915 Apr 22.

α	δ	α	δ	α	δ
15520	14540	16569	18544		
15120	5150	14820	10276		
2920	14160	1110	6269		
		40	28		
<u>120397</u>	<u>0387</u>	<u>29.1746</u>	<u>1738</u>		

239	15300	12757	20029	16580
17	9999	12550	12245	14289
	15097	5052	5160	7984
			00	42
<u>23.9798</u>	<u>9794</u>	<u>29.7770</u>	<u>7752</u>	
3	16754	17120	19000	18101
305	1100100	12870	10470	16600
218	01	6970	7171	9402
	48	30	62	18
<u>30.5750</u>	<u>5746</u>	<u>21.8495</u>	<u>8495</u>	

Density 2

4554

Moon-measures

1915 Apr 22.7

d

N

d

N

Scratch

23.1 16584

19925

15690

15850

14.1 15342

1118400

14741

681100

4037

0000

3931

6000

96

40

70

64

23.12451125714.0951.09482

15691

16860

229

1492115

765761

14.1

07

7061

min

80

79

in

14.0777.0786

y

3

16370

16839

220

1339190

980810

144

80

0710

80

30

14.298629754

214

20461

16380

15.0

1778188

9070

91

5968

62

95

21.267426755

13907

1220194

21.0

1370906

0394

159

05

12008

min

in

y

21.02000191

y

6

13916

1220907

21.0

1370606

1220007

160

0906

12002

21.02090203

4554

Moon measures

1915 Apr 22.1

d

x

N

d

N

Scratch

23.116584

19925

15690

15850

14.115342

1118700

1474131

681100

4037

00

391

000

96

40

70

64

23.12451257140951.09482

15691

16860

229

1492115

765761

141

07

701

m

80

79

y

14.077707863

16370

16839

220

1339190

980810

144

80

07

80

30

14.298629754

214

20461

16380

150

1778188

9070

91

5968

62

95

21.267426755

13907

1220194

210

1370906

0394

159

05

12008

m

N

21.02000.91

N

6

13916

1220907

210

1370606

1220007

150

09

12002

21.02090.203

4554

moon measures

1915 Apr. 22

d

v

d

y

v

7 19034

17892

214 1537478

11539

170

68

38

46

97

21.3666.3644

8

220

17.6

19036

18083

13400

13720

09

09

30

98

17.5630.5624

4554

moon distances

1911 Apr 22

d

w

d

y

w

7	19034	17892
214	1537478	11539
170	68	38
	46	97
	<u>213666</u>	<u>3644</u>

19036	18083
13400	13720
09	09
30	98
<u>175630</u>	<u>5624</u>

4554 Times etc.
 Eptetan 1914 Jan 5 2^h 55^m - 3^h 07^m
 " moon 3 00 50.2 - 3 00 50.5
 clock fast 0 00.2

H Sid T. 3 00 50.15 $\theta - \alpha = +1^{\circ} 10'$
 H long 4 44 31.05
 S. Sid T. 7 45 21.2
 Sid T. in horn 18 56 56.42
 Interval 12 48 24.78
 Red 2 05.89
 S. m. T. 12 46 18.89

From Naut Alman R. A. Decl.
 moon 13^h 1 50 52.45^v + 15 11 37.5^v
 " " = 1.8910 12.387
 " " = 13.6852 - 2 49.5^v
 Tabular place 1 50 26.57^v + 15 08 48.0^v

moon age 9 days

- parallax 54' 38" 48^v
 - semidiam 14' 54.9^v
 R 894.9^v
 Augmentation + 12.3^v
 Irradiation (v) - 0.1^v
 R 907.1^v
 R 1.9445^v
 AR - 929^v
 (1+a)R 1.8516^v
 R² 3.4284^v

934 = +13.4
 895 = +12.3

a = -502.0
 + 24
 478.0

+554 Times etc.
 Exp Retan 191 + Tan 5 2^m 55^m -3^m 07^m
 moon 3 00 502 -3 00 505
 Clock face 0 002

H Sid T. 3 00 5015 6-2-71-11
 H long 4 44 3105
 S. Sid T. 7 45 212
 Sid T in moon 18 56 5642
 Interval 12 48 2478
 Red 2 0589
 S m. T. 12 46 1889

From Naut. Alen R H. Naut.
 moon 13^m 1 50 52 + 5^m + 15 11 375
 within 1^m 14910 12.387
 -13.6852 = 2588 2 495
 Tabular place 1 50 2657 + 15 08 480

moon age 9 days

parallel 54' 38" + 8

sinus 14 549

R 8949

Augmentation + 123

Irradiation (2) - 0.1

R 9071

R 19445

are - 929

(1+a)R 18516

R² 34284

7.4 = 113.4

895 = 112.3

2 - 5020

24

4780

~~Tables~~ $a = +0.7$	$e = -0.4$	$a - e = +1.1$	$b + a = -0.8$
Obs $a = -502.0$	$e = -504.7$	$a - e = +2.7$	$b + a = -1.8$
$0 - c = -502.7$	-504.3	$a - e = +1.6$	-1.0

4554

$$\begin{array}{r}
 12.0392 \\
 23.9796 \\
 30.5748 \\
 \hline
 66.59 \\
 22.20 \\
 \hline
 22.00 \\
 \hline
 .20 \\
 31 \\
 \hline
 65
 \end{array}$$

$$\begin{array}{r}
 29.1742 \\
 25.7761 \\
 21.8495 \\
 \hline
 56.80 \\
 18.93 \\
 \hline
 -15 \\
 \hline
 93 \\
 465 \\
 \hline
 430 \\
 7^h 10^m
 \end{array}$$

$$\begin{array}{r}
 143 \quad 31 \\
 150 \quad 10 \\
 \hline
 153 \quad 59 \\
 146 \quad 100 \\
 \hline
 149 \quad 13 \\
 \hline
 -6 \\
 \hline
 149 \quad 07
 \end{array}$$

$$\begin{array}{r}
 16 \quad 31 \quad 39 \\
 13 \quad 20 \quad 05 \\
 \hline
 15 \quad 30 \quad 42 \\
 14 \quad 81 \quad 86 \\
 \hline
 +15 \quad 07 \quad 29 \\
 \hline
 -7 \quad 10 \\
 \hline
 +15 \quad 00 \quad 20
 \end{array}$$

$$\text{Center } \left\{ \begin{array}{l} A = 1^h 49^m 10^s \\ D = +15^\circ 00' 20'' \end{array} \right.$$

$$\begin{array}{r}
 2-3 \quad +500x \quad +88.44 \quad +2x \quad -13620 \\
 +4996 +6020 = +11016 +2579 = +13595 +24 = +13619 = -1 \\
 +1072 +11990 = +13062 +511 = +13573 +48 = +13621 = +1 \\
 -3658 +15287 = +11629 +1931 = +13560 +61 = +13621 = +1 \\
 228718 +11436 \quad +1408 \quad +46 \quad = 227988
 \end{array}$$

$$\begin{array}{r}
 4-11 +500y \quad -86.6x \quad +4.74 \quad -7570 \\
 -6111 +14587 = +8476 -1043 = +7433 +137 = +7570 = 0 \\
 +6732 +2888 = +9620 -2077 = +7543 +27 = +7570 = 0 \\
 -809 +10925 = +10116 -2648 = +7468 +103 = +7571 = +1 \\
 1579289 +7964 \quad -1981 \quad +75 \quad = 157777
 \end{array}$$

$$\begin{array}{r}
 4554 \\
 \times \\
 120392 \\
 239796 \\
 205748 \\
 \hline
 6659 \\
 2220 \\
 220 \\
 \hline
 20 \\
 81 \\
 \hline
 6
 \end{array}$$

$$\begin{array}{r}
 291742 \\
 257761 \\
 218495 \\
 \hline
 5680 \\
 1893 \\
 \hline
 97 \\
 462 \\
 \hline
 430 \\
 710
 \end{array}$$

$$\begin{array}{r}
 14331 \\
 15010 \\
 15359 \\
 \hline
 146100 \\
 14913 \\
 \hline
 14907
 \end{array}$$

$$\begin{array}{r}
 +163139 \\
 132005 \\
 152042 \\
 \hline
 148186 \\
 +150729 \\
 \hline
 150020
 \end{array}$$

$$\begin{array}{l}
 \text{Center } A = 1^h 49^m 10^s \\
 D = +15^\circ 00' 20''
 \end{array}$$

$$\begin{array}{r}
 2-3 \quad +5001 \quad +88.44 \quad +2x \quad -13620 \\
 +4996 +60202 +11416 +2579 +13585 +24 +13619 = -1 \\
 +1072 +11990 = 13062 +571 +13573 +42 +13621 = +1 \\
 -3658 +152872 +11629 +1931 +13560 +61 +13621 = +1 \\
 228718 +11436 +1708 +46 = 227988
 \end{array}$$

$$\begin{array}{r}
 47-47+5004 \quad -866x \quad +474 \quad -7570 \\
 -6111 +14587 = +8476 -1043 +7432 +137 = +7570 \quad 0 \\
 +6732 +2888 = +9620 -2077 +7543 +27 = +7570 \quad 0 \\
 -309 +10925 +10116 -2648 = +7468 +103 = +7571 \quad 11 \\
 119289 +7964 -1981 +75 = 157777
 \end{array}$$

Curvature

	ξ	η	ΔS	-3.83	$+9.77$	$+12$
1	-10.45	+11.75	-61	+39 = -22	+10 = -12	
2	+1.87	-12.90	+7	-7 = +0	-12 = -12	
3	+8.94	+3.90	+20	-34 = -14	+3 = -11	
M	+0.80	-2.22		-3	-2	<u>+7</u>

$\Delta \eta$	-4.27	$+1.45$	-7
+70	-49 = +21	-14 = +7	
-50	+54 = +4	+3 = +7	
+10	-17 = -7	+14 = +7	
	+9	+1	<u>+3</u>

$$\text{Corr. } \begin{cases} a = +0.02 \\ b = +0.15 \end{cases}$$

4554 Standard Coordinates

Cape W. 255 mag 5.8

Cape W. 277 mag 8.1

Cape W. 282 mag 8.2

C	1	42	45.39	1	49	24.76	1	53	13.02
L			.41			78			.05
E			.38			78			.01
Mean	1	42	45.39	1	49	24.77	1	53	13.03
Prece		+	45.44		+	45.05		+	45.48
X	1	43	30.83	1	50	09.82	1	53	58.51
A	1	49	10	1	49	10	1	49	10
d-A	-	5	39.17	+	59.82		+	4	48.51
tan(d-A)		-	339.14	+	59.82		+	2	88.49
log...		2.53038			1.77685			2.46014	
cos S		9.98168			9.98813			9.98389	
S ₀		1.01930			0.27222			0.95127	
tan 3 _p		-10.4544		+	1.8716		+	8.9386	
3 ₁		-	60	+	8		+	20	
3		11.5396			23.8724			30.9406	
X		12.0392			23.9796			30.5748	
X-3		+	4996		+	1072		-3658	

C	+16	27	27.0	+13	15	56.2	+15	26	34.8
L			26.8			55.4			34.8
E			27.0			55.6			35.2
Mean	+16	27	26.9	+13	15	55.7	+15	26	34.9
Prece	+	4	12.5	+	4	09.1	+	4	06.9
S	+16	31	39.4	+13	20	04.8	+15	30	41.8
D	+15	00	20	+15	00	20	+15	00	20
S-D	+1	31	19.4	-1	40	15.2	+	30	21.8
tan(S-D)		+	54807		-6016.9		+	1821.8	
log...		3.73884			5.77937			3.26050	
" ₁₀		1.06999			1.11052			0.59165	
tan S		9.4724			9.3748			9.4433	
3 ₂		20386			0.5444			1.9025	
3 ₁		8.5644			6.9726			8.3992	
3 ₀		+11.7486		-	12.8980		+	3.9053	
3 ₁		+	367	+	9		+	251	
3 ₂		29.7853			5.1029			2.79304	
3 ₃		29.1742			5.7761			21.8495	
3 ₄		-6.1111		+	6.7333			-8.09	

455+ Standard Coordinates

Cepheus 255 mag 5.8				Cepheus 277 mag 6.1				Cepheus 282 mag 6.2				
C	1	42	45.39	1	49	24	76	1	53	13	02	
L			.41				78				.05	
E			.38				78				.01	
Unknown	1	42	45.39	1	49	24	77	1	53	13	03	
Proc		+	45.44		+	45.05			+	45.48		
X	1	43	30.83	1	50	09	82	1	53	58	51	
A	1	49	10	1	49	10		1	49	10		
x-A	-	5	39.17	+	59.82			+	4	48.51		
W(6-11)		-	339.14	+	59.82			+	288.49			
W(9)	2	53	03.8	1	77	68	5	2	46	07	4	
W(5)	9	98	16.8	9	98	81	3	9	98	38	9	
S ₀	1	01	93.0	0	27	22	2	0	95	12	7	
$\bar{X}_p$	-	10	45.44	+	187	16		+	8.9	38	6	
$\bar{X}_1$	-		60	+		8		+		20		
S		11.5	39.6		23.8	72	4		30.9	40	6	
X		12.0	39.2		23.9	79	6		30.5	74	8	
x-B	+	49	9.6	+	10	72			-	36	58	
C	+	16	27	27.0	+	13	15	56.2	+	15	26	37.8
L			26.8				55.4				34.8	
E			27.0				55.6				35.2	
Unknown	+	16	27	26.9	+	13	15	55.7	+	15	26	34.9
Proc		+	4	12.5	+	4	09.1		+	4	06.9	
S	+	16	31	39.4	+	13	20	04.8	+	15	30	41.8
D	+	15	00	20	+	15	00	20	+	15	00	20.
x-D	+	1	31	19.4	-	1	40	15.2	+	30		21.8
W(6-D)		+	54	80.7		-	60	16.9		+	18	21.8
L		3.7	38.84		3.7	79	37		3.2	60	50	
W		1.0	69.99		1.1	10	52		0.5	91	65	
$\bar{X}_S$		9.4	72.4		9.3	74	8		9.4	42	3	
S		20	38.6		0.5	44	4		1.9	02	5	
η_1		8.5	64.4		6.9	72	6		8.3	99	2	
η_0	+	11.7	48.6		-	12	89	80	+	3.9	05	3
η_1	+		36.7		+		9		+		25.1	
η		29	78.53			51	02.9			21	93	04
η		29	17.42			57	76.1			21	87	95

4
1
2
3
-5
6
7
8

1
-2
3
4
5
6
7
8

4554 Morris Center.

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	23.1251	+0.2531	-2	0.0640	3.4316	+32
2	22.8720	+0.0000	-2	0.0000	3.4295	+11
3	22.0000	-0.8720	-1	0.7606	3.4248	-41
4	21.2674	-1.6046	-1	2.5750	3.4399	+115
5	21.0196	-1.8524	0	3.4314	3.4314	+30
6	21.0206	-1.8514	0	3.4277	3.4326	+42
7	21.3655	-1.5065	+1	2.2692	3.4141	-143
8	22.0000	-0.8720	+1	0.7602	3.4262	-22

$$P^2 = 3.4284$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	14.0950	-1.8350	-1	3.3676	1.72
2	14.0782	-1.8518	-1	3.4295	1.80
3	14.2980	-1.6320	-1	2.6637	2.08
4	15.0000	-0.9300	0	0.8649	2.40
5	15.9300	0.0000	0	0.0000	2.70
6	16.0000	+0.0700	0	0.0049	2.73
7	17.0000	+1.0700	0	1.1449	3.05
8	17.5627	+1.6327	+1	2.6660	3.32

Range 160

Approx Center

$$x = 22 \quad y = 14.2980$$

$$17.5627$$

$$31.8607$$

$$y_0 = 15.9304$$

$$y = \min = 14.0782$$

$$R = 1.8522$$

$$x = \min = 21.0196$$

$$X = 22.8718$$

$$\begin{cases} X_0 = 22.8720 \\ Y_0 = 15.9300 \end{cases}$$

4554 Approx Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	23.1251	+0.2531	-2	0.0640	3.4316	+0.32
2	22.8720	+0.0000	-2	0.0000	3.4295	+0.14
3	22.0000	-0.8720	-1	0.7606	3.4243	-0.41
4	21.2674	-1.6046	-1	2.5750	3.4399	+1.15
5	21.0196	-1.8524	0	3.4317	3.4314	+0.30
6	21.0206	-1.8514	0	3.4277	3.4326	+0.42
7	21.3655	-1.5065	+1	2.2693	3.4141	-0.23
8	22.0000	-0.8720	+1	0.7602	3.4262	-0.22

$$R = 3 + 284$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	14.0950	-0.8550	-1	0.7310	1.72
2	14.0782	-1.8518	-1	3.4295	1.80
3	14.2980	-1.6320	-1	2.6637	2.08
4	15.0000	-0.9300	0	0.8649	2.40
5	15.9300	0.0000	0	0.0000	2.70
6	16.0000	+0.0700	0	0.0049	2.73
7	17.0000	+1.0700	0	1.1449	3.05
8	17.5627	+1.6327	+1	2.6666	3.32
					Range 1.60

Approx Center

$$x = 22 \quad y = 14.2980$$

$$17.5627$$

$$3.18607$$

$$y = 15.9304$$

$$y_{\text{min}} = 14.0782$$

$$R = 1.8522$$

$$x_{\text{min}} = 21.0196$$

$$X = 22.8718$$

$$\begin{cases} X_0 = 22.8720 \\ Y_0 = 15.9300 \end{cases}$$

Formation of Normals.

1	- 0.46	+	8.0	-	58.9
2	- 0.00	+	0.0	-	20.4
3	+ 1.42	+	35.7	+	67.8
4	+ 1.49	-	184.0	-	107.0
5	- 0.60	-	55.5	+	0.0
6	- 0.13	-	77.7	+	2.9
7	- 1.62	+	216.0	-	153.0
8	- 1.42	+	19.2	-	35.8
	- 0.72	-	38.3	-	304.4

-a	-b	+44 +ΔC
+ 7	- 29	+ 22 ^v
+ 0	- 29	+ 16 ¹⁵
- 24	- 26	- 6 ^v
- 45	- 14	- 15 ^v
- 52	+ 0	- 8 ^v
- 52	+ 1	- 7 ^v
- 42	+ 17	+ 19 ^v
- 24	+ 26	+ 46 ^v

4554 Moon's Center Conditional Equations

	O	C	O-C	Corr'
1	+0.25 - 1.84 = +32	-1 + 40 = +39	-7	+15"
2	+0.00 - 1.85 = +11	-0 + 40 = +40	-29	-13"
3	-0.87 - 1.63 = -41	+4 + 35 = +39	-80	-86"
4	-1.60 - 0.93 = +115	+7 + 20 = +27	+88	+73"
5	-1.85 + 0.00 = +30	+8 - 0 = +8	+22	+14"
6	-1.85 + 0.07 = +42	+8 - 2 = +6	+36	+29"
7	-1.51 + 1.07 = -143	+6 - 23 = -17	-126	-107"
8	-0.87 + 1.63 = -22	+4 - 35 = -31	+9	+55"
			+158 = 242	

Average = 50

Normal Equations

$$\begin{aligned}
 +13.29 - 0.72 &= -38 & -8.30 \\
 -0.72 + 14.14 &= -304 & -3.48 \\
 +0.72 - 0.04 &= -2 & -0.45 \\
 +14.10 &= -306 & -4.93 \\
 +13.29 &= -38 - 16 = -54 & a = -4.1 - 0.64
 \end{aligned}$$

Arc measured = 160° Average (O-C) = -11

$$\frac{pc}{n} = 20$$

$$-\frac{11}{20} = -0.55 \quad \Delta v = -0.7$$

$$\begin{aligned}
 -2RC &= +2.22 & +44 & \text{Corr.} = -0.6 \\
 & -16 & & \Delta R = -0.1 \\
 \Delta b &= -0.78 & \Delta \delta &= -0.4 \\
 \Delta a &= -1.42 & \Delta \alpha &= -0.05
 \end{aligned}$$

4554 Previous Center Conditional Equations

	0	C	0-C
1	+0.25 - 1.84 = +32	-1 + 40 = +39	-7
2	+0.00 - 1.25 = +11	-0 + 40 = +40	-29
3	-0.87 - 1.63 = -41	+3 + 35 = +39	-80
4	-1.60 - 0.93 = -11.5	+7 + 20 = +27	+88
5	-1.85 + 0.00 = +32	+8 - 0 = +8	+22
6	-1.85 + 0.07 = +42	+8 - 2 = +6	+36
7	-1.51 + 1.07 = +43	+6 - 23 = -17	-126
8	-0.87 + 1.63 = +22	+4 - 35 = -31	+9
			+153 = 272

Average 50

Normal Equations

$$+1329 - 072 = -38$$

$$-072 + 1414 = -304$$

$$+072 - 004 = -2$$

$$+1410 = -306$$

$$b = -217$$

$$+1329 = -38 - 16 = -54$$

$$a = -4.1$$

Arc measured = 160° Average (0-c) = -11

$$\frac{pc}{\mu} = 20$$

$$= \frac{11}{20}$$

$$+0.55$$

$$\Delta = +0.7$$

4554 Moon's mean position (1914.0)

$$\begin{array}{r} X_0 = 228720 \\ \frac{1}{2}a = -2 \\ \hline 228718 \end{array}$$

$$\begin{array}{r} Y_0 = 159300 \\ \frac{1}{2}b = -11 \\ \hline 159289 \end{array}$$

From plate constants $X = 227988$ $Y = 157777$

$$\begin{array}{r} \bar{z} = +0.7988 \\ \log \bar{z} = 9.90244 \\ \cos \delta = 9.98551 \\ \hline 8.50724 \end{array}$$

$$(\bar{z} - A) = 1.40969$$

$$\alpha - A = +2559$$

$$A = 14910$$

$$\alpha_0 = 1493559$$

$$\text{Red} = +0.50$$

$$Y' = 1493609$$

$$\eta = -2.2223$$

$$\begin{array}{r} \log \tan \delta = 9.4204 \\ 9.8049 \\ \hline 7.0584 \\ 6.2787 \end{array}$$

$$\eta_1 = +2$$

$$\log \eta_0 = -2.2225$$

$$\begin{array}{r} \log \eta_0 = 0.34684 \\ 7.33115 \end{array}$$

$$(\delta - D) = 301569$$

$$S - D = -1716.8$$

$$D = +150020$$

$$S_0 = +144303.2$$

$$\text{Red} = +8.5$$

$$S' = +144311.7$$

4.554 Moon's mean position (1917.0)

$$X_0 = 228730$$

$$Y_0 = 159300$$

$$\begin{array}{r} 228730 \\ - 2 \\ \hline 228718 \end{array}$$

$$\begin{array}{r} 159300 \\ - 11 \\ \hline 159289 \end{array}$$

From plate constant $x = 227988$ $y = 157777$

$$\bar{z} = +0.7988$$

$$\eta = -2.2223$$

$$\begin{array}{r} \log \bar{z} = 9.90244 \\ \log 5 = 9.69897 \\ \hline 8.50724 \end{array}$$

$$\begin{array}{r} \log \eta = 9.4201 \\ \log 5 = 9.69897 \\ \hline 7.0538 \end{array}$$

$$(z-A) = 1.40969$$

$$\eta = -2$$

$$z-A = +2.559$$

$$\log \eta = -2.2225$$

$$A = 1.4910$$

$$\begin{array}{r} \log \eta = 0.34684 \\ \log 5 = 9.69897 \\ \hline 7.33115 \end{array}$$

$$X_0 = 1.493559$$

$$\text{Red} = +0.50$$

$$(z-D) = 3.01569$$

$$Y' = 1.493609$$

$$S-D = -17.168$$

$$D = 15.0020$$

$$S_0 = 14.43032$$

$$\text{Red} = +8.5$$

$$S' = 14.43117$$

$$\begin{array}{r}
 1^h \ 40^m \ 51.52 \\
 \underline{51.02} \\
 + 0.50
 \end{array}$$

$$\begin{array}{r}
 + 8^{\circ} \ 43' \ 37.2 \\
 \underline{30.9} \\
 + 6.3
 \end{array}$$

$$\begin{array}{r}
 1 \ 49 \ 06.72 \\
 \underline{06.11} \\
 + 0.61
 \end{array}$$

$$\begin{array}{r}
 + 2 \ 45 \ 52.7 \\
 \underline{48.2} \\
 + 4.5
 \end{array}$$

$$\begin{array}{r}
 1 \ 49 \ 53.66 \\
 \underline{53.13} \\
 + 0.47
 \end{array}$$

$$\begin{array}{r}
 + 20 \ 28 \ 27.5 \\
 \underline{17.0} \\
 + 10.5
 \end{array}$$

+20 40 45 50
 +15
 +10 1.
 +5
 0

4554

Red. ad l. app

$$H + \Delta \quad 0^{\circ} \quad 54.7 = 13^{\circ} 40'$$

$$H + 23 \quad 051$$

$$\Delta \quad 1 \quad 49.6$$

$$g \quad 18 \quad 48.1$$

$$g + \Delta \quad 20 \quad 37.7 = 309^{\circ} 26'$$

$$l \cos(g + \Delta) \quad 98029$$

$$g \quad 09383$$

$$\sin \quad 9.8878^m$$

$$\tan \delta \quad 9.4194$$

$$8.8239$$

$$g' \quad 07412$$

$$g \quad 90694^m$$

$$l \quad +0.29$$

$$-0.12$$

$$+0.33$$

$$+0.50$$

$$S = +14^{\circ} 43' 03''$$

$$l \cos \delta \quad 9.9855$$

$$l \quad 0.3208^m$$

$$(i) \quad 0.3063^m$$

$$l \sin \delta \quad 9.4049$$

$$\cos(H + \Delta) \quad 9.9875$$

$$h \quad 1.3088$$

$$\sin \quad 9.3734$$

$$\sec \delta \quad 0.0145$$

$$8.8239$$

$$g'$$

$$h' \quad 0.7012$$

$$h \quad 9.5206$$

$$g' \quad +5.51$$

$$h' \quad +5.03$$

$$(i) \quad -2.02$$

$$+8.52$$

4.154

Read all steps.

$$H + A \quad 0 \quad 547 = 13^\circ 40'$$

$$H = 3 \quad 051$$

$$x \quad 1 \quad 49.6$$

$$y \quad 18 \quad 48.1$$

$$B + A \quad 20 \quad 377 = 309^\circ 26'$$

$$L \cos(9+x) \quad 98029$$

$$x \quad 09383$$

$$\sin \quad 98878 \sim$$

$$\tan \delta \quad 97194$$

$$88239$$

$$\delta' \quad 0.7452$$

$$\delta \quad 9.0694 \sim$$

$$f \quad +0.29$$

$$g \quad -0.12$$

$$b \quad +0.32$$

$$+0.50$$

$$S = +14^\circ 43' 05''$$

$$L \cos S \quad 99855$$

$$i \quad 0.3208 \sim$$

$$(i) \quad 0.3063 \sim$$

$$L \sin S \quad 94049$$

$$\cos(H+x) \quad 99879$$

$$h \quad 1.3028$$

$$\sin \quad 9.3737$$

$$\sec S \quad 00145$$

$$88239$$

$$\delta'$$

$$\delta' \quad 0.7012$$

$$h \quad 9.5206$$

$$g \quad +5.51$$

$$h' \quad +5.03$$

$$(i) \quad -2.02$$

$$+8.52$$

4554

Lunar Pavallay.

$$\begin{array}{r}
 \alpha' \quad 1^h \quad 49 \quad 36.09 \\
 \quad \quad 3 \quad 00 \quad 50.15 \\
 \alpha - \alpha' + 1 \quad 11 \quad 14.06 \\
 = + 17^{\circ} \quad 48' \quad 30''
 \end{array}$$

$$+ \quad \quad \quad 6 \quad 24$$

$$17 \quad 42 \quad 06$$

$$\begin{array}{r}
 995727 \\
 0.000000 \\
 0.02106 \\
 \hline
 9.97833
 \end{array}$$

$$\gamma \quad 43 \quad 34 \quad 17$$

$$S \quad +14 \quad 43 \quad 12$$

$$\gamma - S = 28 \quad 51 \quad 05$$

$$\begin{array}{r}
 982640 \\
 820123 \\
 9.68353 \\
 0.16162 \\
 \hline
 7.87278
 \end{array}$$

$$S - S' = +25 \quad 38.9$$

$$S \quad +15 \quad 08 \quad 50.6$$

$$\text{Nant. } S = +15 \quad 08 \quad 48.0$$

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

$$\text{curr.} = +0.1$$

$$\text{Lrr.} \quad -0.4$$

$$S = +15 \quad 08 \quad 50.2$$

$$O - C = +2.2$$

$$S' = +14^{\circ} \quad 43' \quad 11.7''$$

$$\Pi = 54' \quad 38'' \quad 48$$

$$\begin{array}{r}
 9.86913 \\
 8.20123 \\
 9.48549 \\
 0.01535 \\
 \hline
 7.57120
 \end{array}$$

$$\alpha - \alpha' = +12' \quad 48.43$$

$$= + \quad 51.23$$

$$\alpha \quad 1 \quad 50 \quad 27.32$$

$$\alpha \quad 1 \quad 50 \quad 26.57$$

$$+0.75$$

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

$$\text{Lrr.} \quad -0.04$$

$$\alpha = 1 \quad 50 \quad 27.28$$

$$O - C = +0.71$$

4554

human Parallax

$$\alpha \quad 1^{\circ} 49' 36.09''$$

$$\delta \quad 3^{\circ} 00' 50.15''$$

$$\mu_{\alpha} + 1 \quad 1.1 \quad 14.06$$

$$+ 17^{\circ} 48' 30''$$

$$- \quad \quad \quad 6 \quad 24$$

$$17 \quad + 2 \quad 06$$

$$995727$$

$$000000$$

$$002106$$

$$997833$$

$$\chi \quad 43 \quad 34 \quad 17$$

$$S \quad 1.4 \quad 43 \quad 12$$

$$\mu_{\alpha} - 28 \quad 51 \quad 05$$

$$982640$$

$$820123$$

$$968353$$

$$016102$$

$$787278$$

$$S - S \quad + 25 \quad 28.9$$

$$S \quad + 15 \quad 08 \quad 50.6$$

$$\text{Parallax } S \quad + 15 \quad 08 \quad 48.0$$

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

$$2m. \quad - 14$$

$$S. \quad + 15 \quad 08 \quad 50.2$$

$$O - C \quad + 2.2$$

$$S \quad 114^{\circ} 43' 11.7''$$

$$\mu_{\alpha} \quad 54' 38.48''$$

$$986913$$

$$820123$$

$$948549$$

$$001535$$

$$757120$$

$$\mu_{\alpha} - 12' + 8.73''$$

$$+ \quad 51.23''$$

$$\alpha \quad 1 \quad 50 \quad 27.32$$

$$\chi \quad 1 \quad 50 \quad 26.17$$

$$+ 0.75$$

$$2m. \quad - 0.04$$

$$\alpha \quad 1 \quad 50 \quad 27.28$$

$$O - C \quad + 1.71$$

4
1
11
28
3
3
30
20
1
22
13
12
1
2
22
13

4555

Stars measured.

1915 Apr. 23.

	a	n	d	n
1	20694	17078	14380	10320
11.7	1396371	1382126	1382007	3131
251	64	20	1007	9765
	00	90		
	<u>11.6732</u>	<u>.6740</u>	<u>28.0568</u>	<u>.0566</u>
2	19359	17170	19808	19270
233	1621418	1032020	1474429	14320
4.5	19	22	35	4030
	60	92	95	80
	<u>23.3142</u>	<u>.3136</u>	<u>4.5063</u>	<u>.5058</u>
3	19170	17620	19101	16629
201	1803338	876868	1414845	11600
205	40	66	36	940
	69	32	89	40
	<u>20.1133</u>	<u>.1136</u>	<u>20.4952</u>	<u>.4960</u>

Density 2

Moon measured.

1			
22.9		18526	19621
13.4		16372	11780
min		6866	7068
in		29	14
8		<u>13.2158</u>	<u>2158</u>
2 scratch			
22.5	18160	18980	19049
13.3	12940	1421010	1167060
	3840	18	6060
	70	94	47
	<u>22.5226</u>	<u>.5226</u>	<u>2016</u>

Star measures

	a	n	a	n
1	20694	17078	14380	10320
117	1396371	1382120	1382007	3131
281	64	20	1007	9765
	00	90		
	<u>11.6732</u>	<u>6740</u>	<u>28.0568</u>	<u>0.566</u>
2	19359	17170	19808	19270
123	1621418	1032020	14744	14330
45	19	22	35	4030
	60	92	95	80
	<u>23.3142</u>	<u>3136</u>	<u>7.5063</u>	<u>5058</u>
3	19170	17620	19101	16629
101	1803338	876868	1414845	11608
241	40	66	36	97
	69	32	89	40
	<u>30.1133</u>	<u>1136</u>	<u>20.4952</u>	<u>4960</u>

Accuracy 2

Lower measures

1				
229			18526	19621
134			16372	11780
111			6866	706
8			29	14
			<u>13.2158</u>	<u>2158</u>
3	Scratch			
125	18160	18980	17990	19049
133	12940	1421010	15380	1167560
	38	18	7972	60
	70	94	19	47
	<u>22.5626</u>	<u>5226</u>	<u>13.2620</u>	<u>2016</u>

4555 d moons measures 1915 Apr 23.
 3/20 13.5
 16924 19015
 12220 13722
 09 2029
 14 16
134701 4709

4
 21.5 15809 19956
 14.0 1161123 1415045-
 10 50
 23 60
21.4200 4190

5
 21.1 10829 1281210
 15.0 9972 1010
 7280 11958
 21.0854 0853

6
 21.4 20030 17085
 16.0 1667180 1044149
 71 50
 30 98
21.3356 3353

7
 22.0 20258 18120
 16.6 1357069 1479086
 70 9886
 59 30
16.6689 6664

8 scratch
 22.3 19286 18448
 16.5 16620 1112030
 29 3030
 95 60
222665 2670
 19219 18569
 11291 1650000
 9190 0100
 22 60
16.7930 7933

455-1

Account Measures 1915 Apr 23

3

135

16928

122025

69

14

134701

19015

13722

2029

16

4709

4

15 15809

140 1161123

10

23

21.4200

19956

1415045

50

60

4190

5

211 10829

150 9972

7280

21.0854

1281210

1010

11958

0553

6

214 20030

160 1667180

71

30

21.3356

17085

1044145

50

98

3353

7

220

166

20258

1357069

70

59

16.6689

18120

1479026

98

30

6667

8 scratch

223 19286

148 16620

29

95

22.2665

18448

1112030

30

60

2670

19219

11291

9190

22

16.7930

18569

1650000

0100

60

7933

4555 Times etc.
Exp. to stars 1914 Jan 5
Moon
Clock fast

3^h 11^m - 3^h 23^m
3 17 26.4 - 3 17 26.7
0 00.2

H. Sid T.

3 17 26.35 $\odot - X = +1^m 27^m$

H. long

4 44 31.05

G. Sid T.

8 01 57.4

Sid T. Moon

18 56 56.42

Intervals

13 05 00.98

Red.

2 08.61

G. M. T.

13 02 52.37

From least count

R.A.

Decl.

Moon 13^h

1 50 52.45 + 15 11 37.5

Motion in 1^m 1.8916

12.380

2.873

+ 5.43

+ 35.6

Tabular place

1 50 57.88 + 15 12 13.1

Moon's age 9 days

parallax

54' 38" 70

semidiam

14 550

R

8950

934 = 13.2

895 = 12.2

Augmentation

+ 12.2

Irradiation (2)

- 0.1

9071

R =

1.9445

AR =

- 930

(14a) R =

1.8515

R²

34280

a = -502.5

+ 24

478.5

4555 Times etc.
Exp. Wilson 1914 Jan 5
- known
Clock fast

3^h 1 1^m - 3^h 2 3^m
3 17 26.4 - 3 17 26.7
0 00.2

H. Sid T.

3 17 26.35

3 - 15 + 1 27

Whomp

4 44 31.05

S. Sid T.

8 01 57.4

Sid T. known

18 56 56.42

Intervals

13 05 00.98

Reck.

2 08.61

S. M. T.

13 02 52.37

Trans. Kant. Rem.

R.A.

Decl.

known 13^h

1 50 52.45 + 15 11 37.5

known 1.8916

12.380

2.873

+ 5.43

+ 35.6

Tabular place

1 50 57.88 + 15 12 13.1

known's angle 9 days

parallax

54' 38.70

semidiameter

14 55.0

R

8950

934 = 13.2

895 = 12.2

Augmentation

+ 12.2

Irradiation (2)

- 0.1

907.1

R

1944.5

at R =

- 930

(1 + a) R

1851.5

R

3428.0

a = 5.25

38

178.5

4555

Plate Constants

$$\begin{array}{rcl}
 x & 11.6736 & 233139 \quad 301134 \\
 y & 11.5396 & 238724 \quad 309406 \\
 z & 41340 & -5585 \quad -8272
 \end{array}$$

$$\begin{array}{rcl}
 x & 280567 & 45060 \quad 204956 \\
 y & 297853 & 51029 \quad 219304 \\
 z & -17286 & -5969 \quad -14348
 \end{array}$$

$$\begin{array}{rcl}
 x-3 & +500x & -46y \quad +3.5x \\
 +1340 + 5837 = +7177 & -1291 = +5886 & +41 = +5927 \\
 -5585 + 11657 = +6072 & -207 = +5865 & +82 = +59 \\
 -8272 + 15057 = +6785 & -943 = +5842 & +105 = +5947
 \end{array}$$

$$\begin{array}{rcl}
 x-3 & +500x & -456y \quad +2.5x \quad -5921 \\
 +1340 + 5837 = +7177 & -1280 = +5897 & +29 = +5926 & = +1 \\
 -5585 + 11657 = +6072 & -205 = +5867 & +58 = +5925 & = 0 \\
 -8272 + 15057 = +6785 & -935 = +5850 & +75 = +5925 & = 0 \\
 229342 + 11467 & -687 & +57 & = 23.4254
 \end{array}$$

$$\begin{array}{rcl}
 y-2 & +500y & +47.2x \quad +37y \quad +2598 \\
 -17286 + 14028 = -3258 & +5512 & -2707 + 109 = -2598 & = 0 \\
 -5969 + 2253 = -3716 & +1100 = -2616 & +18 = -2598 & = 0 \\
 -14348 + 10248 = -4100 & +1421 = -2679 & +80 = -2599 & = -1 \\
 150677 + 7534 & +1082 & +59 & = 16.1950
 \end{array}$$

$$\text{Tables } a = +0.4 \quad e = 0.3 \quad a-e = +0.7 \quad b+d = -1.0$$

$$\text{Obs } a = -502.5 \quad e = -503.9 \quad a-e = +1.4 \quad b+d = -1.6$$

$$0-e = -502.9'' - 503.6'' \quad -0.6''$$

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Plate Constant

$$\begin{array}{rcl}
 x & 11.6736 & 23.3189 \quad 30.1134 \\
 y & 11.5296 & 23.8724 \quad 30.9406 \\
 z & +1.340 & -5.585 \quad -8.272
 \end{array}$$

$$\begin{array}{rcl}
 x & 28.0567 & 4.5060 \quad 20.4956 \\
 y & 29.7853 & 5.1029 \quad 21.9304 \\
 z & -1.7286 & -5.969 \quad -1.4348
 \end{array}$$

$$\begin{array}{rcl}
 x-3 & +500x & -46y \quad +35z \\
 +1340 & +5837 & +7177 \quad -1291 \quad +5886 \quad +41 \quad +5927 \\
 -5585 & +11657 & +6072 \quad -2057 \quad +5865 \quad +82 \quad +19 \\
 -8272 & +15057 & +6785 \quad -935 \quad +5892 \quad +105 \quad +5447
 \end{array}$$

$$\begin{array}{rcl}
 x-3 & +500x & -46y \quad +35z \quad -5921 \\
 +1340 & +5837 & +7177 \quad -1291 \quad +5886 \quad +41 \quad +5927 \quad : +1 \\
 -5585 & +11657 & +6072 \quad -2057 \quad +5865 \quad +82 \quad +19 \quad : 0 \\
 -8272 & +15057 & +6785 \quad -935 \quad +5892 \quad +105 \quad +5447 \quad : 0 \\
 229342 & +11467 & -687 \quad +57 \quad : 234254
 \end{array}$$

$$\begin{array}{rcl}
 y-27 & +501y & +472x \quad +31z \quad +2598 \\
 -17286 & +140285 & -3258 \quad +5514 \quad -2707 \quad +109 \quad -2598 \quad : 0 \\
 -5467 & +22535 & -3716 \quad +1100 \quad -2414 \quad +18 \quad -2598 \quad : 0 \\
 -14348 & +10248 & -4100 \quad +1421 \quad -2679 \quad +80 \quad -2598 \quad : -1 \\
 150677 & +7534 & +1082 \quad +59 \quad : 16.1950
 \end{array}$$

$$\text{Obs } a = -5025 \quad b = -5039 \quad a-b = +14 \quad b+a = -16$$

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~~Rowin mean Position Center~~

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	22.9380	0.0000	-2	0.0000	3.4347	+67
2	22.5226	-0.4154	-2	0.1727	3.4390	+110
3	22.0000	-0.9380	-2	0.8802	3.4357	+77
4	21.4195	-1.5185	-1	2.3062	3.4490	+210
5	21.0854	-1.8526	0	3.4321	3.4369	+89
6	21.3354	-1.6026	+1	2.5680	3.4348	+68
7	22.0000	-0.9380	+2	0.8794	3.4356	+76
8	22.2668	-0.6712	+2	0.4502	3.4234	-46

3.4280

	y	$y - y_0$	Δy	$(y - y_0)^2$	
-1	13.2158	-1.8532	-1	3.4347	180
2	13.2618	-1.8072	-1	3.2663	193
3	13.4705	-1.5985	-1	2.5555	210
4	14.0000	-1.0690	0	1.1428	235
5	15.0000	-0.0690	0	0.0045	267 270
6	16.0000	+0.9310	0	0.8668	300
7	16.6677	+1.5987	+1	2.5562	330
8	16.7932	+1.7242	+1	2.9732	339

Range 159

$$\begin{aligned}
 x &= 22 & y &= 13.4705 \\
 & & & \underline{16.6677} \\
 & & & 30.1382 \\
 y_0 &= 15.0691 \\
 y_{\min} &= 13.2158 \\
 R &= 1.8533 \\
 x_{\min} &= 21.0854 \\
 x_0 &= 22.9387
 \end{aligned}$$

$$\begin{cases}
 x_0 = 22.9380 \\
 y_0 = 15.0690
 \end{cases}$$

4155 ~~Two new mean position center~~

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 (y - y_0)^2$	$O - C$
1	22.9380	0.0000	-2	0.0000	3.4347	+67
2	22.5226	-0.4154	-2	0.1727	3.4340	+110
3	22.0000	-0.9380	-2	0.8802	3.4357	+77
4	21.4195	-1.5185	-1	2.3062	3.4490	+210
5	21.0854	-1.8526	0	3.4321	3.4369	+89
6	21.3354	-1.6026	+1	2.5680	3.4348	+68
7	22.0000	-0.9380	+2	0.8794	3.4356	+76
8	22.2668	-0.6712	+2	0.4502	3.4234	-46

34280

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	13.2158	-1.8532	-1	3.4347	180
2	13.2618	-1.8072	+1	3.2663	193
3	13.4705	-1.5985	-1	2.5555	210
4	14.0000	-1.0690	0	1.1428	235
5	15.0000	-0.0690	0	0.0045	267
6	16.0000	+0.9310	0	0.8668	300
7	16.6677	+1.5987	+1	2.5562	320
8	16.7932	+1.7242	+1	2.9732	339

Range 159

$$\begin{aligned}
 n &= 22 & y &= 13.4705 \\
 & & 16.6677 \\
 & & \hline
 & & 30.1382 \\
 y_0 &= 15.0691 \\
 y_{\text{mean}} &= 13.2158 \\
 R &= 1.8533 \\
 x_{\text{mean}} &= 21.0854 \\
 x_0 &= 22.9387
 \end{aligned}$$

$$\begin{aligned}
 \sum & \\
 X_0 &= 22.9380 \\
 Y_0 &= 15.0690
 \end{aligned}$$

Formation of waveals

1	- 0.00	+ 0.0	- 123.8
2	+ 0.76	= 46.2	- 201.0
3	+ 1.50	= 72.5	- 123.1
4	+ 1.63	= 319.0	- 224.5
5	+ 0.13	= 164.8	= 6.2
6	- 1.49	= 108.8	+ 63.2
7	- 1.50	= 71.5	+ 121.7
8	- 1.15	= 30.8	+ 79.0
	- 0.12	- 813.6	- 414.7

- a	- b	+ 44 + ΔC
- 0	- 11	+ 33
- 14	- 11	+ 19
- 31	- 10	+ 3
- 50	- 6	- 12
- 61	- 0	- 17
- 53	+ 5	- 14
- 31	+ 10	+ 23
- 22	+ 10	+ 32

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Moon's Center - Conditional Equations

	ϕ	C	$O-C$	Corr
1	$0.00 - 1.85 = +67$	$- 0.447 = +47$	$+20$	$+53$
2	$-0.42 - 1.812 = +110$	$+ 32 + 46 = +78$	$+32$	$+51$
3	$-0.94 - 1.60 = +77$	$+ 72 + 40 = +112$	-35	-33
4	$-1.52 - 1.07 = +210$	$+ 116 + 27 = +143$	$+67$	$+55$
5	$-1.85 - 0.07 = +89$	$+ 142 + 2 = +144$	-55	-72
6	$-1.60 + 0.93 = +68$	$+ 122 - 24 = +98$	-30	-44
7	$-0.94 + 1.60 = +76$	$+ 72 - 40 = +32$	$+44$	$+67$
8	$-0.67 + 1.72 = -46$	$+ 51 - 43 = +8$	-54	-22
				$+163 - 174$

Average: 42

Normal Equations

$$\begin{aligned}
 +10.69 - 0.12 &= -814 & -7.94 \\
 -0.12 + 16.80 &= -415 & -2.15 \\
 +0.12 - 0.00 &= -9 & -0.09 \\
 +16.80 &= -424 & -2.246 = -25.2 - 0.13 \\
 +10.69 &= -814 - 3 = -817 & \alpha = -76.5 - 0.74
 \end{aligned}$$

Arc measured: 159° Average $(O-C) = -1.4$

$$\frac{pc}{n} = 19$$

$$-\frac{1.4}{19} = -0.07 \quad \Delta\alpha = -0.1$$

$$-2RC_2 + 2.22 + 44.$$

$$\text{Corr.} = -0.6$$

$$\Delta b = -0.29$$

$$\Delta \delta = -0.1$$

$$\Delta R = +0.5$$

$$\Delta a = -1.64$$

$$\Delta \alpha = -0.06$$

$$-33.$$

Red ad locus - ft.

S: +14 46 18

$$H+R \quad 0 \quad 55.0 = 13^{\circ} 45'$$

$$H \quad 23 \quad 05.6$$

$$R \quad 1 \quad 19.9 \text{ ~~55.4~~}$$

$$G \quad 18 \quad 48.1$$

$$H+R \quad 20 \quad 38.0 = 309^{\circ} 30'$$

$$L_{\text{cos}}(G+R) \quad 98035$$

$$G \quad 09383$$

$$H+R \quad 98874$$

$$L_{\text{cos}} \quad 97211$$

$$8.8239$$

$$8' \quad 07418$$

$$8 \quad 90707$$

$$f \quad +0.29$$

$$8 \quad -0.12$$

$$L \quad +0.33$$

$$T0.50$$

$$L_{\text{cos}} \quad 99854$$

$$L \quad 0.3208$$

$$G \quad 0.3062$$

$$L_{\text{cos}} \quad 94065$$

$$L_{\text{cos}}(H+R) \quad 99874$$

$$R \quad 13088$$

$$L_{\text{cos}} \quad 93760$$

$$L_{\text{cos}} \quad 00846$$

$$8.8239$$

$$L' \quad 07027$$

$$L \quad 9.5233$$

$$S' \quad +5.52$$

$$L' \quad +5.04$$

$$(i) \quad -2.02$$

$$+8.54$$

4555

Moria Center

Conditional Equations

1	000	-185	=	+67	-	0	+47	=	+47
2	-042	-181	=	+110	+	32	+46	=	+78
3	-094	-160	=	+77	+	72	+40	=	+112
4	-152	-107	=	+210	+	116	+27	=	+143
5	-185	-007	=	+89	+	142	+2	=	+144
6	-160	+093	=	+68	+	122	-24	=	+98
7	-094	+160	=	+76	-	72	-40	=	+32
8	-067	+172	=	-46	+	51	-43	=	+8
									+163-174

Normal Equations

Average 42

$$+10.69 - 0.12 = -814$$

$$- 0.12 + 16.80 = -415$$

$$+ 0.12 - 0.00 = -9$$

$$+ 16.80 = -424$$

$$b = -25.2$$

$$+10.69 = -814 - 3 = -817$$

$$a = -76.5$$

Arc measured 159° Arc of 0-01 = -1.4

$$\frac{1.4}{19} = 0.07$$

$$- \frac{1.4}{19} = -0.07$$

$$A = -0.1$$

Red ad locus mpts

$$S = +14 \quad 46 \quad 18$$

$$H + \alpha \quad 0^h \quad 55.0^m = 13^\circ 45'$$

$$H \quad 23 \quad 05.6$$

$$a = 1 \quad 49.9 \quad \text{---}$$

$$g \quad 18 \quad 45.1$$

$$g + \alpha \quad 20 \quad 38.0 = 809^\circ 30'$$

$$\begin{aligned} \cos(g + \alpha) & 9.8035 \\ -\gamma & 0.9383 \\ \sin & 9.8874 \\ \tan S & 9.4211 \\ & 8.8239 \end{aligned}$$

$$\begin{aligned} 8' & 0.7418 \\ 8 & 90707m \end{aligned}$$

$$\begin{aligned} f & +0.29 \\ 8 & -0.12 \\ u & +0.333 \\ \hline & 70.50 \end{aligned}$$

$$\begin{aligned} \cos S & 9.9854 \\ i & 0.3208m \\ (i) & 0.3062m \end{aligned}$$

$$\begin{aligned} \sin S & 9.4065 \\ \cos(H + \alpha) & 9.9874 \\ e & 1.3088 \\ \sin & 9.3760 \\ \sec S & 0.0746 \\ & 8.8239 \end{aligned}$$

$$\begin{aligned} h' & 0.7027 \\ h & 9.5233 \end{aligned}$$

$$\begin{aligned} 8' & +5.52 \\ 8' & +5.04 \\ (i) & -2.02 \\ \hline & +8.54 \end{aligned}$$

4555

$$X_0 = 22.9380$$

$$\frac{1}{2}a = \frac{-38}{229342}$$

$$Y_0 = 15.0690$$

$$\frac{1}{2}b = \frac{-13}{150677}$$

From plate constants $X = 23.4254$ $Y = 16.1950$

$$\bar{z} = +1.4254$$

$$\log \bar{z} = 0.15393$$

$$\cos \delta = 9.98540$$

$$8.50724$$

$$\log(\delta - \delta_0) = 1.66129$$

$$\alpha - A = + 45.845$$

$$A = 1 \quad 49 \quad 10$$

$$\alpha_0 = 1 \quad 49 \quad 55.845$$

$$\text{Red} \quad + \quad 0.503$$

$$\alpha' = 1 \quad 49 \quad 56.35$$

$$\eta = -1.8050$$

$$\log \tan \delta = 9.4230$$

$$03079$$

$$7.0534$$

$$67848$$

$$\eta_1 = + 6$$

$$\eta_0 = -1.8056$$

$$\log \eta_0 = 0.25662$$

$$7.33115$$

$$292547$$

$$\delta - D = - 14 \quad 02.3$$

$$D = +15 \quad 00 \quad 20$$

$$\delta_0 = +14^\circ 46' 17.7$$

$$\text{Red} \quad + \quad 8.5$$

$$\delta' = +14 \quad 46 \quad 26.2$$

4555"

$$\begin{array}{r} X_0 = 229380 \\ - 38 \\ \hline 229342 \end{array}$$

$$\begin{array}{r} Y_0 = 150690 \\ - 13 \\ \hline 150677 \end{array}$$

From plate constants $X = 23.4254$ $Y = 16.1950$

$$\bar{z} = +14254$$

$$\eta = -18050$$

$$\log \bar{z} = 0.15393$$

$$\cos \delta = 998540$$

$$850724$$

$$\log \tan \delta = 9.4230$$

$$03079$$

$$70534$$

$$67848$$

$$\log \delta = 1.66129$$

$$q - A = + 45845$$

$$\eta_1 = + 6$$

$$\eta_0 = -18056$$

$$A = 14910$$

$$\log \eta = 0.25662$$

$$7.33115$$

$$292547$$

$$X_0 = 14955845$$

$$\log \delta = + 0.50$$

$$\delta - D = - 14023$$

$$X' = 1495635$$

$$D = +150020$$

$$S_0 = +14^{\circ} 46' 17.7$$

$$\text{Red} + 85$$

$$S' = +14^{\circ} 46' 26.2$$

4555

Lunar parallax.

$$\begin{array}{r}
 \alpha' \quad 1 \quad 49 \quad 56.35 \\
 \theta \quad 3 \quad 17 \quad 26.35 \\
 \text{C.A.} = +1 \quad 27 \quad 30.00 \\
 = +21^\circ \quad 52' \quad 30''
 \end{array}$$

$$\begin{array}{r}
 4 \quad 7 \quad 48 \\
 + 21 \quad 44 \quad 42
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 1.00000 \\
 0.03205 \\
 \hline
 9.98932
 \end{array}$$

$$f = 44 \quad 17 \quad 44$$

$$14 \quad 46 \quad 26$$

$$29 \quad 31 \quad 18$$

$$\begin{array}{r}
 9.82640 \\
 8.20126 \\
 9.69263 \\
 0.15592 \\
 \hline
 7.87621
 \end{array}$$

$$\delta - \delta' = +25^\circ \quad 51.1$$

$$\delta = +15 \quad 12 \quad 17.3$$

$$\text{Naut. Alt. } \delta = +15 \quad 12 \quad 13.1$$

$$O-C \quad + \quad 4.2$$

$$\begin{array}{r}
 \text{Curr.} \quad + \quad 0.1 \\
 - \quad 0.1
 \end{array}$$

$$\delta = +15 \quad 12 \quad 17.2$$

$$O-C \quad + \quad 4.1$$

$$\delta' \quad +14^\circ \quad 46' \quad 26.2$$

$$\Pi = 54' \quad 38.70$$

$$\begin{array}{r}
 9.86913 \\
 8.20126 \\
 9.57122 \\
 0.01548 \\
 \hline
 7.65709
 \end{array}$$

$$a - \alpha' = + \quad 15 \quad 36.52$$

$$= + \quad 1^\circ \quad 02.43$$

$$\alpha = 1 \quad 50 \quad 58.78$$

$$\alpha = 1 \quad 50 \quad 57.88$$

$$+ 0.90$$

$$\begin{array}{r}
 \text{Curr.} \quad + \quad 0.02 \\
 \text{Inv.} \quad - \quad 0.06
 \end{array}$$

$$\alpha = 1 \quad 50 \quad 58.72$$

$$O-C \quad + \quad 0.84$$

43-55

human parallax.

$$\begin{array}{r}
 \alpha' \quad 1 \quad 49 \quad 56.35 \\
 \beta \quad 3 \quad 17 \quad 46.35 \\
 \gamma \quad 1 \quad 27 \quad 30.00 \\
 = + 21^\circ 52' 30''
 \end{array}$$

$$7 \quad 48$$

$$- 21 \quad 44 \quad 42$$

$$9.95727$$

$$000000$$

$$000205$$

$$798932$$

$$f = 44 \quad 17 \quad 44$$

$$1.4 \quad 46 \quad 26$$

$$29 \quad 31 \quad 18$$

$$9.82640$$

$$820126$$

$$969263$$

$$015592$$

$$787621$$

$$s-s' \quad + 25 \quad 51.1$$

$$s \quad + 15 \quad 12 \quad 17.3$$

$$\text{hand ellips: } + 15 \quad 12 \quad 13.1$$

$$o-c \quad + 42$$

$$- 0.1$$

$$s \quad + 15 \quad 12 \quad 17.2$$

$$o-c \quad + 41$$

$$s' \quad + 14 \quad 46 \quad 26.2$$

$$\pi \quad 54 \quad 38 \quad 70$$

$$9.86913$$

$$820126$$

$$957122$$

$$001548$$

$$765709$$

$$1-\pi' \quad + 15 \quad 36.52$$

$$= + 1 \quad 02 \quad 43$$

$$\alpha \quad 1 \quad 50 \quad 58.78$$

$$\alpha \quad 1 \quad 50 \quad 57.88$$

$$+ 0.90$$

curr

$$242 \quad - 0.16$$

$$\alpha \quad 1 \quad 50 \quad 58.72$$

$$o-c \quad + 1.84$$

