

KG

11366

4897

Volume XXI



Plates

1168



Harvard Lunar Plates

Measurements and Reductions

Mary Fowler

Volume XXI

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M4168 Comp Stars

1913 Apr 22

1

Preliminary Reduction

	1	2	3
2	10.4366	18.9273	28.8453
3	10.2311	18.6758	28.7790
2-3	+ 2055	+ 2515	+ 663

y	28.3872	33.7470	97866
η	28.2874	33.7217	98130
$\eta - \eta$	+ 998	+ 253	- 264

$$\begin{aligned}
 & \pi - 3 \quad -794 \quad -42 \quad -130\pi - 064 \quad + 235 \\
 & + 2055 - 2243 = -188 - 42 = -230 - 3 - 2 = -235 = 0 \\
 & + 2515 - 2666 = -151 - 76 = -227 - 6 - 2 = -235 = 0 \\
 & + 663 - 773 = -110 - 115 = -225 - 9 - 1 = -235 = 0 \\
 & \text{mean } 18.5718 - 1708 \quad -74 \quad -6 \quad -1 \quad = 18.414 \\
 & y - \eta \quad +822 \quad +124 \quad -146\pi \quad -0.264 \quad -2173 \\
 & + 998 + 856 = +1854 + 341 = +2195 - 15 = +2180 - 7 = +2173 = 0 \\
 & + 253 + 1552 = +1805 + 405 = +2210 - 28 = +2182 - 9 = +2173 = 0 \\
 & - 264 + 2365 = +2101 + 117 = +2218 - 42 = +2176 - 3 = +2173 = 0 \\
 & \text{mean } 21.6237 + 1523 \quad +259 \quad -27 \quad -6 = 21.5813
 \end{aligned}$$

$$\begin{aligned}
 \text{Tables } a &= +0.7 \quad e = -15.3 \quad a - e = +16.0 \quad b + a = -3.0 \\
 \text{Obs } a &= +4.0 \quad e = -11.7 \quad a - e = +15.7 \quad b + a = -0.9
 \end{aligned}$$

M101168 Comp Stars

1913 Apr. 22

1

Preliminary Reduction.

	1	2	3
2	10.4366	18.9273	28.8453
3	10.2314	18.6758	28.7790
2-3	+ 2055	+ 2515	+ 663

y	28.3872	33.7470	4.7866
γ	28.2874	33.7217	9.8130
γ-y	+ 998	+ 253	- 264

$x-3$	-794	-42	$-.10x-.064$	$+231$	
$+2055$	-2243	$-188-42$	$-230-3$	$-22-235=0$	
$+2515$	-2666	$-151-76$	$-227-6$	$-2-235=0$	
$+663$	-773	$-110-115$	$-225-9$	$-1-235=0$	
18.5718	-1708	-74	$-6-1$	$=18.4164$	
$4-\gamma$	$+822$	$+124$	$-1.46x$	-0.264	-2173
$+998$	$+856$	$+1854+341$	$+2195-15$	$+2180-7$	$+2173=0$
$+253$	$+1552$	$+1805+405$	$+2210-28$	$+2182-9$	$+2173=0$
-264	$+2365$	$+2101+117$	$+2218-42$	$-2176-3$	$+2173=0$
21.6237	$+1523$	$+259$	-27	-6	$=21.5813$

MAG 1168

1913 Apr 22

2

	Times	etc.			
Eph. total	1911 July 7	16 ^h 24 ^m	-	16	33
moon		16 28	56.6	- 16	28 56.7
clock fast		3	40.2		
H. Sid T.		16 25	16.45		
H. long		4 44	31.05		
G. Sid T.		21 09	47.50		
Sid Time in hour		6 57	20.55		
Interval		14 12	26.95		
Red.		- 2	19.65		
G. M. T.		14 10	07.30		

From Am Eph.

R.A.

moon 14 ^m	16 19	08.71	- 23.56	17.6
motion in 1 ^m = 2.0927			7.244	
10.1217				

Eph. total	1911 July 7	16 ^h 48 ^m	-	16 ^h 57 ^m	
moon		16 52	10.5	- 16 52	10.6
clock fast		3	40.2		
H. Sid T.		16 48	30.35	G-d-10 28	
H. long		4 44	31.05		
G. Sid T.		21 33	01.40		
Sid T. mean		6 57	20.55		
Interval		14 35	40.85		
Red		2	23.46		
G. M. T.		14 33	17.39		

From Am Eph.

moon 14 ^m	16 19	08.71	- 23° 56'	17.6
motion in 1 ^m = 2.0934			7.223	
33.2898	+ 1	09.69	- 4	00.5
Tabular place	16 20	18.40	- 24 00	18.1

Moon's parallax

54 03.4

- Semidiameter

14 45.4

M/C 1168

1913 Apr. 22.

Times etc.
 Exp. total 1911 July 7 $16^h 24^m$ - $16^h 33^m$
 moon $16^h 28^m$ 56.6 - $16^h 28^m$ 56.7
 clock fast 3 40.2

H. Sid T. $16^h 25^m$ 16.45
 H. long 4 44 31.05
 G. Sid T. $21^h 09^m$ 47.50
 Sid Time m. noon 6 57 20.55
 Interval $14^h 12^m$ 26.95
 Red. - 2 19.65
 G. m. T. $14^h 10^m$ 07.30

From Ann Eph. R.A.
 Moon 19^h $16^h 19^m$ 08.71 - $23^h 56^m$ 17.6
 motion in 1^m - 2.0927 7.244
 ... 10.1217

Exp. total 1911 July 7 $16^h 48^m$ - $16^h 57^m$
 moon $16^h 52^m$ 10.5 - $16^h 52^m$ 10.6
 clock fast 3 40.2

H. Sid T. $16^h 48^m$ 30.35
 H. long 4 44 31.05
 G. Sid T. $21^h 33^m$ 01.40
 Sid T. m. noon 6 57 20.55
 Interval $14^h 35^m$ 40.85
 Red 2 23.46
 G. m. T. $14^h 33^m$ 17.39

From Ann Eph
 Moon 19^h $16^h 19^m$ 08.71 - $23^h 56^m$ 17.6
 motion in 1^m - 2.0934 7.223
 ... 33.2898 + 1 09.69 - 4 00.5
 Tabular place $16^h 20^m$ 18.40 - $24^h 00^m$ 18.1

Moon's parallax 54 03.4
 ... in minutes 14 45.4

MC1168. Comp. Stars. Ucammes. 1913 Apr. 22

3

4

x

λ	d	v	d	v
10.5	19370	19215	16894	19220
28.4	15505	1308080	1125350	1484540
mag	9097	80	50	3240
49	64	60	88	00
	<u>28.3871</u>	<u>.3874</u>	<u>10.4560</u>	<u>.4373</u>

λ	d	v	d	v
3	15614	16170	16172	17771
18.9	814842	1364149	1542530	2848589
338	43	4847	29	89
mag	09	80	70	70
6.6	<u>33.7466</u>	<u>.7473</u>	<u>18.9256</u>	<u>.9282</u>
			num = .9273	

λ	d	v	d	v
28.8	15065	15479	14608	15220
4.7	718999	1333840	1305952	674040
mag	9191	42	4858	40
6.2	55	51	14	98
	<u>9.7865</u>	<u>.7867</u>	<u>28.8445</u>	<u>.8461</u>

Center of Plates. 1166-1168.

λ	d	R	Q	d	R	Q
28.39	10.44	16 15 17	-23	57	20	
33.75	18.93	20 04	-23	15	20	
9.79	28.85	25 55	-26	20	40	
3 71.93	3 58.22	61 16	-13	33	20	
23.98	19.41	16 28 25	-24	31	07	
-22	-18	-44	-15	20		
1.98	1.41	16 19 41	-24	46	27	
465	31					
920	445					
= 15' 20"						

$$A = 16^h 19^m 41^s$$

$$D = -24^\circ 46' 27''$$

MC1168. Comp. Stars & Neumanns 1913 Apr. 22.

3.

$\checkmark$	d	$\checkmark$	d	$\checkmark$	d
10.5	1937.0	19215	16894	19220	
28.4	15505	1308080	1125550	1484540	
mg.	9097	80	50	3240	
49	64	60	88	00	
	<u>28.3871</u>	<u>.3874</u>	<u>10.4560</u>	<u>.4373</u>	
$\underline{3}$	15614	16170	16172	17771	
18.9	814842	1364149	1542530	1848589	
338	43	4847	29	89	
mg.	09	80	70	70	
6.6	<u>33.7466</u>	<u>7473</u>	<u>18.9256</u>	<u>.9282</u>	
			sum: 1.9273		
$\underline{4}$	15065	15479	14608	15220	
28.8	718999	1333840	1305952	674040	
9.7	9191	42	4858	40	
mg.	55	51	14	98	
6.2					
	<u>9.7865</u>	<u>.7867</u>	<u>28.8445</u>	<u>.8461</u>	

Center of Plates. 1166-1168.

$\checkmark$	$\checkmark$	R.A.	Decl.
28.39	10.44	16 15 17	-23 57 20
33.75	18.93	20 04	-23 15 20
9.79	28.85	25 55	-26 20 40
3 71.93	3 58.22	61 16	-13 33 20
23.98	19.41	16 20 25	-24 31 07
- 22	- 18	- 49	- 15 20
1.98	1.41	16 19 41	-24 46 27
465	31		
920	445		
= 15' 20"			

$$A = 16^h 19^m 41^s$$

$$D = -24^\circ 46' 27''$$

11C1166 Moon-measures.

1913 Apr 22

4.

$\frac{1}{18.0}$ d 18100 19148
 $\frac{19.8}{21}$ 1011215 1713030
 96 48
19.7981 .7980

$\frac{2}{17.6}$
 20.0

16506 18901
 1209307 1325170
 0807 7180
 06 91
17.5597 .5627

$\frac{3}{17.0}$ 16151 17685
 20.6 1080125 1298185
 2007 9085
 51 89
20.5338 .5298

$\frac{4}{16.8}$
 21.0

15326 16960
 12941 932220
 4240 30
 34 40
16.9613 .7621

$\frac{5}{16.8}$
 22.0

15239 16937
 1220909 996278
 07 6570
 59 27
16.6964 .6961

$\frac{6}{17.3}$
 23.0

18517 17211
 1087980 1480920
 6075 20
 10 98
17.2362 .2392

11C1168 Moon-Measures.

1913 Apr 22.

4.

	d	N
18.0	18100	19148
19.8	1011211	1713030
	21	25
	96	48
	<u>19.7981</u>	<u>.7980</u>

2
17.6
20.0

16506	18901
1209307	1325170
08	7150
06	91
<u>17.5597</u>	<u>.5627</u>

	d	N
17.0	16151	17685
20.6	1080125	1298185
	2007	90
	51	89
	<u>20.5338</u>	<u>.5298</u>

4
16.8
21.0

15326	16960
1294140	932220
42	30
34	40
<u>16.9613</u>	<u>7621</u>

5
16.8
22.0

15239	16937
1220709	996278
07	6570
59	27
<u>16.8964</u>	<u>6961</u>

6
17.3
23.0

18517	17211
1087980	1480920
6075	20
10	98
<u>17.2362</u>	<u>.2392</u>

MC1168

Moon-Measures.

1913 Apr 22.

5-

	α	N	α	N
7	16548	14110		
18.0	1205645	861009		
23.4	50	1509		
	46	05		
	<u>23.4497</u>	<u>4504</u>		

8. scratch

18.5				
23.5	16520	18690	16038	18270
max	1118080	1402833	1200500	1226565
α	80	30	00	70
N	22	92	38	70
	<u>23.5341</u>	<u>5339</u>	<u>18.5964</u>	<u>6003</u>

min α N

14570
 11100
 90
 80
16.6522

MC1168

Moon-Measures.

1913 Apr. 22.

5-

	d	N	d	N
7	16548	14110		
18.0	1205645	861009		
23.4	50	1509		
	46	05		
	<u>23.4497</u>	<u>4504</u>		

8. S. Crater

18.5				
23.5	16520	18690	16038	18270
max	1118080	1402833	1200500	1226165
in	80	30	00	70
1.	22	92	38	70
	<u>23.5341</u>	<u>5339</u>	<u>18.5964</u>	<u>6003</u>

new = .5973

min in 20

14570
11100
90
80
<u>16.6522</u>

Foundation of Nominals

No	ab	an	bn	cor ^t an	bn
1 +	1.03 -	70.9 -	230.0 -	2.2 -	7.3
2 +	1.63 -	20 -	3.2 -	8.0 -	13.0
3 +	1.71 +	93.8 +	65.6 -	9.3 -	6.5
4 +	1.12 +	254.0 +	87.9 -	12.6 -	4.3
5 -	0.70 +	421.0 +	85.0 +	7.5 -	1.5
6 -	1.82 -	80.8 +	83.9 +	10.6 -	11.0
7 -	1.03 -	68.6 +	222.5 +	2.2 -	7.3
8 +	0.07 +	42.228.0 +		0.0 -	0.0
+	2.01 +	550.7 +	369.7 -	11.8 -	50.9

$$[aa] = +12.57 \quad [ac] = -8.65$$

$$[bb] = +16.63 \quad [bz] = +0.32 \quad [cn] = +3$$

at	pos. 4	residual
1	197.1	+27
2	211.6	-15
3	235.2	+23
4	251.9	-13
5	281.4	-91
6	316.0	+103
7	342.8	+35
8	1.1	-69

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Moon's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	18.00000	-0.5630	-2	0.3172	3.6620	+126
2	17.5612	-1.0018	-1	1.0038	3.6496	+2
3	17.00000	-1.5630	-1	2.4433	3.6434	-60
4	16.7617	-1.8013	0	3.2447	3.6353	-141
5	16.6962	-1.8668	+0	3.4850	3.6268	-226
6	17.2377	-1.3253	+1	1.7561	3.6555	+61
7	18.00000	-0.5630	+2	0.3168	3.6616	+122
8	18.5986	+0.0356	+2	0.0013	3.6613	+119

mean 3.6494 + 3

95

	y	$(y - y_0)$	Δy	$(y - y_0)^2$
1	19.7980	-1.8260	-29	3.3448
2	20.0000	-1.6240	-26	2.6458
3	20.5318	-1.0938	-17	1.2001
4	21.0000	-0.6240	-10	0.3906
5	22.0000	+0.3760	+6	0.1418
6	23.0000	+1.3760	+22	1.6994
7	23.4500	+1.8260	+29	3.3448
8	23.5340	+1.9100	+31	3.6600

cor T_0

	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$
1	-5	0.3176	+4
2	-5	1.0046	+8
3	-3	2.4439	+6
4	-2	3.2454	+7
5	+1	3.4846	-4
6	+4	1.7553	-8
7	+5	0.3164	-4
8	+6	0.0013	0
			+9

Approximate Center

 $x = 18.0$ $y = 19.7980$ $y = 23.4500$

43.2480

mean $y = 21.6240$ $y = 23.5340$ $R = 1.9100$ $x = 16.6530$ mean $x = 18.5630$ $x_0 = 18.5630$ $y_0 = 21.6240$

1891

MC1168

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Moon's Center

	x	$x - X_0$	Δx	$(x - X_0)^2$	$(x - X_0)^2 + (y - Y_0)^2$	$O - C$
1	18.0000	-0.5630	-2	0.3172	3.6620	+126
2	17.5612	-1.0018	-1	1.0038	3.6496	+2
3	17.0000	-1.5630	-1	2.4433	3.6434	-60
4	16.7617	-1.8013	0	3.2447	3.6353	-141
5	16.6962	-1.8668	+0	3.4850	3.6268	-226
6	17.2377	-1.3253	+1	1.7561	3.6555	+61
7	18.0000	-0.5630	+2	0.3168	3.6616	+122
8	18.5986	+0.0356	+2	0.0013	3.6613	+119

mean 3.6494 + 3

	y	$(y - Y_0)$	Δy	$(y - Y_0)^2$
1	19.7980	-1.8260	-29	3.3448
2	20.0000	-1.6240	-26	2.6458
3	20.5318	-1.0938	-17	1.2001
4	21.0000	-0.6240	-10	0.3906
5	22.0000	+0.3760	+6	0.1418
6	23.0000	+1.3760	+22	1.8994
7	23.4500	+1.8260	+29	3.3448
8	23.5340	+1.9100	+31	3.6600

cor. to
O - C

Approximate Center.

 $x = 18.0$ $y = 19.7980$ $y = 23.4500$

43.2480

mean $y = 21.6240$ $y = \text{mean}$ 23.5340 $R = 1.9100$ $x = \text{mean}$ 16.6530mean $x = 18.5630$ $X_0 = 18.5630$ $Y_0 = 21.6240$

	Δx	$(x - X_0)^2$	$(x - X_0)^2 + (y - Y_0)^2$
1	-5	0.3136	+4
2	-5	1.0046	+8
3	-3	2.4439	+6
4	-2	3.2454	+7
5	+1	3.4846	-4
6	+4	1.7553	-8
7	+5	0.3164	-4
8	+6	0.0013	0
			+9

Residuals

	O		C	
1	+130	-	99 + 10 + 192 = +103	+27
2	+10	-	176 + 9 + 192 = +25	-15
3	-54	-	275 + 6 + 192 = -77	+23
4	-134	-	317 + 4 + 192 = -121	-13
5	-230	-	329 - 2 + 192 = -139	-91
6	+53	-	234 - 8 + 192 = -50	+103
7	+118	-	99 - 10 + 192 = +83	+35
8	+119	+	7 - 11 + 192 = +188	-69

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Moon's Center.

Conditional Equations.

	O	C	O - C
1	$-0.56 - 1.83 + 1 = +126 + 98 + 4 + 1.89 = +195$		+ 31
2	$-1.00 - 1.62 + 1 = +218 - 175 + 4 + 1.89 = +18$		- 16
3	$-1.56 - 1.09 + 1 = -60 + 272 + 3 - 1.89 = -80$		+ 20
4	$-1.80 - 0.62 + 1 = -141 + 314 + 1 + 1.89 = -124$		- 17
5	$-1.87 + 0.38 + 1 = -226 + 226 - 1 + 1.89 = -138$		- 88
6	$-1.33 + 1.38 + 1 = +61 - 231 - 3 + 1.89 = -45$		+ 106
7	$-0.56 + 1.83 + 1 = +122 + 98 - 4 + 1.89 = +187$		+ 35
8	$+0.04 + 1.91 + 1 = +119 + 6 - 5 + 1.89 = +190$		- 71
			+ 192 - 192

Normal Equations.

$$\begin{aligned}
 +12.57 + 2.01 - 8.65 &= +551 + 539 \\
 + 2.01 + 16.63 + 0.32 &= +370 + 319 \\
 - 8.65 + 0.32 + 8.00 &= +3 + 12 \\
 - 2.01 - 0.32 + 1.38 &= -88 - 86 \\
 + 8.65 + 1.38 - 5.95 &= +380 + 371
 \end{aligned}$$

$$\begin{aligned}
 +16.31 + 1.70 &= +882 + 233 \\
 + 1.70 + 2.05 &= +383 + 383
 \end{aligned}$$

$$\begin{aligned}
 - 1.70 - 0.18 &= -29 - 24 \\
 + 1.87 &= +354 + 359C = +192
 \end{aligned}$$

$$\begin{aligned}
 - 1.41 - 1.70 &= -318 - 318 \\
 + 1.490 &= -36 - 856 = -2 - 6
 \end{aligned}$$

$$\begin{aligned}
 +54.32 - 2.01 - 50.24 &= -19 - 75\frac{1}{2} \\
 +449.54 - 16.63 - 415.76 &= -156 - 624
 \end{aligned}$$

$$\begin{aligned}
 +66.89 - 58.89 &= +8 + 463\frac{1}{2} \\
 +451.55 - 415.44 &= +36 + 305
 \end{aligned}$$

$$\begin{aligned}
 - 6401 + 5889 &= -30 + 43 \\
 + 2.88 &= +502 + 506\frac{1}{2} + a = +176
 \end{aligned}$$

$$\frac{\Delta b}{\Delta c} = -0.104$$

$$\frac{\Delta a}{\Delta c} = +0.705$$

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Mosses Center.

Conditional Equations.

	O	C	O - C
1	-0.56 - 1.53 + 1 = +126.44	98 + 4 + 189 = +95	+31
2	-1.00 - 1.62 + 1 = +2.8	-175 + 4 + 189 = +18	-16
3	-1.56 - 1.09 + 1 = -60.70	-272 + 3 + 189 = -80	+20
4	-1.80 - 0.62 + 1 = -141.7	-314 + 1 + 189 = -124	-17
5	-1.87 + 0.38 + 1 = -226.9	-326 - 1 + 189 = -138	-88
6	-1.33 + 1.38 + 1 = +61.9	-231 - 3 + 189 = -45	+106
7	-0.56 + 1.83 + 1 = +122.5	98 - 4 + 189 = +187	+55
8	+0.04 + 1.91 + 1 = +119.9	6 - 5 + 189 = +190	-71
		+192 - 192	

Normal Equations.

$$\begin{aligned}
 +12.57 + 2.01 - 8.65 &= +5.51 + 5.39 \\
 +2.01 + 16.63 + 0.32 &= +37.0 + 3.19 \\
 -8.65 + 0.32 + 8.00 &= +3 + 12 \\
 -2.01 - 0.32 + 1.38 &= -88 - 86 \\
 +8.65 + 1.38 - 5.91 &= +38.0 + 37.1
 \end{aligned}$$

$$\begin{aligned}
 +16.31 + 1.70 &= +28.2 + 23.3 \\
 +1.70 + 2.05 &= +38.3 + 38.3
 \end{aligned}$$

$$\begin{aligned}
 -1.70 - 0.18 &= -29 - 24 \\
 +1.87 &= +35.4 + 35.9C = +189
 \end{aligned}$$

$$\begin{aligned}
 -1.41 - 1.70 &= -31.8 + 31.8 \\
 +14.90 &= -36 - 856 = -2 - 6
 \end{aligned}$$

$$\begin{aligned}
 +54.32 - 2.01 - 50.24 &= -19 - 75\frac{1}{2} \\
 +499.54 - 16.63 - 415.76 &= -15.6 - 624
 \end{aligned}$$

$$\begin{aligned}
 +66.89 - 58.89 &= +8 + 963\frac{1}{2} \\
 +451.55 - 414.44 &= +37.1 + 305
 \end{aligned}$$

$$\begin{aligned}
 -64.01 + 58.89 &= -5.12 + 43 \\
 +2.88 &= +50.2 + 506\frac{1}{2} + 177 + 176
 \end{aligned}$$

$$\frac{\Delta b}{\Delta c} = -0.104$$

$$\frac{\Delta a}{\Delta c} = +0.705$$

Average (O - C) = 48

new (O - C)

1	+27
2	-11
3	+23
4	-13
5	-91
6	+103
7	+35
8	-69

Average = 47

MC 1168

1913 Apr. 22

8

Moon's Mean Position (1911.0)

$$\begin{array}{r} X_0 = 18.5630 \\ \text{corr} = +88 \\ \hline 18.5718 \end{array}$$

$$\begin{array}{r} Y_0 = 21.6240 \\ \text{corr} = -3 \\ \hline 21.6237 \end{array}$$

From Plate Constant $X = 18.4164$ $Y = 21.5813$

$$S = +0.4164$$

$$\eta = -0.4187$$

$$\log S = 9.61951$$

$$\log S = 9.95788$$

$$\log S = 8.50724$$

$$(D-A) = 1.15439$$

$$\log \tan S = 9.66442$$

$$S^2 = 9.2388$$

$$\eta_1 = 5.9566m$$

$$\eta_1 = -1$$

$$d-A = +1.427$$

$$\eta_0 = -0.4186$$

$$A = 16.19.41$$

$$\log \eta_0 = 9.62180$$

$$\log \eta_0 = 7.33115$$

$$X_0 = 16.19.55.27$$

$$(d-D) = 2.29065m$$

$$\text{Red} = +2.24$$

$$S-D = -3.15.8$$

$$X' = 16.19.57.51$$

$$D = -24.46.27$$

$$S_0 = -24.49.42.3$$

$$\text{Red} = -12.4$$

$$S' = -24.49.54.7$$

MC1168

1913 Apr. 22.

8.

Moon's Mean Position (1911.0)

$$X_0 = 18.5630$$

$$Y_0 = 21.6240$$

$$\Delta\alpha = +88$$

$$\Delta\delta = -3$$

$$18.5718$$

$$21.6239$$

From Plate Constant $X = 18.4164$ $Y = 21.5813$

$$S = +0.4164$$

$$\eta = -0.4187$$

$$\log S = 9.61951$$

$$\cos S = 9.95788$$

$$\cos \delta = 8.50724$$

$$\log \tan S = 9.66442$$

$$S^2 = 9.2388$$

$$\eta_1 = 5.9566$$

$$(d-A) = 1.15439$$

$$\eta_1 = -1$$

$$d-A = +14.27$$

$$\eta_0 = -0.4186$$

$$A = 16 \quad 19 \quad 41$$

$$\log \eta_0 = 9.62189$$

$$\cos \eta_0 = 7.33115$$

$$X_0 = 16 \quad 19 \quad 55.27$$

$$(d-D) = 2.29065$$

$$\text{Red.} = +224$$

$$S-D = -3.158$$

$$X = 16 \quad 19 \quad 57.51$$

$$D = -24 \quad 46 \quad 27$$

$$S_0 = -24 \quad 49 \quad 42.3$$

$$\text{Red.} = -124$$

$$S = -24 \quad 49 \quad 54.7$$

1168

Red ad locum app.

 $80^{\circ} - 24^{\circ} 50'$

$$H + \alpha \quad 3 \quad 25 = 51^{\circ} 15'$$

$$H \quad 11 \quad 05$$

$$\alpha \quad 16 \quad 20$$

$$\theta \quad 20 \quad 54$$

$$G + \alpha \quad 13 \quad 14 = 198^{\circ} 30'$$

$$l \cos(G + \alpha) \quad 9.9770 m$$

$$8 \quad 0.9751$$

$$\sin \dots \quad 9.5015 m$$

$$\text{trans} \quad 9.6654 m$$

$$8.8239$$

$$8' \quad 0.9521 m$$

$$8 \quad 8.9659$$

$$\begin{array}{r} f \quad + 0.99 \\ 8 \quad + 0.09 \\ m \quad + 1.16 \\ \hline + 2.24 \checkmark \end{array}$$

$$l \cos \quad 9.9579$$

$$i \quad 0.3190$$

$$(i) \quad 0.2769$$

$$l \sin \quad 9.6232 m$$

$$\cos(H + \alpha) \quad 9.7965$$

$$h \quad 1.3083$$

$$\sin \dots \quad 9.8920$$

$$\sec \quad 0.0421$$

$$8.8239$$

$$h' \quad 0.7280 m$$

$$h \quad 0.0663$$

$$\begin{array}{r} 8' \quad - 8.95 \\ h' \quad - 5.35 \\ i \quad + 1.89 \\ \hline - 12.41 \checkmark \end{array}$$

1168

Red act. locum app.

 $5^{\circ} - 24^{\circ} 50'$

$$H + a \quad 3 \quad 25 = 51^{\circ} 15'$$

$$H \quad 11 \quad 05$$

$$a \quad 16 \quad 20$$

$$G \quad 20 \quad 54$$

$$G + K \quad 13 \quad 14 = 198^{\circ} 30'$$

$$\cos(G+a) \quad 99770 \sim$$

$$8 \quad 0.9751$$

$$\sin \dots \quad 9.5015 \sim$$

$$\tan \dots \quad 9.6654 \sim$$

$$8.8239$$

$$8' \quad 09521 \sim$$

$$8 \quad 89659$$

$$\begin{array}{r} +0.99 \\ +0.09 \\ +1.16 \\ \hline +2.24 \end{array} \checkmark$$

$$\cos \quad 99579$$

$$i \quad 0.3190$$

$$(i) \quad 0.2769$$

$$\sin \quad 9.6232 \sim$$

$$\cos(H+a) \quad 9.7965$$

$$\tan \quad 1.3083$$

$$\sin \dots \quad 9.8920$$

$$\cos \quad 0.0421$$

$$8.8239$$

$$8' \quad 0.7280 \sim$$

$$8 \quad 0.0663$$

$$\begin{array}{r} 8' \quad -895 \\ 8 \quad -535 \\ i \quad +1.89 \\ \hline -1241 \end{array}$$

Lunar Parallax.

$$\begin{array}{r}
 1168 \\
 \alpha' = 16 \quad 19 \quad 57.51'' \\
 \theta = 16 \quad 48 \quad 30.35'' \\
 \theta - \alpha' = +28 \quad 32.84'' \\
 = +7'' \quad 08' \quad 13'' \\
 + \quad \quad \quad 2 \quad 43'' \\
 + \quad \quad \quad 7 \quad 05 \quad 30''
 \end{array}$$

$$\begin{array}{r}
 9.95727'' \\
 0.00000'' \\
 0.00333'' \\
 \hline
 9.96060''
 \end{array}$$

$$\begin{array}{r}
 \gamma = 42 \quad 24 \quad 17'' \\
 -24 \quad 49 \quad 55'' \\
 \hline
 67 \quad 14 \quad 12''
 \end{array}$$

$$\begin{array}{r}
 9.82640'' \\
 8.19656'' \\
 9.96478'' \\
 0.17111'' \\
 \hline
 8.15885''
 \end{array}$$

$$s - s' = +49 \quad 33.7''$$

$$s = -24 \quad 00 \quad 21.0''$$

$$\text{Went Allen } s = -24 \quad 00 \quad 18.1''$$

$$o - c \quad -2.9''$$

$$\text{Red to stand radius} \quad +0.6''$$

$$o - c \quad -2.3''$$

$$s' = -24^\circ 49' 54.7''$$

$$\pi = 54' 03.4''$$

$$\begin{array}{r}
 9.86913'' \\
 8.19656'' \\
 9.09427'' \\
 0.03929'' \\
 \hline
 7.19925''
 \end{array}$$

$$\alpha - \alpha' = +5' 26.35''$$

$$= +21' 76''$$

$$\alpha = 16 \quad 20 \quad 19.27''$$

$$\alpha = 16 \quad 20 \quad 18.40''$$

$$+0.87''$$

$$-0.26''$$

$$+0.61''$$

1168 - human Parallax

$$\alpha = 16^{\circ} 19' 57.5''$$

$$\delta = 16^{\circ} 48' 30.3''$$

$$-\alpha = +28^{\circ} 32.8''$$

$$= +7^{\circ} 08' 13''$$

$$+ 2^{\circ} 43'$$

$$+ 7^{\circ} 05' 30''$$

$$9.95727$$

$$0.00000$$

$$0.00333$$

$$9.96060$$

$$\gamma = 42^{\circ} 24' 17''$$

$$-24^{\circ} 49' 55''$$

$$67^{\circ} 14' 12''$$

$$9.82640$$

$$8.19656$$

$$9.96478$$

$$0.17111$$

$$8.15885$$

$$S - S' = +49^{\circ} 33.7'$$

$$S = -24^{\circ} 00' 21.0''$$

$$\text{Hart Allen } S = -24^{\circ} 00' 18.1''$$

$$O - C = -2.9''$$

$$\text{Red-tailed radius} = +0.6''$$

$$O - C = -2.3''$$

$$S = -24^{\circ} 49' 54.7''$$

$$\Pi = 54^{\circ} 03' 4''$$

$$9.86913$$

$$8.19656$$

$$9.09427$$

$$0.03929$$

$$7.19925$$

$$\alpha - \alpha' = +5^{\circ} 26.35''$$

$$= +21.76''$$

$$\alpha = 16^{\circ} 20' 19.27''$$

$$\alpha = 16^{\circ} 20' 18.40''$$

$$+0.87''$$

$$-0.26''$$

$$+0.61''$$

