

KG
11366
v. 965

LXXXVIII

4571

4572

4588

Harvard Lunar Plates

Measurements and Reductions

Mary Fowler

Vol. 88

Plate	Date	Page
4571	1914 Jan 6	1
4572	1914 ... 6	11
4588	~~Jan~~ 1914 Jan 10	20

4571

Stellar Measures

1915 ~~Apr~~ May 27

$$\begin{array}{r} \text{d} \\ 150 \quad 954.1 \\ 224 \quad 923.5 \\ \hline 29 \quad 26 \end{array}$$

$$\underline{150311}$$

$$\begin{array}{r} \text{d} \\ 10210 \\ 1820 \\ \hline 9694 \end{array}$$

$$\underline{0322}$$

$$\begin{array}{r} \text{d} \\ 19392 \\ 15879 \\ \hline 6972 \\ 04 \\ \hline 22.3523 \end{array}$$

$$\begin{array}{r} \text{d} \\ 17377 \\ 10910 \\ \hline 0309 \\ 77 \\ \hline 3536 \end{array}$$

$$\begin{array}{r} \text{d} \\ 217 \quad 20175 \\ 69 \quad 12686 \\ \hline 81 \\ 88 \\ \hline 21.7505 \end{array}$$

$$\begin{array}{r} \text{d} \\ 20168 \\ 17673 \\ \hline 7078 \\ 87 \\ \hline 7501 \end{array}$$

$$\begin{array}{r} \text{d} \\ 13940 \\ 4940 \\ \hline 13377 \\ \hline 6.9434 \end{array}$$

$$\begin{array}{r} \text{d} \\ 13951 \\ 13390 \\ \hline 8989 \\ \hline 9434 \end{array}$$

$$\begin{array}{r} \text{d} \\ 338 \quad 19519 \\ 165 \quad 10842 \\ \hline 29 \\ \hline 33.8701 \end{array}$$

$$\begin{array}{r} \text{d} \\ 19330 \\ 18038 \\ \hline 3140 \\ 46 \\ \hline 8704 \end{array}$$

$$\begin{array}{r} \text{d} \\ 18612 \\ 14260 \\ \hline 6052 \\ 09 \\ \hline 16.4354 \end{array}$$

$$\begin{array}{r} \text{d} \\ 19031 \\ 13398 \\ \hline 9800 \\ 47 \\ \hline 4359 \end{array}$$

- moon -

$$\begin{array}{r} \text{d} \\ 23.6 \\ 13.9 \\ \hline 10.7 \end{array}$$

$$\begin{array}{r} \text{d} \\ 18750 \\ 947182 \\ \hline 6082 \\ 59 \\ \hline 13.9287 \end{array}$$

$$\begin{array}{r} \text{d} \\ 16090 \\ 1532971 \\ \hline 6471 \\ 09 \\ \hline 9279 \end{array}$$

$$\begin{array}{r} \text{d} \\ 230 \\ 14.1 \end{array}$$

$$\begin{array}{r} \text{d} \\ 11934 \\ 11689 \\ \hline 8789 \\ \hline 14.0246 \end{array}$$

$$\begin{array}{r} \text{d} \\ 12569 \\ 6666 \\ \hline 12304 \\ \hline 10263 \end{array}$$

$$\begin{array}{r} \text{d} \\ 21.8 \quad 17469 \\ 15.0 \quad 8452 \\ \hline 5551 \\ 88 \\ \hline 21.9024 \end{array}$$

$$\begin{array}{r} \text{d} \\ 16871 \\ 1591105 \\ \hline 0805 \\ 85 \\ \hline 9036 \end{array}$$

4571

Star Measures

1914phae.27

$$\begin{array}{r} \text{d} \\ 150 \quad 9541 \\ 224 \quad 923526 \\ \quad 29 \\ \hline 150311 \end{array}$$

$$\begin{array}{r} \text{v} \\ 10210 \\ 1820 \\ 9894 \\ \hline 0322 \end{array}$$

$$\begin{array}{r} \text{d} \\ 19392 \\ 15879 \\ 6972 \\ 84 \\ \hline 22.3523 \end{array}$$

$$\begin{array}{r} \text{v} \\ 17377 \\ 10910 \\ 0309 \\ 77 \\ \hline .3136 \end{array}$$

$$\begin{array}{r} 2 \quad 20178 \quad 20168 \\ 217 \quad 126861 \quad 1767378 \\ 69 \quad 81 \quad 7078 \\ \quad 88 \quad 87 \\ \hline 21.7505 \quad .7501 \end{array}$$

$$\begin{array}{r} 13940 \\ 4940 \\ 13377 \\ 69434 \\ \hline \end{array}$$

$$\begin{array}{r} 13951 \\ 1339089 \\ 8989 \\ \hline .9434 \end{array}$$

$$\begin{array}{r} 3 \quad 19519 \quad 19330 \\ 338 \quad 1082729 \quad 18038 \\ 165 \quad 2129 \quad 3140 \\ \quad 29 \quad 46 \\ \hline 33.8701 \quad .8704 \end{array}$$

$$\begin{array}{r} 18612 \\ 1426052 \\ 6052 \\ 09 \\ \hline 16.4354 \end{array}$$

$$\begin{array}{r} 19031 \\ 13398 \\ 9800 \\ 47 \\ \hline .4359 \end{array}$$

$$\begin{array}{r} 1 \\ 236 \\ 139 \\ 114 \\ \hline \end{array}$$

$$\begin{array}{r} 18750 \\ 947182 \\ 6052 \\ 59 \\ \hline 13.9287 \end{array}$$

$$\begin{array}{r} 16090 \\ 1537571 \\ 6471 \\ 09 \\ \hline 9279 \end{array}$$

$$\begin{array}{r} 2 \\ 230 \\ 141 \\ \hline \end{array}$$

$$\begin{array}{r} 11934 \\ 11689 \\ 8789 \\ \hline \end{array}$$

$$\begin{array}{r} 1256966 \\ 6666 \\ 12304 \\ \hline \end{array}$$

$$\begin{array}{r} 14.0246 \\ \hline \end{array}$$

$$\begin{array}{r} .0263 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \quad 17469 \quad 16871 \\ 218 \quad 845251 \quad 1591105 \\ 150 \quad 5551 \quad 0805 \\ \quad 78 \quad 85 \\ \hline 21.9024 \quad .9036 \end{array}$$

4571

moon-measures

1915 Apr. 27.

2

$$\begin{array}{r}
 4 \quad 15495 \quad 16389 \\
 217 \quad 8235 \quad 13674 \\
 127 \quad 3125 \quad 7370 \\
 \text{min} \quad 09 \quad 10 \\
 \hline
 221.7275 \quad 7277
 \end{array}$$

$$\begin{array}{r}
 5 \quad 15505 \quad 17370 \\
 217 \quad 8137 \quad 14750 \\
 160 \quad 55 \quad 50 \\
 \quad 19 \quad 97 \\
 \hline
 21.7361 \quad 7374
 \end{array}$$

$$\begin{array}{r}
 6 \\
 22.0 \\
 167
 \end{array}$$

$$\begin{array}{r}
 15992 \quad 18040 \\
 832530 \quad 1573531 \\
 21 \quad 3131 \\
 02 \quad 50 \\
 \hline
 16.7675 \quad 7690
 \end{array}$$

$$\begin{array}{r}
 7 \quad 222 \quad 19986 \quad 18880 \\
 17.0 \quad 18309 \quad 10570 \\
 \quad 9998 \quad 7984 \\
 \quad 09 \quad 00 \\
 \hline
 22.1689 \quad 11681
 \end{array}$$

$$\begin{array}{r}
 8 \\
 230 \\
 175
 \end{array}$$

$$\begin{array}{r}
 20499 \quad 19834 \\
 14835 \quad 1550090 \\
 \quad 3840 \quad 9090 \\
 \quad 95 \quad 49 \\
 \hline
 17.5659 \quad 5651
 \end{array}$$

Density 2

4571

moon-measures

1915 Apr 27.

2

$$\begin{array}{r}
 4 \times 15495 = 16389 \\
 217 \times 8235 = 13671 \\
 127 \times 3125 = 7370 \\
 109 \times 09 = 10 \\
 \hline
 2217275 \quad 7277
 \end{array}$$

$$\begin{array}{r}
 5 \times 15505 = 17370 \\
 217 \times 8157 = 14750 \\
 160 \times 55 = 50 \\
 19 \times 97 = 97 \\
 \hline
 219361 \quad 7377
 \end{array}$$

$$\begin{array}{r}
 6 \\
 220 \\
 167
 \end{array}$$

$$\begin{array}{r}
 15992 \\
 832530 \\
 21 \\
 02 \\
 \hline
 167675
 \end{array}$$

$$\begin{array}{r}
 18040 \\
 1573531 \\
 3131 \\
 50 \\
 \hline
 7690
 \end{array}$$

$$\begin{array}{r}
 2 \times 222 \times 19986 = 18880 \\
 170 \times 18309 = 10570 \\
 9298 \times 7984 = 7984 \\
 09 \times 00 = 00 \\
 \hline
 221687 \quad 11681
 \end{array}$$

$$\begin{array}{r}
 8 \\
 230 \\
 175
 \end{array}$$

$$\begin{array}{r}
 20499 \\
 14835 \\
 3840 \\
 95 \\
 \hline
 175659
 \end{array}$$

$$\begin{array}{r}
 19834 \\
 1550090 \\
 9090 \\
 49 \\
 \hline
 5651
 \end{array}$$

density 2

4571	Times etc				
Exp. to stars	1914 Jan. 6	2 ^h	49 ^m	-3 ^h 01 ^m	
" " moon		2	55	14.5 - 2 55	14.7
Block fast			0	00.4	
H. Sid T.		2	55	14.2	6 - α : + 18 ^m 11 ^s
H. long		4	44	31.05	
S. Sid T.		7	39	45.25	
Sid T. in moon		19	00	52.98	
Interval		12	38	52.27	
Red.			2	04.32	
g. Sid T.		12	36	47.95	

From Hawthorn	R	A	Red.	
Moon 12 ^h	2 ^h 35 ^m	48.58	+19° 40'	45.0
motion in 1 ^m 2 02 35			10.906	
36.799	+ 1	14.46	+ 6	41.3
Tubular place	2	37	03.04	+19 47 26.3

Moon's age 10 days.

	parallel	55' 05" 55
	semidiameter	15' 02" 3
934 = +14.4	R	9 02.3
9025 = +13.4	Augmentation	- 13.4
	Irradiation (2)	- 0.1
	R	9 15.6
	R	19 62.7
a = -501.2	ak	- 937
+ 24	(1+a)R	18 69.0
477.2	R ²	3493.2

4571 Times etc.
 Imp + star 1914 Jan 6 $2^h 49^m - 3^h 01^m$
 Moon $2 55 14.5 - 2 55 14.7$
 Block fast $0 00.4$

H. Sid T. $2 55 14.2$ 6.2×10^{-11}
 H. long $4 44 31.05^m$
 S. Sid T. $7 39 45.25^m$
 Sid T. in Moon $19 00 52.98$
 Interval $12 38 52.27$
 Red $2 04.32$
 Blue T. $12 36 47.95$

From Hawthorn R A. Seed.
 Moon $12^h 2^m 35^s$ $2^h 35^m 48.58$ $+19^h 40' 45.0$
 Moon $1^m 20.235^s$ 10.906
 36.799 $+1 14.46$ $+6 41.3$
 Tabular place $2 37 03.04$ $+19 47 26.3$

Moon's age 10 days.

Parallax $55' 05.55$
 Semidiam $15' 02.3$
 R $9 02.3$
 Augmentation $+ 1.34$
 Irradiation (2) $- 0.1$
 R $9 15.6$
 R $19 62.7$
 alt $- 9.37$
 $(1+a)R$ $18 69.0$
 R² 349.32

alt -50.12
 $- 2.4$
 47.72

4172 Plate

4172 a +

457.1 Center of Plate - Plate Constants

4

x	y	$R-A$	$\mu_{\text{rad.}}$
15.0316	22.3526	2 31 52	+20 19 37
21.7503	6.9434	35 44	+18 44 47
33.8702	16.4356	42 45	+19 30 28
70.65	4573	108 141	63 112
70.71	4477	2 36 47	+19 21 37
3 70.68	45.25	- 48	+ 22 40
23.56	15.08	2 36 00	+19 44 17
-22	-18		
156	292		
31	4665		
485	1360		
	= 22' 40"		

Center $\left\{ \begin{array}{l} A = 2^h 36^m 00^s \\ LD = +19^\circ 44' 20'' \end{array} \right.$

$$\begin{array}{rclcl}
 2 - 5 & +500x & +37.74 & +1.2x & -13407 \\
 +503.0 + 7516 = +12546 & +843 = +13389 & +18 = +13407 & & = 0 \\
 +2244 + 10875 = +13119 & +262 = +13381 & +26 = +13407 & & = 0 \\
 -4188 + 16935 = +12747 & +619 = +13366 & +41 = +13407 & & = 0 \\
 235960 + 11788 & +592 & +28 & & = 23.4961
 \end{array}$$

$$\begin{array}{rclcl}
 y-m & +500x & -366x & +44 & -8625 \\
 -2091 + 11176 = +9085 & -550 = +8535 & +89 = +8624 & & = -1 \\
 +5921 + 3472 = +9393 & -796 = +8597 & +28 = +8625 & & = 0 \\
 +1581 + 8218 = +9799 & -1240 = +8559 & +66 = +8625 & & = 0 \\
 157956 + 7898 & -864 & +63 & & = 15.6428
 \end{array}$$

$$\text{Tables } a = +0.8 \quad e = 0.0 \quad a - e = +0.8 \quad t + a = -0.0$$

$$\text{Obs } a = -501.2 \quad e = -4.0 \quad a - e = +2.8 \quad t + a = -1.1$$

$$0 - a = -502.0^{\circ} - 509.0^{\circ} \quad -1.1^{\circ}$$

4571 Center of Plate - Plate Constants

4

x	y	R	A	μ	ν
15 0316	22 3526	2	31 52	+20	19 37
21.7503	6.9434		35 44	+18	44 47
33 8702	16 4356		42 45	+19	30 28
70.65	4573		108 141		63 112
70.71	4477		2 30 47	+19	21 37
70.68	4525		- 45	+ 22	40
23 576	15 08		2 36 00	+19	44 17
	15				
1176	2 92				
31	4 665				
485	1 360				
	22' 40"				

Center } $A = 2^h 36^m 00^s$
 $D = +19^\circ 44' 20''$

$$\begin{aligned}
 x - S &+ 1500x & + 37.74 & + 12x & - 13407 \\
 + 503.0 + 7516 & = +12546 + 843 & + 13389 + 18 & + 13407 & = 0 \\
 + 2244 + 21087 & = +13119 + 262 & + 13381 + 26 & + 13407 & = 0 \\
 - 4188 + 16935 & = +12747 + 619 & + 13366 + 41 & + 13407 & = 0 \\
 235960 & + 11788 & + 592 & + 25 & = 234961
 \end{aligned}$$

$$\begin{aligned}
 y - m &+ 1500y & - 36.6x & + 4y & - 8625 \\
 + 2091 + 11176 & = +9085 - 550 & + 4535 + 39 & + 8624 & = -1 \\
 + 5921 + 3472 & = +9393 - 796 & + 8597 + 28 & + 8625 & = 0 \\
 + 1581 + 8218 & = +9799 - 1240 & + 8559 + 66 & + 8625 & = 0 \\
 157916 & + 7898 & - 864 & + 63 & = 1576 + 28
 \end{aligned}$$

Tables $a_1 = +0.8$ $a_2 = 0.0$ $a_3 = +0.8$ $b_1 + a_2 = 0.0$
 Cells $a_1 = 16$ $a_2 = -4.0$ $a_3 = +2.8$ $b_1 + a_2 = 1.1$

	S	Curvature γ	PS	-3.35	$-.77$	$-.7$
1.	-7.47	$+4.54$	-15	$+25 = +10$	-3	$= +7$
2.	-0.47	-11.65	-2	$+1 = -1$	$+8$	$= +7$
3.	$+12.28$	-1.78	$+47$	$-40 = +7$	$+1$	$= +8$
M	$+1.50$	-2.36		-5	$+2$	$= -10$

$$\begin{aligned}
 \Delta\gamma &= -3.17 & -25 & +4 \\
 +9 - 14 &= -5 & +1 &= -4 \\
 -40 + 36 &= -4 & +0 &= -4 \\
 -6 + 5 &= -1 & -2 &= -3
 \end{aligned}$$

$$+7 \quad -0 = +11$$

$$\text{Corr} \begin{cases} \alpha = -0.03 \\ \delta = -0.5 \end{cases}$$

Standard Coordinates - Reference Stars

Cape No. 378 mag 8.5				Cape No. 389 mag 8.1				Cape No. 407 mag 8.6			
A	2	31	05.00	2	34	57.62	2	41	58.02		
L			.00			.64	2.3.	7	.07		
E			.98			.57	Berlin A)				
mean	2	31	04.99	2	34	57.61	2	41	58.04		
Prec			+ 47.26		-	46.87		+	47.32		
d	2	31	52.25	2	35	44.48	2	42	45.36		
A	2	36	00	2	36	00	2	36	00		
A-A	-4		07.75		-	15.52	+6		45.36		
sin(A-A)	-2		47.74		-	15.52	+4		05.80		
log ₁₀			2.39400m			1.19089m			2.60778		
cos			99.7208			9.97763			9.97433		
sin			08.7332m			9.67576m			1.08935		
Σ ₀			-7.4700			-0.4749			+1.22843		
Σ ₁			-			-			+ 47		
Σ ₂			14.5286			21.5259			34.2890		
Σ ₃			15.0316			21.7503			33.8702		
Σ ₄			+5030			+2244			- 4188		
C	+20	15	55.572	+18	10	08.6	+19	26	546		
L			55.5			08.4	2.3.)		55.8		
E			55.4			08.7					
mean	+20	15	55.5	+18	10	08.6	+19	26	55.2		
Prec		+3	41.5		+3	38.6		+3	33.1		
S	+20	19	37.0	+18	13	47.2	+19	30	28.3		
D	+19	44	20	+19	44	20	+19	44	20.		
S-D	+35	17.0		-1	30	32.8	-	13	51.7		
tan(S-D)	+2	17.1			-5	43.4		-8	31.7		
log ₁₀			3.32574			3.73513m			2.91997m		
cos			0.65689			1.06628m			0.25112m		
tan			9.5687			9.5177			9.5493		
Σ ₂			1.7466			9.3514			2.1787		
Σ ₃			8.3687			4.9225			8.7814		
Σ ₄			+4.5383			-11.6487			-1.7829		
Σ ₅			+ 234			0			+ 604		
Σ ₆			22.5617			6.3513			16.2775		
Σ ₇			22.3526			6.9434			16.4356		
Σ ₈			-2091			+5.924			+1.581		

Standard Coordinates Reference Stars									
45712					Cape W 389 mgs 1				
Cape W 378 mgs 8.5					Cape W 407 mgs 6				
A	2	31	05	00	2	34	57	62	2 41 58 02
L				00			64		2 41 58 02
E				98			57		2 41 58 04
Mean	2	31	04	99	2	34	57	61	2 41 58 04
Pre				47.26				46.87	2 41 58 02
d	2	31	52	25	2	35	44	48	2 42 45 36
A	2	36	00		2	36	00		2 36 00
A-A		-4	07	75		-	15	52	+ 6 45 36
Build-A			-2	47 74			-1	55 52	+ 4 05 30
log		2	39	40 00		1	19	08 90	2 60 77 8
log		9	9	72 08		9	9	77 63	9 9 74 33
log		0	8	73 22		9	6	75 76	1 08 93 5
log		-7	4	70 0		-0	4	74 0	+ 1 2 28 43
log		-		1 4		-		1	+ 47
log		14	5	28 6		21	5	25 9	34 28 90
log		15	0	31 6		21	7	50 3	33 67 02
log		+5	0	30		+2	2	44	- 4 18 8
C	+20	15	55	52 +18	10	08	6	+19	26 546
L			55	5			08	+25	55
E			55	4			08	7	
Mean	+20	15	55	5 +18	10	08	6	+19	26 55
Pre		+3	41	5		+3	38	6	+ 3 331
S	+20	19	37	0 +18	13	47	2	+19	30 285
D	+19	44	20	+19	44	20		+19	44 20
S-D		+35	17	0 -1	30	32	8	-13	51.5
Build-A			+2	1 17 1			-5	43 4	- 4 31.5
log		3	3	25 74		3	7	3 51 3	29 19 97
log		0	6	5 68 9		1	0	6 62 8	0 25 11 2
log		9	5	68 7		9	5	1 77	9 54 93
log		1	8	4 66		9	3	5 14	2 17 87
log		8	3	68 7		9	9	2 25	8 78 14
log		+4	5	38 3		-1	1	64 87	- 1 78 25
log		+2	3	4				0	+ 60 4
log		2	2	5 61 7			6	3 51 3	1 6 27 75
log		2	2	3 52 6			6	9 4 34	1 6 43 56
log		-2	0	9 1		+4	0	2 4	+ 1 58 1

1
2
3
-
4
5
6
7
8
-1
2
3
4
5
6
7
8

4571 Moon.

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	23.5960	0.0000	0.0000	3.4883	-49
2	23.0000	-0.5960	0.3552	3.4906	-26
3	21.9030	-1.6930	2.8662	3.4998	+66
-4	21.7276	-1.8684	3.4909	3.4909	-23
5	21.7368	-1.8592	3.4566	3.4982	+50
6	22.0000	-1.5960	2.5472	3.4924	-8
7	22.1684	-1.4276	2.0380	3.4876	-56
8	23.0000	-0.5960	0.3552	3.4867	-65

$$R^2 = 3.4932$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
-1	13.9284	-1.8676	-1	3.4883	180 ✓
2	14.0254	-1.7706	-1	3.1354	199 ✓
3	15.0000	-0.7960	0	0.6336	245 ✓
4	15.7960	0.0000	0	0.0000	270 ✓
5	16.0000	+0.2040	0	0.0416	276 ✓
6	16.7682	+0.9722	0	0.9452	301 ✓
7	17.0000	+1.2040	0	1.4496	318 ✓
8	17.5655	+1.7695	+1	3.1315	341 ✓

Range 161

$$x = 23 \quad y = 14.0254$$

$$\begin{array}{r} 17.5655 \\ 31.5909 \end{array}$$

$$y_0 = 15.7954$$

$$y_{\min} = 13.9284$$

$$R = 1.8670$$

$$x_{\min} = 21.7276$$

$$y = 23.5946$$

$$\text{Center } \left\{ \begin{array}{l} x_0 = 23.5960 \\ y_0 = 15.7960 \end{array} \right.$$

4571 *Orion*

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$O - C$
1	23.5960	0.0000	0.0000	3.4883	-4.9
2	23.0000	-0.5960	0.3552	3.4906	-2.6
3	21.9030	-1.6930	2.8662	3.4998	+6.6
4	21.7276	-1.8684	3.4909	3.4909	-2.3
5	21.7368	-1.8592	3.4566	3.4982	+5.0
6	22.0000	-1.5960	2.5472	3.4924	-8
7	22.1684	-1.4276	2.0380	3.4876	-5.6
8	23.0000	-0.5960	0.3552	3.4867	-6.5

$$R^2 = 3.4932$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	13.9284	-1.8676	-1	3.4883	180
2	14.0254	-1.7706	-1	3.1354	199
3	15.0000	-0.7960	0	0.6336	245
4	15.7960	0.0000	0	0.0000	270
5	16.0000	+0.2040	0	0.0416	276
6	16.7682	+0.9722	0	0.9452	301
7	17.0000	+1.2040	0	1.4496	310
8	17.5655	+1.7695	+1	3.1315	341

Range 1.67

$$\begin{aligned}
 x &= 23 & y &= 14.0254 \\
 & & & \underline{17.5655} \\
 & & & 31.5909 \\
 y_0 &= 15.7954 \\
 y_{\text{min}} &= 13.9284 \\
 R &= 1.8670 \\
 x_{\text{min}} &= 21.7276 \\
 y &= 23.5946
 \end{aligned}$$

Center

$$\begin{cases}
 x_0 = 23.5960 \\
 y_0 = 15.7960
 \end{cases}$$

Formation of Normal

1	-0.00	-	0.0	+	91.5
2	+1.06	+	15.6	+	46.0
3	+1.35	-	11.1	-	52.9
4	-0.00	+	43.0	-	0.0
5	-0.37	-	93.0	+	10.0
6	-1.55	+	12.8	-	7.8
7	-1.72	+	80.0	-	67.3
8	-1.06	+	39.0	-	114.5
	-2.29	-	14.1	-	95.0

-a	-b	+45
		+ ΔC
+ 0	- 11	+ 34 ^v
- 17	- 11	+ 17 ^v
- 49	- 5	- 9 ^v
- 54	+ 0	- 9 ^v
- 54	+ 2	- 7 ^v
- 46	+ 6	+ 5 ^v
- 41	+ 7	+ 11 ^v
- 17	+ 11	+ 3.9 ^v

4571 Moon's Center Conditional Equations 7

	O	C	O-C	Corr.
1	+0.00 - 1.87 = -49	0 + 15 = +15	-64	-30"
2	-0.60 - 1.77 = -26	0 + 14 = +14	-40	-23"
3	-1.69 - 0.80 = +66	0 + 6 = +6	+60	+51"
4	-1.87 + 0.00 = -23	0 - 0 = 0	-23	-32"
5	-1.86 + 0.20 = +50	0 - 2 = -2	+52	+45"
6	-1.60 + 0.97 = -8	0 - 8 = -8	0	+5"
7	-1.43 + 1.20 = -56	0 - 9 = -9	-47	-36"
8	-0.60 + 1.76 = +65	0 - 14 = -14	-51	-12"

Normal Equation

$$+112 - 225$$

$$\text{Average} = 42$$

$$+15.11 - 2.29 = -14 \quad -9.65$$

$$- 2.29 + 12.83 = -9.5 \quad -0.31$$

$$+4.13$$

$$-4.44$$

$$-3.1$$

$$+ 2.29 - 0.35 = -2 \quad -1.46$$

$$+ 12.48 = -9.7 \quad -1.77 \quad b = -7.8 \quad -0.14$$

$$+15.11 = -14 + 18 = +4$$

$$a = +0.8 - 0.65$$

Arc measured = 161° Average (O-C) = -14 $\frac{pc}{m} \approx 21$

$$\text{Average} = \frac{-14}{21} = -0.67 \quad \Delta \alpha = -0.7$$

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

$$\Delta R = -0.1$$

$$-2RC = +2.24 \quad +45$$

$$\Delta \delta = -0.31 \quad \Delta \delta = -0.2$$

$$\Delta \alpha = -1.46 \quad \Delta \alpha = -0.05$$

-29

4571 Moon's Center Condensed Equation 7

	O	C	O-C
1	+0.00 - 1.87 = -4.9	0 + 1.5 = +1.5	-6.4
2	-0.60 - 1.77 = -2.6	0 + 1.4 = +1.4	-4.0
3	-1.69 - 0.80 = +6.6	0 + 6 = +6	-6.0
4	-1.87 + 0.00 = -2.3	0 - 0 = 0	-2.3
5	-1.86 + 0.20 = +5.0	0 - 2 = -2	+5.2
6	-1.60 + 0.97 = -8	0 - 8 = -8	0
7	-1.43 + 1.20 = -1.6	0 - 9 = -9	-4.7
8	-0.60 + 1.76 = -6.5	0 - 14 = -14	-5.1

+112 = 225

Average = 42

Normal Equation

$$+15.11 - 2.29 = -1.4$$

$$- 2.29 + 1.283 = -9.5$$

$$+ 2.29 = 0.35 = 2$$

$$+ 1.248 = 9.7$$

$$b = 7.8$$

$$+15.11 = -14 + 1.8 + 4$$

$$a = 0.2$$

Obs measured 161° Average (O-C) = -14

$$\frac{14}{21} = 21$$

$$\frac{-14}{21} = -0.67 \text{ or } -0.7$$

4571 Moon's Mean Position (1914.0)

8

$$X_0 = 23.5960$$

$$Y_0 = 15.7960$$

$$12a = 0$$

$$12b = -4$$

$$15.7956$$

From plate constants $X = 23.4961$ $Y_0 = 15.6428$

$$\xi = +1.4961$$

$$\eta = -2.3572$$

$$\log \xi = 0.17496$$

$$\log \eta = 9.97453$$

$$8.50724$$

$$\log \tan \xi = 9.5492$$

$$0.3499$$

$$7.0534$$

$$6.9525$$

$$\log(\alpha - A) = 1.69319$$

$$\mu_1 = +9$$

$$\alpha - A = +49.34$$

$$\mu_0 = -23.581$$

$$A = 236.00$$

$$\log \mu_0 = 0.37256$$

$$7.33115$$

$$\alpha_0 = 236.49.34$$

$$\text{Red.} = +0.77$$

$$\log(\alpha - D) = 3.04141$$

$$\alpha' = 236.50.11$$

$$S - D = 18.20.05$$

$$D = +19.44.20$$

$$S_0 = +19.25.59.95$$

$$\text{Red.} = +10.84$$

$$S' = +19.26.10.8$$

4571 known mean position (1914.2)

8

$$X_0 = 23.5960$$

$$Y_0 = 15.7960$$

$$\begin{array}{r}
 -0.0004 \\
 \hline
 15.7956
 \end{array}$$

True plate center $X = 23.4961$ $Y = 15.6428$

$$Z = +1.7961$$

$$\eta = 23.572$$

$$\log \pi = 0.17796$$

$$\log \pi = 9.77453$$

$$8.50724$$

$$(u-A) = 1.69319$$

$$\log \tan S = 9.5492$$

$$0.3499$$

$$7.0534$$

$$6.9525$$

$$u-A = +4.934$$

$$m = +9$$

$$Y_0 = 23.581$$

$$A = 2.3600$$

$$\log \pi_0 = 0.37256$$

$$7.33112$$

$$Y = 2.3649.34$$

$$\text{Red.} = +0.77$$

$$(u-D) = 3.04141$$

$$X = 2.365011$$

$$S-D = -1.820.05$$

$$D = +1.944.20$$

$$S_0 = +1.925.59.95$$

$$\text{Red.} = -10.8$$

$$S = +1.926.10.8$$

$$\begin{array}{r} 2 \quad 33 \quad 56.55 \\ \underline{55.80} \\ + 0.75 \end{array}$$

$$\begin{array}{r} + 21 \quad 35 \quad 35.9 \\ \underline{24.3} \\ + 11.6 \end{array}$$

$$\begin{array}{r} 2 \quad 40 \quad 18.28 \\ \underline{17.44} \\ + 0.84 \end{array}$$

$$\begin{array}{r} + 9 \quad 45 \quad 14.0 \\ \underline{06.2} \\ + 7.8 \end{array}$$

$$\begin{array}{r} 2 \quad 44 \quad 55.88 \\ \underline{55.06} \\ + 0.82 \end{array}$$

$$\begin{array}{r} + 26 \quad 54 \quad 37.6 \\ \underline{24.3} \\ + 13.3 \end{array}$$

30 35 40 45
+3



30

25

20

15

10

5

$$\begin{array}{r} 11.6 \\ \underline{7.8} \\ 11.6 \\ \underline{10.7} \end{array}$$

4571

Red ad locum uph.

9

S $+19^{\circ} 26'$ $1 + \alpha$ $1^{\circ} 38.1 : 24^{\circ} 32'$

H 23 01.3

a 2 36.8

g 18 49.9

B + α 21 26.7 = $321^{\circ} 40'$ l cos 99745 i $0.3500m$ (ii) $0.3245m$ l cos(B + α) 98946 g 0.9373 sin " $97926m$ l cos 95475 8.8239 g' 08319 g $9.1013m$ f $+0.30$ g -0.13 h $+0.60$ $+0.77$ l sin 95221 l cos(H + α) 99589 h 1.3085 sin " 96183 sec 00250 8.8239 h' 0.7895 h 97757 g' $+679$ h' $+616$ L -211 $+10.84$

4.1.11

Red ad. & ~~sun~~ uph.

9

S 19° 26'

1+ + x 1 38.1 24° 32'

H 23 013

L cos 6 9.9775

9 2 368

L 0.3500

8 18 499

(1) 0.3245

S + x 21 267 : 321° 40'

L sin 5 9.5221

L cos (S + x) 9.8946

L cos (H + x) 9.9589

8 0.9373

L sin 1.3085

L sin 7.7966

L sin 9.6183

L sin 9.5475

L sin 0.0250

8.8239

8.8239

2 0.8319

L sin 0.7895

8 9.1013

L sin 9.7757

+ 0.30

L sin + 6.79

- 0.13

L sin + 6.16

+ 0.60

L sin - 7.11

10.77

+ 10.64

A
W

+571

Muana Parallax.

10

$$\begin{array}{r} \alpha' \quad 2 \quad 36 \quad 50.11 \\ 0 \quad 2 \quad 55 \quad 14.2 \\ \oplus - \alpha' \quad + \quad 18 \quad 24.1 \\ \quad \quad + \quad 4^0 \quad 36' \end{array}$$

$$s' = +19 \quad 26 \quad 10.8$$

$$\pi = 55' \quad 05'' \quad 5$$

$$\begin{array}{r} + \quad 2 \\ 4 \quad 34 \end{array}$$

$$\begin{array}{r} 986913 \\ 820480 \\ 890421 \\ \hline 002644 \\ 700458 \end{array}$$

$$\begin{array}{r} 9.95727 \\ 000000 \\ \hline 000138 \\ 9.95865 \end{array}$$

$$\alpha - \alpha' = +3' \quad 28.45$$

$$+ \quad 13.90$$

$$f = +42 \quad 16 \quad 36$$

$$19 \quad 26 \quad 11$$

$$22 \quad 50 \quad 25$$

$$\begin{array}{r} 9.82640 \\ 820480 \\ 958901 \\ \hline 017217 \\ 779238 \end{array}$$

$$s - s' = +21 \quad 08.8$$

$$s \quad +19 \quad 47 \quad 29.6$$

$$\chi \quad 2 \quad 37 \quad 04.00$$
~~Antar~~

$$\text{Wankellens} = +19 \quad 47 \quad 26.3$$

$$\chi \quad 2 \quad 37 \quad 03.04$$

$$O - C \quad + \quad 3.3$$

$$+ 0.97$$

$$\text{curr.} \quad + \quad 0.5$$

$$\text{curr} \quad - \quad 0.03$$

$$\text{Lrr} \quad - \quad 0.2$$

$$\text{Lrr} \quad - \quad 0.05$$

$$s \quad +19 \quad 47 \quad 29.4$$

$$\chi \quad 2 \quad 37 \quad 03.96$$

$$O - C = + \quad 3.1$$

$$O - C = + \quad 0.92$$

4571

Munda Parallax

10

 $\alpha' \quad 2 \quad 36 \quad 50.11$
 $\delta' \quad +19 \quad 26 \quad 10.8$
 $\circ \quad 2 \quad 55 \quad 14.2$
 $\pi: \quad 55' \quad 05''5$
 $\ominus-\alpha' \quad + \quad 18 \quad 24.1$
 $\quad \quad \quad + \quad 4 \quad 36'$

986913

820450

890421

002644

700458

995727

000000

000138

995865

 $\alpha-\alpha' = \quad +3' \quad 28.45$
 $\quad \quad \quad + \quad 1390$
 $\delta \quad +42 \quad 16 \quad 36$
 $\quad \quad 19 \quad 26 \quad 11$
 $\quad \quad 22 \quad 50 \quad 25$

982640

820450

955901

017217

779238

 $S-\delta \quad +7.21 \quad 18.8$
 $S \quad +19 \quad 47 \quad 29.6$
 $\gamma \quad 2 \quad 37 \quad 04.00$

Hantel

 $\text{Hantel } S: +19 \quad 47 \quad 26.3$
 $\gamma \quad 2 \quad 37 \quad 03.04$
 $O-C \quad +3.3$
 $+0.97$
 $\delta \quad \text{curr} \quad -0.2$
 $\delta \quad +19 \quad 47 \quad 29.4$
 curr
 $\gamma \quad 2 \quad 37 \quad 03.96$
 $O-C \quad +3.1$
 $O-C \quad +0.92$

1
15
22

2
21
6

2
103
16

1
20
1
2

2
24
10

3
2
14

4572 stars - Measures

1915 Apr. 27. 11

	α	δ	α	δ
1	12850	13250	12362	14292
50	12666	4549	5760	14219
20	6770	13072	12287	2120

15.01820176219927.9928

2 16810
217 8749
65 5050

17809
15867
7277

17489
11360
6261

16829
12960
5457

13
21.4062

26
8060

79
66.6122

24
6128

3 17751
338 8909
162 10

16859
15700
9405

15901
14285
8078

17370
8990
9090

09
49
33.8840

67
8841

86
16.1617

76
1615

Moon measures.

1
243
139
min
8

2
24.0
139

3
23.0
144

12377
7280
11948

14431
13995
7989

139572.9557

12301
0000
11965

14436
14094
8888

13.9665.9654

15593
11680
8089

20380
14220
1220

74
14.3902

20
3893

4572 stars measures

1915 Apr 27. 11

	a	d	a	d
1	12850		12362	14292
150	12666	4549	5760	14219
20	67	13072	12287	21

15018201702199279928

16810
 8745
 50
 13
214062

17809
 15867
 7277
 26
8060

17489
 113606
 62
 79
366132

16829
 12960
 5751
 24
6128

17751
 890910
 09
 49
338840

16859
 15700
 9205
 67
8841

15901
 1428578
 80
 86
161617

17370
 8990
 9000
 76
1615

Moon measures

243
 139
 8

2
 240
 139

3
 230
 144

1237780
 72
 11948

14431
 13995
 7989

1391729557

1230100
 00
 11965

14436
 14094
 8888

1396659654

15593
 11680
 8039
 74

20380
 14220
 1220

1439023893

45-72

Snow-measures

1915 Apr 27.

12

$$\begin{array}{r}
 4 \quad 14927 \\
 226 \quad 9709 \\
 15.0 \quad 1919 \\
 \quad \quad 31 \\
 \hline
 22.5213
 \end{array}$$

$$\begin{array}{r}
 19359 \\
 14565 \\
 \quad 7176 \\
 \quad \quad 65 \\
 \hline
 .5209
 \end{array}$$

$$\begin{array}{r}
 5 \quad 19670 \\
 224 \quad 16346 \\
 15.7 \quad 4336 \\
 \quad \quad 60 \\
 \hline
 22.3325
 \end{array}$$

$$\begin{array}{r}
 16243 \\
 9.559 \\
 \quad 6959 \\
 \quad \quad 41 \\
 \hline
 .3320
 \end{array}$$

$$\begin{array}{r}
 6 \quad 19677 \\
 225 \quad 16304 \\
 16.0 \quad 0103 \\
 \quad \quad 80 \\
 \hline
 22.3375
 \end{array}$$

$$\begin{array}{r}
 16230 \\
 9607 \\
 \quad 0540 \\
 \quad \quad 40 \\
 \hline
 3370
 \end{array}$$

$$\begin{array}{r}
 7 \quad 19730 \\
 22.8 \quad 12170 \\
 17.0 \quad 7676 \\
 \quad \quad 19 \\
 \hline
 22.7548
 \end{array}$$

$$\begin{array}{r}
 16184 \\
 13722 \\
 \quad 2231 \\
 \quad \quad 89 \\
 \hline
 .7542
 \end{array}$$

$$\begin{array}{r}
 8 \\
 230 \\
 173
 \end{array}$$

$$\begin{array}{r}
 19223 \\
 16659 \\
 \quad 5759 \\
 \quad \quad 12 \\
 \hline
 17.2564
 \end{array}$$

$$\begin{array}{r}
 16945 \\
 95118 \\
 \quad 308 \\
 \quad \quad 35 \\
 \hline
 2582
 \end{array}$$

$$\begin{array}{r}
 9 \quad 17711 \\
 23.5 \quad 13180 \\
 17.5 \quad 9087 \\
 \quad \quad 22 \\
 \hline
 23.4530
 \end{array}$$

$$\begin{array}{r}
 18795 \\
 13235 \\
 \quad 4041 \\
 \quad \quad 00 \\
 \hline
 4442
 \end{array}$$

$$\begin{array}{r}
 20094 \\
 1476055 \\
 \quad 54 \\
 \quad \quad 86 \\
 \hline
 17.5334
 \end{array}$$

$$\begin{array}{r}
 18769 \\
 14091 \\
 \quad 0001 \\
 \quad \quad 55 \\
 \hline
 5335
 \end{array}$$

Density 3

4572

brown-hermes

1915 Apr. 27.

12

$$\begin{array}{r} 4 \quad 15927 \\ 226 \quad 9709 \\ 150 \quad 1919 \\ \quad 31 \\ \hline 225213 \end{array}$$

$$\begin{array}{r} 19359 \\ 14565 \\ \quad 7176 \\ \quad 65 \\ \hline 5209 \end{array}$$

$$\begin{array}{r} 5 \quad 19670 \\ 224 \quad 16346 \\ 157 \quad 4336 \\ \quad 60 \\ \hline 223325 \end{array}$$

$$\begin{array}{r} 16243 \\ 9559 \\ \quad 6957 \\ \quad 41 \\ \hline 3320 \end{array}$$

$$\begin{array}{r} 6 \quad 19677 \\ 225 \quad 16304 \\ 160 \quad 0103 \\ \quad 80 \\ \hline 223375 \end{array}$$

$$\begin{array}{r} 16230 \\ 9607 \\ \quad 0540 \\ \quad 40 \\ \hline 3370 \end{array}$$

$$\begin{array}{r} 7 \quad 19730 \\ 224 \quad 12170 \\ 170 \quad 7676 \\ \quad 19 \\ \hline 227548 \end{array}$$

$$\begin{array}{r} 16184 \\ 13722 \\ \quad 2231 \\ \quad 89 \\ \hline 7542 \end{array}$$

$$\begin{array}{r} 8 \\ 230 \\ 173 \end{array}$$

$$\begin{array}{r} 19223 \\ 16659 \\ \quad 5159 \\ \quad 12 \\ \hline 172564 \end{array}$$

$$\begin{array}{r} 16945 \\ 95115 \\ \quad 30 \\ \quad 35 \\ \hline 2582 \end{array}$$

$$\begin{array}{r} 9 \quad 17711 \\ 235 \quad 13180 \\ 175 \quad 9087 \\ \quad 22 \\ \hline 234530 \end{array}$$

$$\begin{array}{r} 18795 \\ 13235 \\ \quad 4041 \\ \quad 00 \\ \hline 4442 \end{array}$$

$$\begin{array}{r} 20094 \\ 14760 \\ \quad 1455 \\ \quad 86 \\ \hline 175334 \end{array}$$

$$\begin{array}{r} 18769 \\ 14091 \\ \quad 0001 \\ \quad 55 \\ \hline 5335 \end{array}$$

Remainder 3

4572 Times 9 to
 Sept Oct Nov 1914 Jan 6 3h 05m - 3h 17m
 moon 3 11 14.1 - 3 11 14.3
 clock fast 0 00.4

H Sid T. 3 11 13.8 $\odot - \alpha = + 0^{\circ} 33' 38''$
 H long 4 44 31.05
 G. Sid T. 7 55 44.85
 Sid T. in moon 19 00 52.98
 Interval 12 54 51.87
 Recd 2 06.94
 G. M. T. 12 52 44.93

From Kantlen RA. Recd.
 moon 13h 2 37 50.06 + 19 51 38.5
 Unobscured 2.0275 10.857
 -7.251 - 14.70 - 1 18.7
 Tabular Place 2 37 35.36 + 19 50 19.8

Moon's age 10 days.

- Parallax 55 05.92

- Semidiam. 15 02.4

R 9 02.4

Augmentation + 13.4

Inradiation (3) - 0.3

R 9 15.5

R 1.9625

AR - 93.5

(1+AR) 1.8690

R² 3.4932

934 = 1435

902 = 13.4

a = 500.2

+ 24
 476.2

4572 Times into
 Sept 1914 Jan 6 3^h 05^m - 3^h 17^m
 moon 3 11 141 - 3 11 143
 clock fast 0 004

H. Sid T. 3 11 13.8 $\Theta - \alpha = +0^{\circ} 52' 38''$
 H. hour 4 44 3105
 G. Sid T. 7 55 4485
 Sid T. in hour 19 00 5298
 Interval 12 54 5187
 Recd 2 0694
 G. in T. 12 52 4493

From last then RA Recd
 moon 13^h 2 37 5006 +19 51 385
 within 17 20275 10.857
 -7251 - 1470 - 1 187
 Tabular place 2 37 3536 +19 50 198

Observed 26 10 days

- parallel 55 05.72
 - perpendicular 15 024

754 1431
 700 130

R 9024
 Augmentation +134
 Irradiation 3 -03

200 1302

24
 1900

R 9155
 R 19025
 or R -935
 11 + 41 R 18690
 R² 34932

4572

$$\begin{array}{r}
 x \quad 15.0179 \quad 21.8061 \quad 33.8840 \\
 y \quad 14.5286 \quad 21.5259 \quad 34.2890 \\
 x-y \quad +4893 \quad +2802 \quad -4050
 \end{array}$$

$$\begin{array}{r}
 y \quad 21.9928 \quad 6.6125 \quad 16.1616 \\
 y \quad 22.5617 \quad 6.3513 \quad 16.2775 \\
 y-y \quad -5689 \quad +2612 \quad -1159
 \end{array}$$

$$\begin{array}{r}
 x-y + 500x \quad +84.7y \quad +.2x \quad -14268 \\
 +4893 + 7509 = +12402 + 1863 = +14265 + 3 = +14268 \quad = 0 \\
 +2802 + 10903 = +13705 + 560 = +14265 + 42 = +14269 \quad = +1 \\
 -4050 + 16942 = +12892 + 1369 = +14261 + 7 = +14268 \quad = 0 \\
 24.1996 + 12000 = +1340 \quad +5 \quad = 24.1173
 \end{array}$$

$$\begin{array}{r}
 y-y + 500y \quad -84.9x \quad +2.2y \quad -4080 \\
 -5689 + 10996 = +5307 - 1275 = +4032 + 48 = +4080 \quad = 0 \\
 +2612 + 3306 = +5918 - 1851 = +4067 + 14 = +4081 \quad = +1 \\
 -1159 + 8081 = +6922 - 2877 = +4045 + 35 = +4080 \quad = 0 \\
 15.8240 + 7912 \quad -2055 \quad +2055 + 35 \quad = 16.0052
 \end{array}$$

$$\begin{array}{r}
 Tables \quad + 0.8 \quad + 0.3 \quad a-e = +0.5 \quad = 0 \\
 Obs a = -500.2 \quad e = -502.2 \quad a-e = +2.0 \quad b+a = +0.2 \\
 o-c \quad -501.0 \quad -502.5 \quad +0.2
 \end{array}$$

4572

x	150179	218061	338840
y	145286	215259	342890
z	+4893	+2802	-4050

x	219928	66125	161616
y	225617	63513	162775
z	-5689	+2612	-1159

x - 8 + 1000	+5474	+22	-14262
+4893 + 7504 = +12402	+1863	+14265	+3 = +14268
+2802 + 10933 = +12735	+560	+14265	+4 = +14269
-4050 + 16942 = +12892	+1269	+14263	+7 = +14268
241996 + 12800	+1340	+5	2441173

y - 21 + 1000	-8474	+224	-4080
+1689 + 10996 = +12685	-1270	+4032	+48 = +4080
+2612 + 3306 = +5918	-1851	+4067	+14 = +4081
-1119 + 9081 = +7962	-2877	+4075	+35 = +4080
156240 + 7912	-2051	+2051	+30 = 160022

Tables

$\Delta b = -5002$ $\Delta c = -5022$ $\Delta = 0.2 + 20$ $b + a = +0.2$
 $b - c$

1
2
3
4
5
6
7
8
9

1
2
3
4
5
6
7
8
9

4572 Moon approx. Center.

15

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	24.2000	0.0000	0.0000	3.4921	-11
2	24.0000	-0.2000	0.0400	3.4963	+31
3	23.0000	-1.2000	1.4400	3.5001	+69
4	22.5211	-1.6789	2.8187	3.4993	+61
5	22.3322	-1.8678	3.4887	3.4887	-45
6	22.3372	-1.8628	3.4700	3.5006	+74
7	22.7545	-1.4455	2.0894	3.4700	-232 $\frac{1}{2}$ wt
8	23.0000	-1.2000	1.4400	3.4918	-14
9	23.4436	-0.7564	0.5721	3.4911	-21

$$c^2 = 3.4932$$

	y	$y - y_0$	Δy		
1	13.9564	-1.8686	-1	3.4921	180 ✓
2	13.9660	-1.8590	-1	3.4563	186 ✓
3	14.3898	-1.4352	-1	2.0601	220 ✓
4	15.0000	-0.8250	0	0.6806	244 ✓
5	15.8250	0.0000	0	0.0000	270 ✓
6	16.0000	+0.1750	0	0.0306	275 ✓
7	17.0000	+1.1750	0	1.3806	309 ✓
8	17.2573	+1.4323	+1	2.0518	320 ✓
9	17.5334	+1.7084	+1	2.9190	336 ✓

Range = 15-6

Approx center

$$x = 23.0 \quad y = 14.3898$$

$$17.2573$$

$$31.6471$$

$$x_0 = 15.8236$$

$$y_{\min} = 13.9564$$

$$R = 1.8672$$

$$x_{\min} = 22.3322$$

$$x_0 = 24.1994$$

$$\left\{ \begin{array}{l} x_0 = 24.2000 \\ y_0 = 15.8250 \end{array} \right.$$

4572

Moon - Approx Center

15

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	24.2000	0.0000	0.0000	3.4921	-1.1
2	24.0000	-0.2000	0.0400	3.4963	+3.1
3	23.0000	-1.2000	1.4400	3.5001	+6.9
4	22.5211	-1.6789	2.8187	3.4993	+6.1
5	22.3322	-1.8678	3.4887	3.4887	-4.5
6	22.3372	-1.8628	3.4700	3.5006	+7.4
7	22.7545	-1.4455	2.0894	3.4700	-2.2
8	23.0000	-1.2000	1.4400	3.4918	-1.4
9	23.4436	-0.7564	0.5721	3.4977	-2.1

 $\Sigma^2 = 3.4932$

	y	$y - y_0$	Δ^2		
1	13.9564	-1.8686	-1	3.4921	180
2	13.9662	-1.8590	-1	3.4563	186
3	14.3898	-1.4352	-1	2.0601	220
4	15.0000	-0.8250	0	0.6806	244
5	15.8250	0.0000	0	0.0000	270
6	16.0000	+0.1750	0	0.0306	275
7	17.0000	+1.1750	0	1.3806	309
8	17.2573	+1.4323	+1	2.0518	320
9	17.5334	+1.7084	+1	2.9190	336

Range = 15-6

Approx center

$$x = 23 - \frac{y}{2} = 14.3898$$

$$\frac{17.2573}{3.16471}$$

$$f_0 = 15.8236$$

$$y_{\text{min}} = 13.9564$$

$$R = 1.8673$$

$$x_{\text{min}} = 22.3322$$

$$x_0 = 24.1994$$

$$\left\{ \begin{array}{l} x_0 = 24.2000 \\ y_0 = 15.8250 \end{array} \right.$$

Formation of normal,

1	- 0.00	-	20	+	20.5
2	+ 0.37	-	6.2	-	57.6
3	+ 1.73	-	82.8	-	99.4
4	+ 1.40	-	102.6	-	50.6
5	- 0.00	+	84.0	-	0.0
6	- 0.34	-	137.8	+	13.3
7	- 0.43	+	95.0	-	77.3
8	- 1.72	+	16.8	-	20.0
9	- 1.30	+	16.0	-	36.0
	- 0.29	-	117.6	-	307.1

- e	- b	+ 15	+ ΔC
+ 0	- 4	+ 11 ^v	
- 2	- 4	+ 9 ^v	
- 13	- 3	- 1 ^v	
- 18	- 2	- 5 ^v	
- 20	+ 0	- 5 ^v	
- 20	+ 0	- 5 ^v	
- 16	+ 2	+ 1 ^v	
- 13	+ 3	+ 5 ^v	
- 8	+ 3	+ 10 ^v	

4572 Moon's Center - Conditional Equation					16
	O		C	O - C	Corr.
1	+0.00 - 1.87 = -1.1	-	0 + 38 = +38	-49	-38"
2	-0.20 - 1.86 = +31	+	2 + 38 = +40	-9	0
3	-1.20 - 1.44 = +69	+	11 + 30 = +41	+28	+27"
4	-1.68 - 0.83 = +61	+	15 + 17 = +32	+29	+24"
5	-1.87 + 0.00 = -45	+	17 - 0 = +17	-62	-67"
6	-1.86 + 0.18 = +74	+	17 - 4 = +13	+61	+56"
7 ^{1/2 wt}	-1.45 + 1.18 = -232	+	7 - 12 = -5	(-227)	-226"
8	-1.20 + 1.43 = -44	+	11 - 30 = -19	+5	+10"
9	-0.76 + 1.71 = -21	+	7 - 35 = -28	+7	+17"
				+130	-231
+13.79 - ^{4.50} 0.29 = -118 - 10.22				Average = 42	
-0.29 + 15.04 = -307 - 1.50					
+0.29 - 0.00 = -2 - 0.22					
+15.04 = -309 - 1.72				b = -20.6 - 0.11	
+13.79 = -118 - 6 = -124				a = -9.0 - 0.74	

Ar = measured = 156° Average(O - C) = -12

$$\frac{RC}{n} = 18$$

$$-\frac{12}{1.8} = -6.67$$

$$\Delta n = -0.7$$

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

$$-2RC = +0.75 + 15$$

$$\Delta R = -0.5$$

$$\Delta b = -0.09 \quad \Delta S = -0.0$$

$$\Delta a = -0.55 \quad \Delta \alpha = -0.02$$

4572 Moon's Center Endomere Equation

16

	0	c	0-c
1	+0.00 - 1.67 = -1.1	- 0.738 = +3.8	-4.9
2	-0.20 - 1.86 = +3.1	+ 2.738 = +4.0	- 9
3	-1.20 - 1.44 = +6.9	+ 1.1730 = +4.1	+2.8
4	-1.68 - 0.83 = +6.1	+ 1.5717 = +3.2	+2.9
5	-1.87 + 0.00 = -4.5	+ 1.7 = 0 = +1.7	-6.2
6	-1.86 + 0.18 = +7.4	+ 1.7 = 4 = +1.3	+6.1
7	-1.45 + 1.18 = -2.3	+ 7 = 12 = -5	(-1.1)(2.2)
8	-1.20 + 1.43 = -4.4	+ 1.1 = 30 = -19	+5
9	-0.76 + 1.71 = -2.1	+ 7 = 35 = -28	+7

$$+ 13.0 = 231$$

Average: 42

$$+ 1.379 - 0.29 = -1.18$$

$$- 0.29 + 1.504 = -3.07$$

$$+ 0.29 - 0.00 = -2$$

$$+ 1.504 = -3.09$$

$$b = -20.6$$

$$+ 1.379 = -1.18 - 6 = -12.4$$

$$a = -9.0$$

$$\text{Observed} = 156^\circ \quad \text{Average}(0-c) = -12$$

$$\frac{P_0}{m} = 18$$

$$\frac{-12}{18} = -0.67 \quad \Delta = -0.7$$

4572 Moon's mean Position (1914.0)

17

$$\begin{array}{r}
 X_0 = 24.2000 \\
 \hline
 \Delta a = -4 \\
 \hline
 24.1996
 \end{array}
 \qquad
 \begin{array}{r}
 Y_0 = 15.8250 \\
 \hline
 \Delta b = -10 \\
 \hline
 15.8240
 \end{array}$$

From plate constants $X = 2411.73$ $Y_0 = 16.0052$

$$\begin{array}{r}
 \bar{S} = +2.1173 \\
 \log \frac{S}{\bar{S}} = 0.32578 \\
 \therefore \log S = 9.97440 \\
 \qquad \qquad 8.50724
 \end{array}$$

$$\therefore (X-A) = 1.84414$$

$$X-A = +1.0985$$

$$A = 236.00$$

$$X_0 = 237.0985$$

$$Red = +0.77$$

$$X' = 237.1062$$

$$\eta = -1994.8$$

$$\begin{array}{r}
 \tan S = 9.5475 \\
 \qquad \qquad 0.6516 \\
 \hline
 7.0534 \\
 \hline
 7.2525
 \end{array}$$

$$\eta_1 = +1.8$$

$$\eta_0 = -1.9966$$

$$\begin{array}{r}
 \log \eta_0 = 0.30029 \\
 \qquad \qquad 7.33115
 \end{array}$$

$$\therefore (H-D) = 2.96914$$

$$S = -15.314$$

$$D = +19.4420$$

$$S_0 = +19.2848.6$$

$$Red = +10.8$$

$$S' = +19.28594$$

4572 Previous Mean Position (1914.0)

$$X_0 = 242000$$

$$Y_0 = 158250$$

$$X_0 - 3 = 241997$$

$$Y_0 - 10 = 158240$$

$$241996$$

$$158240$$

Transit plate constant $X = 241173$ $Y = 160052$

$$S = +2.1173$$

$$\eta = -19948$$

$$\log S = 0.32578$$

$$997440$$

$$850724$$

$$(X-A) = 184414$$

$$X-A = +10985$$

$$A = 23600$$

$$X = 2370985$$

$$Red = +0.77$$

$$X = 2371062$$

$$S = 9.5475$$

$$0.6516$$

$$7.0534$$

$$7.2525$$

$$\eta_1 = +1.8$$

$$\eta_0 = -19966$$

$$\log \eta = 0.30029$$

$$733111$$

$$(A-D) = 296914$$

$$S = -15314$$

$$D = +194420$$

$$S_0 = +192848.6$$

$$Red = +10.8$$

$$S' = +1928594$$

4572

Lunar Parallax.

19

$$\begin{array}{rcl}
 \alpha' & 2^h & 37^m & 10.62 \\
 \ominus & 3 & 11 & 13.8 \\
 \theta - \alpha & + & 34 & 03.2 \\
 & & 8^\circ & 30' & 48'' \\
 & + & & 3 & 12
 \end{array}$$

$$8 \quad 27 \quad 36$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 000475 \\
 \hline
 9.96202
 \end{array}$$

$$8 - 42 \quad 29 \quad 53$$

$$19 \quad 28 \quad 59$$

$$23 \quad 00 \quad 54$$

$$\begin{array}{r}
 9.82640 \\
 820485 \\
 9.59215 \\
 0.17034 \\
 \hline
 7.79374
 \end{array}$$

$$S - S' : \quad + 21 \quad 22.8$$

$$S \quad + 19 \quad 50 \quad 22.2$$

$$\text{Amalphi S} \quad + 19 \quad 50 \quad 19.8$$

$$O - C \quad + \quad 2.4$$

$$\begin{array}{rcl}
 \text{curr.} & - & 0.5 \\
 \text{Inv} & - & 0.0
 \end{array}$$

$$\begin{array}{rcl}
 S - & + 19 & 50 \quad 22.2 \\
 O - C & + & 2.4
 \end{array}$$

$$S' \quad + 19^\circ \quad 28' \quad 59.4$$

$$\Pi \quad 55 \quad 05.92$$

$$\begin{array}{r}
 9.86913 \\
 8.20485 \\
 9.17038 \\
 0.02657 \\
 \hline
 7.27093
 \end{array}$$

$$\alpha - \alpha' = 6' \quad 24.90$$

$$= + 25.66$$

$$\alpha \quad 2 \quad 37 \quad 36.28$$

$$\alpha \quad 2 \quad 37 \quad 35.36$$

$$+ 0.92$$

$$\begin{array}{rcl}
 \text{curr} & - & 0.03 \\
 \text{Inv} & - & 0.02
 \end{array}$$

$$\alpha - 2 \quad 37 \quad 36.26$$

$$O - C = \quad + 0.90$$

4572

Lunar Parallax

19

$$\begin{array}{rcl}
 \alpha & 2 & 37 \quad 10.62 \\
 \odot & 3 & 11 \quad 13.8 \\
 \alpha - \odot & + & 34 \quad 03.2 \\
 & & 8'' \quad 30' \quad 48'' \\
 & + & 3 \quad 12
 \end{array}$$

$$\begin{array}{rcl}
 & & 8 \quad 27 \quad 36
 \end{array}$$

$$\begin{array}{r}
 995727 \\
 000000 \\
 \hline
 000478 \\
 996202
 \end{array}$$

$$\begin{array}{rcl}
 \delta & 42 & 29 \quad 53
 \end{array}$$

$$\begin{array}{rcl}
 & 19 & 28 \quad 59
 \end{array}$$

$$\begin{array}{rcl}
 & 23 & 00 \quad 54
 \end{array}$$

$$\begin{array}{r}
 982640 \\
 820485 \\
 959215 \\
 \hline
 017034 \\
 779374
 \end{array}$$

$$\begin{array}{rcl}
 S-S' & + & 21 \quad 22.8
 \end{array}$$

$$\begin{array}{rcl}
 S & + & 19 \quad 50 \quad 22.2
 \end{array}$$

$$\begin{array}{rcl}
 \text{Moon from } S & + & 19 \quad 50 \quad 19.8
 \end{array}$$

$$\begin{array}{rcl}
 O-C & + & 2.4
 \end{array}$$

$$\begin{array}{rcl}
 \text{Sun} & - & 0.0 \\
 S & + & 19 \quad 50 \quad 22.2 \\
 O-C & + & 2.4
 \end{array}$$

$$\begin{array}{rcl}
 S' & + & 19^\circ \quad 28' \quad 59''
 \end{array}$$

$$\begin{array}{rcl}
 \Pi & 55 & 08.92
 \end{array}$$

$$\begin{array}{r}
 986913 \\
 820485 \\
 917038 \\
 \hline
 0.02657 \\
 727093
 \end{array}$$

$$\begin{array}{rcl}
 \alpha - \alpha' & = & 6 \quad 24.90
 \end{array}$$

$$\begin{array}{rcl}
 & = & +25.66
 \end{array}$$

$$\begin{array}{rcl}
 \alpha & 2 & 37 \quad 36.28
 \end{array}$$

$$\begin{array}{rcl}
 \alpha & 2 & 37 \quad 35.36
 \end{array}$$

$$\begin{array}{rcl}
 & + & 0.92
 \end{array}$$

$$\begin{array}{rcl}
 \text{Moon} & - & 0.02 \\
 242 & - & 0.02 \\
 \alpha & 2 & 37 \quad 36.26 \\
 O-C & + & 0.90
 \end{array}$$

4
2
16
89
2
20
2
3
33
14
1
20
14
2
20
14
2
20
14

4588 Comp. Stars - Measures. 1915 Apr 29. 20

d	n	d	n
16660	19340	16943	17834
9955	16039	8120	16660
5860	3835	13	5660
63	56	38	48
<u>16.6704</u>	<u>.6692</u>	<u>8.8823</u>	<u>.8823</u>
8460	12900	20025	18490
5955	12272	16154	12353
7840	7880	62	50
		18	01
<u>20.9382</u>	<u>.9376</u>	<u>21.3867</u>	<u>.3854</u>
18980	20324	18204	19419
10932	18360	15750	12855
3435	6971	5249	40
70	38	78	20
<u>33.8038</u>	<u>.8040</u>	<u>14.2434</u>	<u>2424</u>

Moon measures.

19049	19330	18471	15695
12210	16151	12638	11525
0586	4152	3030	3130
52	31	58	05
<u>20.6850</u>	<u>.6818</u>	<u>14.5830</u>	<u>.5830</u>
19817789	15879		
15010142	13521		
4257	1909		
01	89		
<u>19.7653</u>	<u>.7629</u>		

4588 Comp. Stars Measures 17.1 7 1 20
 d n d n
 1 16660 19340 16943 17834
 27 9955 16039 8120.11 16660.60
 89 3835 5660
 63 56 38 48
16.6704 .6692 8.8823 5823

2 8460 12900 20025 18490
 209 5955 12272 16154.50 12353.50
 27 7840 7850
20.9382 9376 21.3867 3854

3 18980 20324 18204 19419
 398 10932 18360 15750.49 12855.10
 143 3435 6971 529 40
 70 38 78 20
33.8038 8040 14.2734 2424

Moon Measures.

1 190.49 19330
 207 12210.66 16151
 140 05 4152
 52 31
20.6850 .6818

2 18471 15695
 200 12638 11525.30
 146 30 30 31
 58 05
14.5830 5830

3 19817789 15879
 150 10142 13521
 42 1909
 01 89
19.7653 .7629

41
19
15
6
5
19
16

6
2
11

7
21
17

8
2
1
2

2
2
1

4588

Moon-measures

1915 Apr 29.

21

4	17200	17729
19.6	10980	14000
15.6	7980	0095
min	03	95
2	19.6222	.6213

5	17221	17720
197	10879	14100
16.0	8077	0000
	21	80
	19.6342	.6326

6	15879	
20.0	676050	
16.9	47	
	60	
	16.9110	

17914
1704331
30
28
.9120

7	16152	
21.0	9969	
17.5	6972	
	60	
	17.6187	

17660
1384542
48
60
.6185

8	20070	
21.5	1301409	
17.6	209	
max	80	
1	17.7063	

18686
15758
8869
90
.7075

9	19039	
22.0	12420	
17.6	2020	
	40	
	17.6620	

18719
1532628
25
15
.6608

Density 2.

43-58

Moon - measures -

1915 Apr 19

21

α
 4
 19.6
 15.6
 7980
 03
19.6222

$\sim$
 17729
 1400095
 00
 95
6213

$\frac{5}{17}$
 17221
 10879
 8077
 21
19.6342

17770
 1410000
 00
 50
6326

$\frac{6}{20.0}$
 16.9

15879
 676050
 47
 60
16.9110

17914
 1704331
 30
 28
9120

$\frac{7}{21.0}$
 17.5

16152
 996972
 60
 60
17.6187

17660
 1384542
 48
 60
6185

$\frac{8}{21.5}$
 17.6
 17.6
 17.6

20070
 1301409
 2009
 80
17.7063

18686
 15758
 5869
 90
7085

$\frac{9}{22.0}$
 17.6

19039
 1242020
 20
 40
17.6620

18719
 1532628
 25
 15
6608

2.

4588 Times etc. 22
 Exp. to stars 1914 Jan 10, 9^h 51^m - 10^h 03^m
 " " Moon 9 57 22.8 - 9 57 23.1
 Clock fast 0 017

H. Sid T. 9 57 21.25 $\Theta_{\text{ax}} = +3^{\circ} 19'$
 W. Long 4 44 31.05
 G. Sid T. 14 41 52.30
 Sid T. in Moon 19 16 39.21
 Interval 19 25 13.09
 Red, 3 10.89
 G. M. T. 19 22 02.20
~~19 50 26.69~~

From Naut Alman R.A. Decl.
 Moon 19^h 37^m 52.85 + 27° 53' 40.6
 Moon 21^h = 2.5661 3.407
 " " 22.037 + 56.55 - 1 15.4
 Tabular place. 6 34 49.40 + 27 52 25.5

Moon's age 15 days. (before full)

" parallax 58' 02.14

- Semidiam 15 50.4

934011.7
 910 =

R 950.4

Augmentation + 12.1

Invadialun(2) - 0.1

R 962.4

R 2.0630

ark - 989

(1+a)/R 1.9641

R² 38577

a = 5032

24

479.2

45-88 Time etc. 22

Exp. to star 1914 Jan 10, 7^h 51^m - 10^h 03^m

" " Moon 9 57 228 - 9 57 231

Closest pass 0 017

H Sid. T. 9 57 21.25 00x - 3^h 19

H Long 4 44 31.05

Q Sid. T. 14 41 52.30

Sid. T. in hours 19 16 39.21

Interval 19 25 13.09

Red 3 10.89

Q in T. 19 22 02.20

~~+9 50 26.69~~

From Mount Allen R A. Decd.

Moon 19^h 6^m 27^s 52.85 + 27^h 53^m 40.6

Mercury 21^h 2.5661 3407

" 22.037 + 56.55 - 1 15.2

Tabular place 6 34 49.40 + 27 52 25.4

Moon's age 15 days (1914 Jan 10)

parallax 58' 02.14

semidiam 15' 50.4

R 950.4

Augmentation + 12.1

Horizontal parallax 0.1

R 962.4

R 2063.0

alt - 98.9

11.41 R 1964.1

R² 3257.7

934.117

914.

@ -5032

24

4792

Tables $a: -1.7$ $a: -1.0$ $a-a: -0.7$ $b+a: -2.2$

4588 Plate constants

23

$$\begin{array}{r}
 \begin{array}{r}
 \times \\
 166698 \\
 209379 \\
 338039 \\
 \hline
 7171 \\
 23.80 \\
 -22 \\
 \hline
 1.80 \\
 31 \\
 \hline
 56^s
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{r}
 y \\
 88823 \\
 213860 \\
 142429 \\
 \hline
 44.51 \\
 14.87 \\
 -18 \\
 \hline
 3.13 \\
 46.5 \\
 \hline
 1460'' \\
 = 24' 20''
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{r}
 63319 \\
 3556 \\
 4348 \\
 \hline
 111123 \\
 63741 \\
 -52 \\
 \hline
 63645
 \end{array}
 \end{array}$$

$$\begin{array}{l}
 \text{Center } \left\{ \begin{array}{l} X_0 = 6^h 36^m 40^s \\ Y_0 = +27^\circ 46' 10'' \end{array} \right.
 \end{array}$$

$$\begin{array}{r}
 2-3 \quad +500x \quad +37.64 \quad +3.2x \quad -13251 \\
 +4529 + 8335 + 12864 + 334 = +13198 + 53 = +13251 \quad 2 \quad 0 \\
 +1912 + 10469 + 12381 + 804 = +13185 + 67 = +13252 \quad < \quad +1 \\
 -4295 + 16902 + 12607 + 536 = +13143 + 108 = +13251 \quad = \quad 0 \\
 215824 + 10791 \quad + 592 \quad + 69 \quad = 214025
 \end{array}$$

$$\begin{array}{r}
 y = -11500y \quad -34.3x \quad +3.6y \quad -4737 \\
 +8307 + 4441 = +5271 = 572 = +4699 + 32 = +4731 \quad = \quad 0 \\
 -5321 + 10693 = +5372 = 718 = +4654 + 77 = +4731 \quad = \quad 0 \\
 -1281 + 7121 = +5840 = 1159 = +4681 + 50 = +4732 \quad = \quad +1 \\
 157438 + 7872 \quad - 740 \quad + 57 \quad = 159896
 \end{array}$$

$$\begin{array}{l}
 \downarrow \quad = -1.7 \\
 \text{Obs } a = -503.2 \quad e = -503.6 \quad a - e = +0.4 \quad t + a = -3.3 \\
 o - e = -501.5'' \quad -502.6'' \quad -1.1''
 \end{array}$$

4588 Plate Computations

23

$$\begin{array}{r}
 \times \\
 16.6698 \quad 8.8823 \\
 209379 \quad 213860 \\
 338039 \quad 142429 \\
 \hline
 7171 \quad 7451 \\
 2380 \quad 14.87 \\
 \hline
 32 \quad 1.82 \\
 \hline
 1.82
 \end{array}$$

56"

1460"

24' 20"

$$\begin{array}{r}
 6 \quad 33 \quad 19 \quad +26 \quad 34 \quad 20 \\
 3.5 \quad 56 \quad +28 \quad 16 \quad 37 \\
 \hline
 43 \quad 48 \quad +27 \quad 17 \quad 16 \\
 \hline
 111 \quad 123 \quad \hline
 6 \quad 37 \quad 41 \quad +27 \quad 22 \quad 48 \\
 \hline
 6 \quad 76 \quad 45 \quad +27 \quad 46 \quad 08
 \end{array}$$

$$\begin{aligned}
 \text{Center } \left\{ \begin{aligned} X_0 &= 6'' \quad 26'' \quad +0'' \\ Y &= +27'' \quad +6' \quad 10'' \end{aligned} \right.
 \end{aligned}$$

$$\begin{array}{r}
 2-3 \quad +1000x \quad +37.64 \quad +3.28 \quad -1325-1 \\
 +4529 + 8335 = +12864 + 334 = +13198 + 53 = +13251 \quad = 0 \\
 +1912 + 10469 = +12381 + 804 = +13185 + 67 = +13252 \quad = +1 \\
 -4295 + 16902 = +12607 + 536 = +13143 + 108 = +13251 \quad = 0 \\
 215824 + 10791 \quad = 592 \quad + 69 \quad = 214025
 \end{array}$$

$$\begin{array}{r}
 y-y \quad +1000y \quad -34.3 \quad +3.64 \quad -4731 \\
 +830 + 4441 = +5271 - 572 = +4699 + 32 = +4731 \quad = 0 \\
 -5821 + 10693 = +5372 - 718 = +4654 + 77 = +4731 \quad = 0 \\
 -1281 + 7121 = +5840 - 1159 = +4681 + 51 = +4732 \quad = +1 \\
 157438 - 7872 \quad = 740 \pm 20 \quad + 57 \quad = 159496
 \end{array}$$

$$\text{Obs } a = -503.2 \quad e = -503.6 \quad a - e = +0.4 \quad b + a = -3.3$$

Curvature

	S	η	ΔS	- 3.75	- .1 η - 5
1	- 5.78	- 9.22	- 1.7	+ 21 = + 4	+ 1 = + 5
2	- 1.25	+ 3.92	- .0	+ 4 = + 4	- 0 = + 4
3	+ 12.23	- 3.72	+ 5.0	- 45 = + 5	+ 0 = + 5
M	- 0.60	- 2.01		+ 2	0 = - 3

$$\begin{array}{rcl}
 \Delta \eta & & - 2.3 \eta + 7 \\
 - 28 & + 21 & = - 7 \\
 + 2 & - 9 & = - 7 \\
 - 15 & + 8 & = - 7 \\
 & + 5 & = + 12
 \end{array}$$

$$\text{corr.} \left\{ \begin{array}{l} \delta = - 0.01 \\ \delta = + 0.6 \end{array} \right.$$

4588

Standard Coordinates - Reference Stars.

Cat. No. 946 Aug 8.7 ^{dr?}	Cat. No. 953 Aug 6.6	Cat. No. 977 Aug 6.6
C 6 ⁿ 32 ^m 26.65026	35 02.82	6 42 55.49
L .74040	.78	.51
E .61068	.79	.52
Mean 6 32 26.67	6 35 02.80	6 42 55.51
Proc + 52.28	+ 52.94	+ 52.50
S 6 33 18.95	6 35 55.74	6 43 48.01
D 6 36 40	6 36 40	6 36 40
S-D - 3 210.5	- 4.426	+ 7 08.01
ln(D-A) - 201.04	- 44.26	+ 427.94
log ₁₀ 2.30328 ^m	1.64601 ^m	2.63138
-log ₁₀ 9.9575 ^A	9.94481	9.94876
-3 ₀ 0.76203 ^m	0.09806 ^m	1.08738
3 ₀ - 5.7814	- 1.2533	+ 12.2286
3 ₁ - 17	0	+ 48
3 ₂ 16.2169	20.7467	342334
3 ₃ 16.6698	20.9379	338039
2-3 + 4529	+ 1912	- 4295
C + 26° 35' 09" 9	+ 28 17 20.6	+ 27 18 09.1
L 09.8	20.5	09.5
E 09.6	20.5	09.1
Mean + 26 35 09.8	+ 28 17 20.5	+ 27 18 09.2
Proc - 40.1	- 43.2	- 52.8
S + 26 34 29.7	+ 28 16 37.3	+ 27 17 16.4
D + 27 46 10	+ 27 46 10	+ 27 46 10.
S-D - 1 11 40.3	+ 30 27.3	- 28 53.6
ln(D-A) - 4300.9	+ 1827.3	- 1733.6
log ₁₀ 3.63356 ^m	3.26181	3.23895 ^m
3 ₀ 0.96471 ^m	0.59296	0.57010 ^m
3 ₁ 9.6992	9.7307	9.7125
3 ₂ 15.241	01961	2.1748
3 ₃ 8.2767	69802	8.9407
3 ₀ - 9.2196	+ 3.9171	- 3.7162
3 ₁ + 189	+ 1.0	+ 872
3 ₂ 8.7993	219181	14.3710
3 ₃ 8.8823	213860	142429
3 ₄ + 8.30	- 5321	- 1281

Standard Coordinate Reference Stars											
4588				4589				4590			
Catalano 946 ang 87				Catalano 913 ang 66				Catalano 977 ang 66			
6" 32" 26.65				6 35 02.82				6 42 55.49			
74				78				51			
61				79				52			
6 32 26.67				6 35 02.80				6 42 55.51			
+ 52.26				+ 52.94				+ 52.50			
6 33 18.95				6 35 55.74				6 43 48.01			
6 36 40				6 36 40				6 36 40			
- 3 210.5				- 44.26				+ 7 08.01			
- 201.04				- 44.26				+ 42.794			
2.30328				1.64601				2.63138			
59515A				994481				994876			
0.76203				0.09806				1.08738			
- 57817				- 12533				67122286			
17				0				+ 1 48			
16.2109				20.7467				342334			
16.6698				20.9379				338039			
+ 4529				+ 1912 6				- 4295			
C +26° 35' 09"9				+28 17 20.6				+27 18 091			
L 09.8				20.5				045			
L 09.6				20.5				071			
mean +26 35 09.8				+28 17 20.5				+27 18 092			
- 40.1				- 43.2				- 52.8			
S +26 34 29.7				+28 16 37.3				+27 17 16.4			
D +27 46 10				+27 46 10				+27 46 10			
-D -1 11 40.3				+ 30 27.3				28.556			
mean (4-11) -4300.9				+18273				- 1733.6			
3.63356				3.26181				3.22575			
0.96471				0.59296				0.57010			
9.6992				9.7307				9.7125			
15241				01961				21748			
82767				69802				89407			
-9.2196				+3.9171				-3.7162			
+ 189				+ 10				+ 872			
87993				219181				143710			
88823				213860				142426			
+ 830				-5321				-1281			

45-88

moor's Center

25

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	
1	20.6834	-0.9006	-4	0.8118	3.8596	+19
2	20.0000	-1.5840	-2	2.5097	3.8621	+44
3	19.7641	-1.8199	-2	3.3128	3.8692	+115
4	19.6218	-1.9622	0	3.8502	3.8502	-75
5	19.6334	-1.9506	+4	3.8045	3.8690	+113
6	20.0000	-1.5840	+2	2.5085	3.8667	+90
7	21.0000	-0.5840	+4	0.3406	3.8465	-112
8	21.5840	0.0000	+4	0.0000	3.8443	-134
9	22.0000	+0.4160	+4	0.1734	3.8414	-163

$$R^2 = 3.8577$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	14.0000	-1.7460	+2	3.0478	207 ✓
2	14.5830	-1.1630	+1	1.3524	234 ✓
3	15.0000	-0.7460	+1	0.5564	248 ✓
4	15.7460 ✓	0.0000	0	0.0000	270 ✓
5	16.0000	+0.2540	0	0.0645	277 ✓
6	16.9115	+1.1655	-1	1.3582	306 ✓
7	17.6186	+1.8726	-2	3.5059	343 ✓
8	17.7069	+1.9609	-2	3.8443	360 ✓
9	17.6614	+1.9154	-2	3.6680	12 ✓

Range 165

Approx. Center

$$x = 20.0 \quad y = 14.5830$$

$$\frac{16.9115}{31.4945}$$

$$y_0 = 15.7472$$

$$y_{\text{max}} = 17.7069$$

$$R = 1.9597$$

$$x_{\text{min}} = 19.6218$$

$$x_0 = 20.5815$$

$$\text{Center} \left\{ \begin{array}{l} x_0 = 21.5840 \\ y_0 = 15.7460 \end{array} \right.$$

4588

mosses Center

25

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	
1	20.6834	-0.9006	-4	0.8118	3.8596	+1.9
2	20.0000	-1.5840	-2	2.5097	3.8621	+4.4
3	19.7641	-1.8199	-2	3.3128	3.8692	+1.5
4	19.6218	-1.9622	0	3.8502	3.8502	-7.5
5	19.6334	-1.9506	+4	3.8045	3.8690	+1.3
6	20.0000	-1.5840	+2	2.5065	3.8667	+9.0
7	21.0000	-0.5840	+4	0.3406	3.8465	-1.2
8	21.5840	0.0000	+4	0.0000	3.8443	-1.34
9	22.0000	+0.4160	+4	0.1734	3.8414	-1.63

$$R^2 = 3.8577$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	14.0000	-1.7460	+2	3.0478	2.07
2	14.5830	-1.1630	+1	1.3524	2.34
3	15.0000	-0.7460	+1	0.5564	2.48
4	15.7460	0.0000	0	0.0000	2.70
5	16.0000	+0.2540	0	0.0645	2.77
6	16.9115	+1.1655	-1	1.3582	3.06
7	17.6186	+1.8726	-2	3.5059	3.43
8	17.7069	+1.9609	-2	3.8443	3.60
9	17.6614	+1.9154	-2	3.6680	1.2

Range 1.65

Affines Center

$$x = 20.0 \quad y = 14.5830$$

$$\frac{1.9911}{31.4945}$$

$$y_0 = 15.7472$$

$$y_{\text{max}} = 17.7069$$

$$R = 1.9597$$

$$x_{\text{min}} = 19.6218$$

$$x_0 = 20.5815$$

Center

$$x_0 = 21.5840$$

$$y_0 = 15.7460$$

1	+ 1.5 8	- 17.1	- 33.2
2	+ 1.8 3	- 69.5	- 51.0
3	+ 1.3 6	- 209.0	- 86.2
4	- 0.0 0	+ 9.2	- 0.0
5	- 0.4 9	- 220.0	+ 28.3
6	- 1.8 4	- 142.2	+ 10.5.3
7	- 1.0 8	+ 65.0	- 209.5
8	+ 0.0 0	- 0.0	- 263.0
9	+ 0.8 0	- 68.5	- 311.0
	+ 2.1 6	- 652.1	- 820.3

-a	-b	+45 + ΔC
- 24	+ 21	+ 42 ✓
- 43	+ 14	+ 16 ✓
- 49	+ 9	+ 5 ✓
- 53	- 0	- 8 ✓
- 53	- 3	- 11 ✓
- 43	- 14	- 12 ✓
- 16	- 22	+ 7 ✓
+ 0	- 24	+ 21 ✓
+ 11	- 23	+ 32 ✓

4588 Moon's Center

26

	O	C	O - C	Corr.
1	-0.90 - 1.75 = +1.9	+ 29 + 75 = +104	- 85	- 43 [✓]
2	-1.58 - 1.16 = +4.4	+ 51 + 50 = +101	- 57	- 41 [✓]
3	-1.82 - 0.75 = +1.1	+ 59 + 32 = +91	+ 24	+ 29 [✓]
4	-1.96 + 0.00 = -7.5	+ 32 - 0 = +32	- 70	- 78 [✓]
5	-1.95 + 0.25 = +1.3	+ 63 - 11 = +52	+ 61	+ 50 [✓]
6	-1.58 + 1.17 = +4.0	+ 51 - 50 = +1	+ 89	+ 77 [✓]
7	-0.58 + 1.87 = -1.2	+ 19 - 80 = -61	- 51	- 44 [✓]
8	+0.00 + 1.96 = -1.3	+ 0 - 84 = -84	- 50	- 29 [✓]
9	+0.42 + 1.91 = -1.6	- 14 - 82 = -96	- 67	- 35 [✓]
			+174	- 380
			Average	= 65

Normal Equations.

$$\begin{aligned}
 &+17.31 + 2.16 = -652 \quad -9.95 \\
 &+ 2.16 + 17.40 = -820 \quad +3.50 \\
 &- 2.16 - 0.27 = +81 \quad +1.24 \\
 &\quad +17.13 = -739 \quad +4.746 = -43.1 \quad +0.28 \\
 &\cancel{+ 2.16 - 820} \\
 &+17.31 = -652 + 93 = -559 \quad a = -32.3 \quad -0.61
 \end{aligned}$$

are measured = 165° Average (O - C) = -2.32

$$\frac{RC}{n} = 22 \quad - \frac{2.32}{22} = -1.04 \quad \Delta R = -1.3$$

$$\begin{aligned}
 -2RC &+ 2.24 + 45 \quad \text{Corr} = 0.6 \\
 &+ 12 \quad \Delta R = 0.7 \\
 \Delta b &+ 0.62 \quad \Delta \delta = +0.3 \\
 \Delta a &- 1.37 \quad \Delta \alpha = -0.05
 \end{aligned}$$

4588 Moon's Center

0

C

0 - C

1	-0.90	-1.75	= +1.9	+2.9	+7.5	= +10.4	= -2.5
2	-1.58	-1.16	= +4.4	+5.1	+5.0	= +10.1	= -5.7
3	-1.82	-0.75	= +1.15	+5.9	+3.2	= +9.1	= +2.4
4	-1.96	+0.00	= -7.5	+3.2	-0	= +3.2	= -7.0
5	-1.95	+0.25	= +1.13	+6.3	-1.1	= +5.2	= +6.1
6	-1.58	+1.17	= +9.0	+5.1	-5.0	= +1	= +8.9
7	-0.58	+1.87	= -1.12	+1.9	-8.0	= -6.1	= -5.1
8	+0.00	+1.96	= -1.34	= 0	-8.4	= -8.4	= -5.0
9	+0.42	+1.91	= -1.63	+1.4	-8.2	= -9.6	= -6.7

+17.4 = 38.0

Average = 6.5

Normal Equations

$$+17.31 + 21.6 = -652$$

$$+ 21.6 + 17.40 = -820$$

$$- 21.6 = 0.27 + 8.1$$

$$+ 17.13 = -739$$

$$C = -43.1$$

$$+ 21.6 = 0.27 + 8.1$$

$$+ 17.31 = -652 + 93 = -559$$

$$a = -32.3$$

Observed = 16.5° Average (0 - C) = 24.2

$$- \frac{2.3}{.22}$$

$$- 1.04 \quad \Delta R = -13$$

Moon's Mean Position (1914.0)

$$\begin{array}{r}
 X_0 = 215840 \quad Y_0 = 157460 \\
 \text{Lat} = \quad -16 \quad 26 \quad -22 \\
 \hline
 215824 \quad 157438
 \end{array}$$

From Plate Constants $X = 21.4025 \quad Y = 15.9896$

$$\begin{array}{l}
 \bar{z} = -0.5975 \\
 \log \bar{z} = 9.77634 m \\
 \cos \quad 994788 \\
 \quad 8.50724
 \end{array}$$

$$(X-A) \quad 1.32122 m$$

$$X-A \quad - \quad 20.95$$

$$A \quad 6 \quad 36 \quad 40$$

$$\alpha_0 = 6 \quad 36 \quad 19.05$$

$$\text{Red} \quad + \quad 1.99$$

$$\alpha' = 6 \quad 36 \quad 21.04$$

$$\eta = -2.0104$$

$$\begin{array}{l}
 \log \tan \delta = 9.7165 \\
 \quad 9.5527 \\
 \quad 7.0534 \\
 \hline
 6.3226
 \end{array}$$

$$\eta_1 = + \quad 2$$

$$\eta_0 = -2.0106$$

$$\begin{array}{l}
 \log \eta_0 = 0.30333 m \\
 \quad 7.33115
 \end{array}$$

$$(S-D) = 2.67218 m$$

$$S-D = -15 \quad 37.95$$

$$D = +27 \quad 46 \quad 10$$

$$S = +27 \quad 30 \quad 32.05$$

$$+ \quad 0.97$$

$$S' = +27 \quad 30 \quad 39.0$$

Moon's Mean Position (1914.0)

$$\begin{array}{r}
 X_0 = 215840 \quad Y_0 = 157460 \\
 \hline
 \quad \quad \quad - 16 \quad \quad \quad - 22 \\
 \hline
 \quad \quad \quad 215824 \quad \quad \quad 157438
 \end{array}$$

True Plate Constants $X = 214025 \quad Y = 159896$

$$\begin{array}{r}
 \delta Z = 0.5975 \\
 \log S = 9.77634 \\
 \log S = 9.94788 \\
 \quad \quad \quad 8.50724
 \end{array}$$

$$(X-A) = 132122 \sim$$

$$X-A = -20.95$$

$$A = 6 \quad 36 \quad 40$$

$$Q = 6 \quad 36 \quad 19.05$$

$$Red = 4 \quad 199$$

$$X = 6 \quad 36 \quad 21.04$$

$$\eta = -2.0104$$

$$\begin{array}{r}
 \log \tan S = 9.7165 \\
 \quad \quad \quad 9.5527 \\
 \quad \quad \quad \hline
 \quad \quad \quad 7.0534 \\
 \quad \quad \quad \hline
 \quad \quad \quad 6.3226
 \end{array}$$

$$\eta_1 = +2$$

$$\eta_0 = -2.0106$$

$$\begin{array}{r}
 \log \eta_0 = 0.30333 \\
 \quad \quad \quad 7.33115
 \end{array}$$

$$(S-D) = 297218 \sim$$

$$S-D = -15 \quad 3795$$

$$D = +27 \quad 40 \quad 10$$

$$S = +27 \quad 30 \quad 3205$$

$$+ \quad 697$$

$$S' = +27 \quad 30 \quad 3910$$

$$\begin{array}{r} 6 \quad 32 \quad 44.32 \\ \underline{42.06} \\ + 2.26 \end{array}$$

$$\begin{array}{r} -39 \quad 28 \quad 11.9 \\ \underline{03.7} \\ + 8.2 \end{array}$$

$$\begin{array}{r} 6 \quad 38 \quad 40.45 \\ \underline{38.51} \\ + 1.94 \end{array}$$

$$\begin{array}{r} +25 \quad 13 \quad 089 \\ \underline{02.1} \\ + 6.8 \end{array}$$

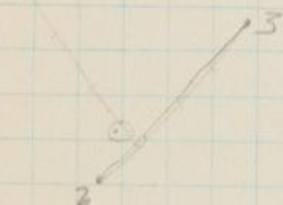
$$\begin{array}{r} 6 \quad 47 \quad 09.52 \\ \underline{07.37} \\ + 2.15 \end{array}$$

$$\begin{array}{r} +34 \quad 03 \quad 64.3 \\ \underline{57.5} \\ + 6.8 \end{array}$$

$$+ 2.01$$

$$+ 6.9$$

30 35 40 45 50



199

40

35

30

25

20

4588

Red. ad locum ahp.

29

$$\begin{array}{rcl}
 H + \alpha & 5^h & 1.3 = 80^\circ 20' \\
 H & 22 & 45.0 \\
 \alpha & 6 & 36.3 \\
 \delta & 19 & 01.7 \\
 H + \alpha & 1 & 39.0 = 24^\circ 45'
 \end{array}$$

$$S \quad +27 \quad 30 \quad 42$$

$$\begin{array}{rcl}
 \log S & 9.9479 \\
 l & 0.4510 \\
 (l) & 0.3989
 \end{array}$$

$$\begin{array}{rcl}
 \log(S + \alpha) & 9.9582 \\
 \delta & 0.9401 \\
 \sin \delta & 9.6219 \\
 \tan \delta & 9.7667 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \delta' & 0.8983 \\
 \delta & 9.1526
 \end{array}$$

$$\begin{array}{rcl}
 f & +0.35 \\
 \delta & +0.14 \\
 h & +1.50 \\
 \hline
 & +1.99
 \end{array}$$

$$\begin{array}{rcl}
 \log S & 9.6646 \\
 \cos(H + \alpha) & 9.2251 \\
 h & 1.3069 \\
 \sin h & 9.9938 \\
 \sec S & 0.0521 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 h' & 0.1966 \\
 h & 0.1767
 \end{array}$$

$$\begin{array}{rcl}
 \delta' & +7.91 \\
 \delta & +1.57 \\
 \hline
 & -2.51 \\
 & +6.97
 \end{array}$$

4588 Red ad locum aph.

S 727 30 42

H+9 5 ~~3~~ 3 = 80° 20'

H 22 45.0

α 6 36.3

δ 19 01.7

G+2 1 390 24° 45'

L 99479

L 0.4510m

(2)

L cos(S+α)

8 0.9401

sin

1 sin 8 9.7667

8.8239

8
8

f +0.35-

8
m

L cos S 9.6646

cos(H+α)

L 1.3069

sin

dec 8 0.0521

8.8239

L

L

L

L

L

L

4588

lunar Parallax.

30

$$\begin{array}{r} \alpha' \quad 6^h 36^m 21.04 \\ \theta \quad 9 \quad 57 \quad 21.25 \\ \theta - \alpha' + 3 \quad 21 \quad 00.21 \end{array}$$

$$+ 50^\circ 15' 03''$$

$$+ \quad \quad \quad 18 \quad 40$$

$$+ \quad 49 \quad 56 \quad 23$$

$$9.95727$$

$$9.99999$$

$$0.04272$$

$$9.76599$$

$$0.14853$$

$$\delta = 54 \quad 36 \quad 44$$

$$27 \quad 20 \quad 39$$

$$27 \quad 05 \quad 55$$

$$9.82640$$

$$8.22740$$

$$9.65851$$

$$0.08870$$

$$7.80106$$

$$S - S' \quad + 21 \quad 44.5$$

$$S \quad + 27 \quad 52 \quad 23.5$$

$$\text{Parallax } S + 27 \quad 52 \quad 25.5$$

$$O - C \quad - \quad 2.0$$

$$\text{curr.} \quad + \quad 0.6$$

$$+ \quad 0.3$$

$$\delta \quad + 27 \quad 52 \quad 23.8$$

$$O - C \quad - \quad 1.7$$

$$S' \quad + 27^\circ 30' 39.0$$

$$\pi \quad 58' 02.14$$

$$9.86913$$

$$8.22740$$

$$9.88585$$

$$0.05356$$

$$8.03594$$

$$\alpha - \alpha' = + 37' 20.65$$

$$+ 2'' 29.38$$

$$\alpha \quad 6 \quad 38 \quad 50.42$$

$$\alpha \quad 6 \quad 38 \quad 49.40$$

$$+ 1.02$$

$$- 0.01$$

$$\text{curr.} \quad - 0.05$$

$$\alpha - 6 \quad 38 \quad 50.37$$

$$O - C \quad + 0.97$$

4588

Inner Parallax

30

α 6 36 21.05
 δ 9 57 21.25
 $\alpha - \delta$ + 3 28 00.21

+ 50 15 03
 + 18 40
 + 49 56 23

995727

999999

0.99127

978519

0.14853

 α 54 36 44

27 20 49

27 05 55

982640

822740

965851

0.08820

780206

 $S - S'$ + 21 44.5 S + 27 52 23.5Naut. Alt. S + 27 52 25.4 $O - C$ - 2.0

+ 0.6

+ 0.3

 S + 27 52 23.8 $O - C$ - 1.7 S' + 27 30 39.0 π 58 02.14

986913

822740

965855

0.05356

803594

 $\alpha - \delta$ + 37' 20" 65

+ 2 29.38

 α 6 38 50.42 α 6 38 49.40

+ 1.02

- 0.01

2m - 0.15

 α 6 38 50.37 $O - C$ + 0.97

