

KG
11366
v.975

CXXII

122

8307

8316

8317

Harvard Lunar Plates
Measures and Reductions
Martha C. Borton

16320
 14320
 1216
 00
 11.2000

14110 15586
 11136 8590
 4892 90
 10 92
 28.2968 28.3000

8307

Star Measures.

19-9

1	17152	16148	17386	18196
17.7	10010	13322	15596	10058
20.3	10	2021	46	80
	74	70	400	200
	<u>17.7156</u>	<u>17.7166</u>	<u>20.1892</u>	<u>20.1860</u>
2	17308	19649	15150	17762
23.7	9756	12184	13140	9770
11.2	6058	8082	3839	4658
	00	50	52	86
	<u>23.7594</u>	<u>23.7590</u>	<u>11.2012</u>	<u>11.1976</u>
3	14164	14728	16680	1730
28.3	11150	7700	16248	7806
20.1	9075	722	4044	0405
	38	30		7396
	<u>28.3012</u>	<u>28.2982</u>	<u>20.0436</u>	<u>20.0410</u>

Moon Measures.

1		15928	16420
21		1296259	935096
16.3		56	92
		32	20
		<u>16.2970</u>	<u>16.2926</u>
2	17980	12300	12300
20.9	2010	9692	9692
17	89	42	42
		6958	6958
	<u>20.2670</u>	<u>20.2684</u>	
3			
20.9			
18.1			
	20.0000		

Star: *Kepler 90*

20159	20190
12970	17380
80	80
50	99
<u>17.7179</u>	<u>17.7189</u>

19959	203 ⁹⁰ ~~89~~
18060	12270
64	66
58	89
<u>20.1892</u>	<u>20.1879</u>

19888	19160
12396	16718
98	18
99	72
<u>23.7585</u>	<u>23.7555</u>

20390	20568
18376	12298
76	98
80	570
<u>11.2012</u>	<u>11.1978</u>

20400	19658
17422	12632
926	39
900	58
<u>28.2976</u>	<u>26.2976</u>

19790	207 ~~38~~
19332	10162
40	1169
90	98
<u>20.0959</u>	<u>20.0916</u>

19778
19326
20
78
<u>20.0955</u>

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Star Measures.

17.1	52	46	198	17.3	86	18.1	96
100	10	133	22	155	96	100	58
17.7	10	20	21	76		60	59
20.3	74	70		100		200	
11.7	156	11.7	166	20	18	92	20.1
							860
2	17	308	196	90	12	150	17
23.7	97	56	121	84	83	170	97
11.2	60	58	80	8	38	59	96
	00	50		52			86
13.7	596	23.7	890	11.2	012	11.1	976
3	191	69	197	28	106	80	730
28.3	111	50	170	00	142	78	06
20.1	90	75	722	49	40	49	04
	38	30					7396
28.30	12	28.29	82	20	09	36	20.09
							10

Moon Measures.

1		159	28	169	20
21		129	6.2	93	50
16.3		56		92	
		32		20	
		16	2970	16.29	26
2	17	980	179	80	
20.9	123	00	96	92	
17	20	10	92		
	89		69	58	
	20	26	70	20.26	89
3					
20.9					
18					
7	20.00	00			

Stars measured

1 20159 20190
 12970 17380
 80 80
 50 99
17.7179 17.7189

 19959 203⁹⁰~~82~~
 18060 122~~70~~
 64 66
 58 89
20.1892 20.1879

2 19888 19160
 12346 16718
 98 18
 94 72
23.7585 23.7555

 20390 20568
 18376 12598
 76 98
 80 570
11.2012 11.1978

3 20400 19658
 17422 12632
 926 34
 900 58
28.2976 28.2976

 19790 207~~38~~
 19332 10162
 40 1169
 90 98
20.0454 20.0716

 19778
 19326
 20
 78
20.0435

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Moon Measures.

2

2	12704	15752
20.9	9846	8632
19	3641	2830
	20	62
	<u>20.2866^v</u>	<u>20.2870^v</u>

3^v
21.
19.6

19986
8198
52²⁰
66
19.6829^v

16728
13532²⁸
27²⁸
28
19.6800^v

6
21.9
19.8
+21

17586
8350⁴⁶
42⁴⁶
90
19.9294^v

16787
16018¹⁵
12¹⁵
394
19.9230^v

7
22
19.8
8

17586
8390
8244
80
19.9290^v

15800
15017⁰⁰²
990⁰⁰²
08
19.9202^v

8 1687.4
223 13126
2023
19.7 74
Sc, 22.3750^v

15662
9432³⁹
4639
70
22.3772^v

17562
8850⁵⁹
68⁵⁹
62
19.8702^v

15820
19526³⁶
46³⁶
08
19.8718^v

7Star

10.8 20702
11.6 13752
57
83
15.6942

18530
15472
72
26
15.6942

19776
13780
86
58
11.6282

19176
15452
48
86
11.6270

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Moon Measures

2

2	12704	15752
20.9	9846	8632
19.	3641	2830
	20	62
	<u>20.2866</u>	<u>20.2870</u>

5	19986	16728
21.	8148	13332
19.6	3250	2428
	66	28
	<u>19.6829</u>	<u>19.6800</u>

6	17586	16789
21.9	8350	16018
19.8	9246	1215
	90	799
	<u>19.9299</u>	<u>19.9230</u>

7	17586	15800
224	8390	12019
19.88	8294	99000
	80	08
SC	<u>19.9290</u>	<u>19.9202</u>

8	16874	15662	17562	15820
223	13126	9432	8850	19526
	2023	9639	6859	7636
19.7	74	70	60	08
SC	<u>223750</u>	<u>223772</u>	<u>19.8702</u>	<u>19.8718</u>

9 Star	20702	18530	19776	19176
15.8	13752	15972	13980	15952
11.6	59	72	86	48
	93	26	58	86
	<u>15.6992</u>	<u>15.6999</u>	<u>11.6282</u>	<u>11.6270</u>

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Times + etc.

Mar 26 '13-

Epp. to stars	8	43		8	55	
" " Moon	8	48	56.6 ✓	8	48	56.8 ✓
Clock fast			.2 ✓			

H Sid Time	8	48	56.5 ✓	$\theta - \alpha = -$	7 ^m
H Long.	4	44	31.05 ✓		
G. Sid. T.	13	33	27.55 ✓		
Sid. T. to Noon	0	11	23.90 ✓		
Interval	13	22	03.65 ✓		
Reduction		2	11.40 ✓		
G. M. T.	13	19	52.25 ✓		

From Naut. Alm.	08	55	08.35	+18	47	15.0
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Moon 13^h

Motion in 1 ^m			2,1540			-11,758
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" " 19.8708

Tabular Place	08	55	51.15 ✓	18	43	21.4 ✓
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Moon's age 14 days

Parallax	57	00.27 ✓
Semid.	15	33.5 ✓
R		933.5 ✓
Aug		14.3 ✓
Gr. A		-0.6 ✓
R		947.2 ✓
R.		2.0309 ✓
ak.		-959 ✓
(1+R)		1.9345 ✓
R ²		3.7423 ✓

934 = 14.3-

$\alpha = -496.4$ ✓
27
-472.4 ✓

after
remeasuring

2 Star.

$$\begin{array}{r} \chi \\ \eta \\ \chi - \eta \end{array} \begin{array}{r} 15.6993 \\ 16.1323 \\ - .9380 \end{array}$$

$$\begin{array}{r} \eta \\ \eta \\ \eta - \eta \end{array} \begin{array}{r} 11.6276 \\ 10.3617 \\ + 12.659 \end{array}$$

$$\begin{array}{r} 17.7189 \\ 18.2998 \\ \eta - 5.31x \end{array} \begin{array}{r} 23.7550 \\ 27.5939 \\ + 8.389 \end{array} \begin{array}{r} 28.2976 \\ 27.3588 \\ - 1.0612 \end{array}$$

$$\begin{array}{r} \eta \\ \eta \\ \eta \end{array} \begin{array}{r} 20.1885 \\ 19.3535 \\ + 8.350 \end{array} \begin{array}{r} 11.1995 \\ 9.9172 \\ + 12.823 \end{array} \begin{array}{r} 20.0955 \\ 18.2073 \\ + 8.362 \end{array}$$

$$\begin{array}{r} \eta \\ 5.31x + 8859 \\ 8389 + 11877 \\ 10612 + 19189 \\ 8380 + 7897 \\ 219391 + 10967 \end{array} \begin{array}{r} + 500x \\ = + 3545 \\ = + 3988 \\ = + 3537 \\ = + 3467 \\ = 230308 \end{array} \begin{array}{r} -6.94 \\ -139 \\ 77 \\ 138 \\ 80 \\ -124 \end{array} \begin{array}{r} -9x \\ + 3906 \\ + 3911 \\ + 3399 \\ + 3387 \\ -19 \end{array} \begin{array}{r} -3383 \\ + 3390 \\ + 3390 \\ + 3379 \\ + 3377 \\ 22.6782 \end{array} \begin{array}{r} = +7 \\ = +7 \\ = 9 \\ = 6 \\ = 18382 \end{array}$$

$$\begin{array}{r} \text{ables} \\ \text{Obs} \\ \eta \end{array} \begin{array}{r} a = +.7 \\ = -799.1 \\ + 500\eta \end{array} \begin{array}{r} e = +.3 \\ = -501.6 \\ + 591 \end{array} \begin{array}{r} a-e = +.9 \\ = +2.5 \\ + 1.64 \end{array} \begin{array}{r} b+d = 2 \\ = +1.0 \\ - 18382 \end{array}$$

$$\begin{array}{r} -8350 + 10099 \\ 12823 + 5600 \\ 8362 + 10022 \\ 12639 + 5819 \\ 17.9869 + 8993 \end{array} \begin{array}{r} = + 18949 \\ = + 18923 \\ = + 18988 \\ = + 18973 \\ = 188857 \end{array} \begin{array}{r} + 105 \\ + 190 \\ + 167 \\ + 93 \\ + 129 \end{array} \begin{array}{r} + 18399 \\ 63 + 18 \\ 51 + 32 \\ 66 + 19 \\ + 29 \end{array} \begin{array}{r} + 32 \\ = 18381 \\ 81 \\ 83 \\ 85 \\ = 17.0933 \end{array} \begin{array}{r} -1 \\ -1 \\ +1 \\ +3 \end{array}$$

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Times etc.

Mar 26 '15

Eph. tr. stars	8	93		8	25
" " Moon	8	98	56.6 ✓	8	98
Clock fast			2 ✓		

H Sid Time	8	98	56.5 ✓	$\delta - \alpha = -$	7 ^m
H Long.	4	99	31.05		
G Sid T.	13	33	27.55		
Sid T M. Moon	0	11	23.90		
Interval	13	22	03.65 ✓		
Reduction		2	11.90		
G. M. T.	13	19	52.25		

From Naut. Alm	08	55	08.35	118	97	15.0
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Moon + 3^h

Motion in 1 ^m			2.1590		-11.70
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19.8708

Tabular Place	08	55	51.15	18	93	21.4
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Moon's Age 13 days

Parallax	54"	0027"
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Semid.	15"	31.5
--------	-----	------

R	933.5
---	-------

Aug.	17.3
------	------

alt	0.6
-----	-----

R	947.2
---	-------

R	2030.9
---	--------

alt	-95.9
-----	-------

alt	1939.5
-----	--------

R	3.7923
---	--------

$\alpha = 996.4$ ✓

27

- 972.4 ✓

after
remeasuring

85 Jan.

$$\begin{array}{r} x \\ y \\ x-y \end{array} \begin{array}{r} 15.6993 \\ 16.1323 \\ - 4380 \end{array}$$

$$\begin{array}{r} y \\ y \\ y-y \end{array} \begin{array}{r} 11.6276 \\ 10.3617 \\ + 12659 \end{array}$$

$$\begin{array}{r} x \\ y \\ x-y \end{array} \begin{array}{r} 17.7187 \\ 18.2798 \\ - 5317 \end{array} \begin{array}{r} 23.7550 \\ 24.5939 \\ + 8389 \end{array} \begin{array}{r} 28.2976 \\ 29.3588 \\ - 10612 \end{array}$$

$$\begin{array}{r} y \\ y \\ y-y \end{array} \begin{array}{r} 20.1885 \\ 19.3533 \\ + 8350 \end{array} \begin{array}{r} 11.1995 \\ 9.9172 \\ + 12823 \end{array} \begin{array}{r} 20.0435 \\ 19.2073 \\ + 8362 \end{array}$$

$$\begin{array}{r} y \\ - 5317 + 8859 \\ - 8389 + 11877 \\ - 10612 + 14189 \\ - 4380 + 7847 \\ 21.9341 + 10967 \end{array} \begin{array}{r} + 500x \\ = + 3545 \\ = + 3488 \\ = + 3537 \\ = + 3467 \\ = 230308 \end{array} \begin{array}{r} - 4.94 \\ - 1392 + 3706 \\ 77 + 3411 \\ 138 + 3099 \\ 80 + 3087 \\ - 124 \end{array} \begin{array}{r} - 9x \\ - 162 + 3390 \\ - 21 + 3090 \\ - 25 + 3374 \\ - 10 + 3077 \\ - 19 \end{array} \begin{array}{r} - 3383 \\ = + 7 \\ = + 7 \\ = - 9 \\ = - 6 \\ 22.6782 \end{array}$$

Tables $a = +.7$ $e = +.3$ $a-e = +.4$ $\delta+d = +.2$

Obs $= -499.1$ $= -501.6$ $= +2.5$ $= +1.0$

y $+500x$ $+5.9x$ $+1.6y$ -18382

$$\begin{array}{r} + 8350 + 10097 = + 18447 + 105 = + 18552 + 32 = 18581 - 1 \\ + 12823 + 5600 = + 18423 + 170 = + 18593 + 18 = 81 - 1 \\ + 8362 + 10022 = + 18384 + 167 = + 18551 + 32 = 83 + 1 \\ + 12659 + 5817 = + 18476 + 93 = + 18569 + 19 = 85 + 3 \\ 17.9864 + 8993 = 188857 + 129 + 29 = 17.0433 \end{array}$$

$O-C = -499.8 - 501.9 + 0.8$

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Plate Center & Constants

4

$$\begin{array}{rcl}
 x & 17.7161^{\vee} & 23.7592^{\vee} \quad 28.2999^{\vee} \\
 y & 18.2498^{\vee} & 24.5939^{\vee} \quad 29.3588^{\vee} \\
 x-y & -5337^{\vee} & -8397^{\vee} \quad -10591^{\vee}
 \end{array}$$

$$\begin{array}{rcl}
 u & 20.1851^{\vee} & 11.1999^{\vee} \quad 20.0923^{\vee} \\
 v & 19.3535^{\vee} & 9.9172^{\vee} \quad 19.2073^{\vee} \\
 u-v & +8316^{\vee} & +12822^{\vee} \quad +8350^{\vee}
 \end{array}$$

$$\begin{array}{rcl}
 x-y & +500x & -7y & -3.6x & -3316 \\
 -5337 + 8858 & = +3521 & -191 = +3380 & -64 = +3316 & = 0 \\
 -8397 + 11877 & = +3480 & -78 = +3902 & -86 = +3316 & = 0 \\
 -10591 + 19150 & = +8559 & -190 = +3919 & -102 = +3317 & = +1 \\
 21938.5 + 10967 & & -125 & -79 & = 22,678.7^{\vee} \\
 -4380 + 7844 & & -81 & -56 = 3330 & \\
 u-v & +500y & +3.6x & +3.8y & -18550 \\
 +8316 + 16093 & = +18909 + 64 = +18973 & +77 = +18550 = 0 \\
 +12822 + 5600 & = +18422 + 86 = +18508 & +42 = +18550 = 0 \\
 +8350 + 10021 & = +18371 + 102 = +18473 & +76 = +18549 = 1 \\
 17.9868 + 8993 & & +79 & +68 = 17.0954^{\vee}
 \end{array}$$

$$\begin{array}{rcl}
 x-y & +500x & -6.5y & -3x & -3390 \\
 -5337 + 8858 & = +3521 & -131 = +3390 & -53 = +3337 & -3 \\
 -8397 + 11877 & = +3480 & -73 = +3907 & -71 = +336 & -4 \\
 -10591 + 19150 & = +8559 & -130 = +3929 & -85 = + & 89 + 4 \\
 -4380 + 7844 & = +3464 & -76 = +3391 & -47 = + & 74 + 4
 \end{array}$$

$$\begin{array}{rcl}
 \text{plate} & = -497. & = -504.9 & = +7.9 & = +1.7 \\
 \text{Tables} & a = +.4 & e = 0 & a-e = +.4 & b+d = +.2 \\
 \text{lbs} & = -496.4 & = -503.8 & = +7.9 & = +3.2
 \end{array}$$

$$\begin{array}{rcl}
 u-v & +500y & +9.8x & +7.9y & -18499 \\
 +8316 + 10093 & = +18409 + 85 = +18494 & +99 = +18593 & = -6 \\
 +12822 + 5600 & = +18422 + 119 = +18541 & +55 = + & 91 = -8 \\
 +8350 + 10021 & = +18371 + 136 = +18507 & +98 = + & 605 = +6 \\
 +12659 + 5814 & = +18473 + 75 = +18548 & +57 = + & 605 = +6
 \end{array}$$

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Plate Center & Constants

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x	17.7161	23.7592	28.2997
y	18.2998	29.3939	29.3588
x-y	-5337	-8397	-10591

y	20.1851	11.1999	20.0923
n	19.3535	9.9172	19.2073
y-n	+8316	+12822	+8350

~~| | | | | | | |
|----------------|---------|------|---------|----------|---------|------|
| x-y | +500x | -77 | -3.6x | -331 | | |
| -5337 + 8858 | = +3521 | -191 | = +3380 | -69 | = +3316 | = 0 |
| -8397 + 11877 | = +3480 | -78 | = +3902 | -86 | = +3816 | = 0 |
| -10591 + 19150 | = +8559 | -190 | = +8919 | -102 | = +8817 | = +1 |
| 219385 | +10967 | -125 | -79 | = 226782 | | |~~

~~| | | | | | | |
|---------------|----------|-------|----------|-----------|----------|--|
| y-n | +500y | +3.6x | +3.8y | -1x2 | | |
| +8316 + 10093 | = +18909 | +69 | = +18978 | +17 | = +18650 | |
| +12822 + 5600 | = +18422 | +86 | = +18508 | +92 | = +18600 | |
| +8350 + 10021 | = +18371 | +102 | = +18473 | +76 | = +18549 | |
| 17.9868 | +8993 | +79 | +68 | = 17.0959 | | |~~

~~| | | | | | | |
|----------------|---------|-------|---------|-------|---------|----|
| x-y | +500x | -6.5y | -3x | -3390 | | |
| -5337 + 8858 | = +3521 | -131 | = +3390 | -53 | = +3337 | -3 |
| -8397 + 11877 | = +3480 | -73 | = +3907 | -71 | = +3836 | -9 |
| -10591 + 19150 | = +8559 | -130 | = +8929 | -80 | = +8849 | +9 |
| -9380 + 7897 | = +3467 | -76 | = +3391 | -97 | = +3294 | +9 |~~

~~| | | | | |
|--------|----------|----------|------------|------------|
| Obs | = -997. | = -509.9 | = +7.9 | = +1.7 |
| Tables | a = +1.9 | e = 0 | a-e = +1.9 | b+d = +1.2 |~~

~~| | | | | | | |
|---------------|----------|----------|----------|---------|----------|----|
| Obs | = -796.1 | = -503.8 | = +7.9 | = +1.3 | | |
| y-n | +500y | +9.8x | +99y | -189.99 | | |
| +8316 + 10093 | = +18909 | +85 | = +18994 | +99 | = +18593 | -6 |
| +12822 + 5600 | = +18422 | +119 | = +18541 | +55 | = +18596 | -8 |
| +8350 + 10021 | = +18371 | +136 | = +18507 | +98 | = +18605 | +6 |
| +12659 + 5814 | = +18473 | +75 | = +18548 | +57 | = +18605 | +6 |~~

a 0
B +.6

Moon's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)$
1	21,0000	-0.9330	0	0.8705	3.7377 - 86
2	20,2677	-1.6653	0	2.7732	3.7493 + 70
3	20,0000	-1.9330	0	3.7365	3.7365 - 58
4	20,2868	-1.6462	0	2.7100	3.7341 - 82
5	21,0000	-0.9330	0	0.8705	3.7377 - 86
6	21,9330	0.0000	0	0.0000	3.7446 + 23
7	22,0000	+0.0670	0	0.0045	3.7457 + 37
8	22,3761	+0.9431	0	0.1963	3.7424 + 91

	y	$y - y_0$	Δy	$(y - y_0)^2$	$R = 3.7423$
1	16,2948	-1.6932	-1	2.8672	209
2	17,0000	-0.9880	0	0.9761	239
3	17,9880	-0.0000	0	0.0000	270
4	19,0000	+1.0120	0	1.0241	302
5	19,6812	+1.6932	+1	2.8672	334
6	19,9237	+1.9350	+1	3.7446	360
7	19,9221	+1.9341	+1	3.7412	2
8	19,8710	+1.8830	+1	3.5461	164 ⁰ 13

Approximate Center

$$\begin{aligned}
 x &= 21 & y &= 16.2948 \\
 & & & 19.6812 \\
 & & & 35.9760 \\
 & & y_0 &= 17.9880 \\
 & & y_{\max} &= 19.9237 \\
 & & R &= 1.9357
 \end{aligned}$$

$$\begin{aligned}
 x_{\min} &= 20.0000 \\
 x_0 &= 21.9327
 \end{aligned}$$

$$\begin{aligned}
 \text{Moon's Center } x_0 &= 21.9330 \\
 y_0 &= 17.9880
 \end{aligned}$$

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- Moon's Center

x	$x - x_0$	y	$y - y_0$	$(x - x_0)^2 + (y - y_0)^2$
1 21.0000	-0.9330	16.2998	-1.6933	0.8705
2 20.2677	-1.6653	17.0000	-0.9880	2.7732
3 20.0000	-1.9330	17.9880	-0.0000	3.7365
4 20.2868	-1.6462	19.0000	+1.0120	2.7100
5 21.0000	-0.9330	19.6812	+1.6932	0.8705
6 21.9330	0.0000	19.9237	+1.9357	0.0000
7 22.0000	+0.0670	19.9221	+1.9341	0.0045
8 22.3761	+0.4431	19.8710	+1.8830	0.1963
				3.7923

x	$x - x_0$	y	$y - y_0$	$(x - x_0)^2 + (y - y_0)^2$
1 16.2998	-1.6933	16.2998	-1.6933	2.8672
2 17.0000	-0.9880	17.0000	-0.9880	0.9761
3 17.9880	-0.0000	17.9880	-0.0000	0.0000
4 19.0000	+1.0120	19.0000	+1.0120	1.0291
5 19.6812	+1.6932	19.6812	+1.6932	2.8672
6 19.9237	+1.9357	19.9237	+1.9357	3.7496
7 19.9221	+1.9341	19.9221	+1.9341	3.7412
8 19.8710	+1.8830	19.8710	+1.8830	3.5461
				20.9
				23.9
				27.0
				30.2
				33.9
				36.0
				40.1
				1.3

Approximate Center

$$\begin{aligned}
 x &= 21 & y &= 16.2998 \\
 & & & 19.6812 \\
 & & & 35.9760 \\
 & & y_0 &= 17.9880 \\
 & & y_{\text{max}} &= 19.9237 \\
 & & R &= 1.9357
 \end{aligned}$$

$$\begin{aligned}
 x_{\text{min}} &= 20.0000 \\
 x_0 &= 21.9327
 \end{aligned}$$

Moon's Center

$$\begin{aligned}
 x_0 &= 21.9330 \\
 y_0 &= 17.9880
 \end{aligned}$$

Formation of Normals.

1	+ 1.57	+ 93.0	+ 177.6	+ 278.0	+ 320
2	+ 1.65	- 117.0	+ 31.6	- 269.0	+ 187.0
3	+ 0.00	+ 112.0	+ 36.5	+ 0.5	+ 0.0
4	- 1.67	+ 135.0	+ 31.2	- 183.0	- 191.0
5	- 1.57	+ 93.0	+ 177.6	- 277.5	- 320
6	0.0	0.0	0.0	+ 449.5	- 365
7	+ 0.17	+ 72.5	- 1.3	+ 65.5	- 365
8	+ 0.83	+ 80.5	- 2.3	+ 372.0	- 355
	+ 4.19	+ 336.0		+ 1700	- 1089
	- 3.24	- 117.0		- 229.5	
	+ 0.95	+ 219.0		- 39.5	

$$a = 11.16$$

$$B = 18.76$$

	a	b	c	new 0-c	v
a	-10	+ 9	- 10	- 17 ^v	- 95 ^v
b	+ 6	+ 17	- 6	- 5 ^v	+ 73 ^v
c	- 16	+ 19	- 0	+ 3 ^v	- 1.0
		+ 16	+ 6	+ 6 ^v	- 7
		+ 9	+ 10	+ 3 ^v	+ 31
		0	+ 12	- 4 ^v	+ 80
		- 1	+ 12	- 5 ^v	+ 90
		- 7	+ 11	- 9 ^v	+ 41 ^v

$$+ 0.95 + 18.76 = + 5.76 \Delta$$

$$+ [] + 0.08 = - 0.56$$

$$+ 18.68 = + 6.32 \Delta$$

$$+ 11.16 = - 6.60 \Delta - 0.32 = - 6.92 \Delta$$

+19°

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Conditional Equations

6

1	-0.93	-1.69	= -76	-21	+53	= +32	-78
2	-1.67	-0.99	= +70	-39	+31	= -8	+78
3	-1.93	-0.00	= -58	-75	+0	= -75	-13
4	-1.65	+1.01	= -82	-38	-31	= -69	-13
5	-0.93	+1.69	= -76	-21	-53	= -74	+28
6	0.00	+1.93	= +23	0	-161	= -61	+87
7	+0.07	+1.93	= +38	+0	-161	= -61	+95
8	+0.44	+1.88	= +18	+10	-159	= +79	+50

$$\begin{aligned}
 &+11.16 + 0.95 = +219.0 - 6.60 \Delta \\
 &+0.95 + 18.76 = +39.56 + 5.76 \Delta
 \end{aligned}$$

$$+0.95 + 0.08 = +18.6$$

$$+18.68 = +158.1$$

$$b = +31.5 + .37 \Delta$$

$$+11.16 = +219.0 + 29.5 = +248.5$$

$$a = +212.3 - .62 \Delta$$

Arc Measures 16.4°

$$\frac{p}{h} = .21$$

$$\frac{v}{h} = +29$$

$$\text{Inv } \gamma \quad R \quad 2.03$$

$$+ \frac{29}{.21} = +138 \quad \Delta R = +1.7$$

$$-2RC = -0.81$$

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

$$\Delta h = -0.28$$

$$\Delta s = -0.1$$

$$\Delta R = +1.5$$

$$\Delta a = +0.50$$

$$\Delta q = +0.02$$

From Plate Constants

$$\lambda = 22.6782$$

$$\gamma = 17.0933$$

$$\bar{\gamma} + 6782$$

$$\eta - 0.9567$$

$$\log \tau = 9.83136$$

$$\log \tan \delta = 9.5208$$

$$\log \delta = 9.97737$$

$$\bar{\gamma} = 9.6627$$

$$8.50724$$

$$1.0339$$

$$1.37675$$

$$6.2365$$

$$1-A = 22.22$$

$$\eta_1 = 1.0002$$

$$A = 8.55 \quad 33.00$$

$$\log \eta_0 = 0.98087$$

$$\alpha = 8.55 \quad 55.22$$

$$7.33115$$

$$3.69772$$

$$476.7$$

$$\mu_{\alpha} = 1.238$$

$$\delta - D = 7.269$$

$$\alpha_1 = 8.55 \quad 57.60$$

$$D = 18.27 \quad 96.0$$

$$\delta = 18.20 \quad 19.6$$

$$\mu_{\delta} = -3.2$$

$$\delta' = 18.20 \quad 1.69$$

8307

Conditional Equations

6

U-C

1	-0.93	-1.69	-961	-21	+53	= +32	-28
2	-1.67	-0.99	+701	-39	+31	= -8	+78
3	-1.93	-0.00	-581	-95	+0	= -95	-13
4	-1.65	+1.01	-82	-38	-31	= -69	-13
5	-0.93	+1.69	-961	+21	-53	= -74	+28
6	0.00	+1.93	+230	0	-61	= -61	+88
7	+0.07	+1.93	+381	+0	-61	= -61	+25
8	+0.47	+1.88	+1	+10	-59	= +9	+50

$$+335 - -1077$$

$$+11.16 + 0.93 = +219.0$$

$$+0.93 + 18.76 = +19.5$$

$$+0.93 + 0.08 = +18.6$$

$$+18.68 = +158.1$$

$$b = 31.5$$

$$+11.16 = +219.0 + 29.5 = +248.5$$

$$a = +223$$

Arc Measures 167°

$$\frac{P}{n} = 21$$

$$\frac{\Sigma v}{n} = +219.2$$

$$\frac{+29}{+215} = +138$$

$$\Delta P = +1.7$$

From Plate Constants

$\chi = 22.6782$

$\eta = 17.0433$

$\zeta + .6782$

$\eta - 0.9567$

$$\begin{array}{r}
 \log \zeta \quad 9.83136 \\
 \log \delta \quad 9.97737 \\
 \hline
 8.50724 \\
 1.34675
 \end{array}$$

$$\begin{array}{r}
 \log \tan \delta \quad 9.5207 \\
 \zeta^2 \quad 9.6627 \\
 \hline
 7.0537 \\
 6.2365
 \end{array}$$

$\delta - A \quad 22.22$

$\eta_1 + .0002$

$A \quad 8 \quad 55 \quad 33.00$

$\log \eta_0 \quad 0.98087$

$\alpha \quad 8 \quad 55 \quad 55.22$

7.33115

$3.64972 = 476.7$

$\text{Red} \quad + 2.38$

$\delta - D \quad 7 \quad 26.9$

$\alpha_1 \quad 8 \quad 55 \quad 57.60$

$D \quad 18 \quad 27 \quad 46.0$

$\delta \quad 18 \quad 20 \quad 19.6$

$\text{Red} \quad - 3.2$

$\delta' \quad 18 \quad 20 \quad 16.7$

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Moon's Mean Position.

7

$$\begin{array}{r} \lambda_0 = 21.9330'' \\ + 11'' \\ \hline 21.9341'' \end{array}$$

$$\begin{array}{r} \eta_0 = 17.9880'' \\ + 16'' \\ \hline 17.9864'' \end{array}$$

From Plate Constants

$$\begin{array}{r} 22.6782 \\ \chi = 22.6787'' \end{array}$$

$$\begin{array}{r} 17.0433 \\ \eta = 17.0458'' \end{array}$$

$$\zeta = +1.6787''$$

$$\eta = -0.9546''$$

$$\begin{array}{r} \log \zeta \quad 9.83168'' \\ \log \delta \quad 9.97737'' \\ \hline 8.50724 \\ 1.34707 \end{array}$$

$$\begin{array}{r} \log \tan \delta \quad 9.5203 \\ \zeta^2 \quad 9.6633'' \\ \hline 7.0534'' \\ 6.2370'' \end{array}$$

$$\alpha - A \quad + 22.25'' \quad \eta_1 \quad +.0004$$

$$A \quad 8 \quad 55 \quad 33.0'' \quad \eta_0 \quad -0.9550$$

$$\alpha \quad 8 \quad 55 \quad 55.25 \quad \log \eta_0 \quad 9.98000''$$

$$\text{Red} \quad + 2.38'' \quad \begin{array}{r} 7.33115 \\ \hline 2.64885'' \end{array} \quad \eta = -973.3''$$

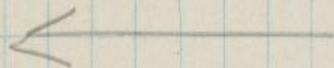
$$\alpha' \quad 8 \quad 55 \quad 57.63'' \quad \delta - D \quad -7 \quad 25.5$$

$$D \quad 18 \quad 27 \quad 46.0''$$

$$\delta_0 \quad 18 \quad 20 \quad 20.5''$$

$$\text{Red} \quad - 3.2''$$

$$\delta' \quad 18 \quad 20 \quad 17.3''$$



Moon's Mean Position

$$\lambda_0 = 21.7330$$

$$+ 46$$

$$21.73915$$

$$\gamma_0 = 17.7880$$

$$- 16$$

$$17.7864$$

From Plate Constants

$$2.6782$$

$$x = -2.67187$$

$$y = +.67187$$

$$17.0433$$

$$y = 17.0459$$

$$m = -0.9596$$

$$\log \delta = 9.831168$$

$$\log \delta = 9.97737$$

$$8.50729$$

$$1.39728$$

$$\log \tan \delta = 9.021039$$

$$2.96633$$

$$7.0539$$

$$6.359$$

7-A

$$+ 22.25$$

m

$$+ 0.042$$

A

$$8.55 33.0$$

h₀

$$- 0.555011$$

L

$$8.55 55.25$$

log h₀

$$9.9610610$$

$$7.33115$$

Red

$$+ 2.38$$

$$22.6998458 m = 990.6$$

L

$$8.55 57.63$$

D-D

$$- 71.255$$

D

$$18.27.96.0$$

S

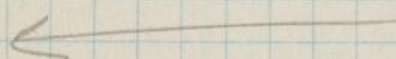
$$18.20.202.51$$

Red

$$- 3.2$$

S

$$18.20.117.3$$



$$= 38^{\circ} \quad 3,0$$

$\delta \quad 18^{\circ} \quad 20' \quad 22''$

8 5 5 5 5

Log Cos δ 9.9779

$$2 \quad 0,9091 \quad 2$$

2'	0	8	8	6	5	m
----	---	---	---	---	---	---

Loc Sin 8 9 7 9 7 8

cos $(H + \alpha)$ 9 89 6 2

h				1.	27	90
---	--	--	--	----	----	----

Si (14+6) 9 7 8 9 8

Sp. 1 0 0 2 2 6

8, 8 23 9

h' 0 6 6 8 0

h 9 9 1 0 3

$$2 + 1,305$$

9-0159

 $\frac{1}{9} + 0.259$
$$h' + 7.656$$
$$\frac{9}{10} + 0.813$$

1-7701

+	2	3	7	7
---	---	---	---	---

$$-3.209$$

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Reduction to Apparent Place

 $\epsilon = 38^\circ 31.0'$ H + α 26 32.2

H 17 26.7

 K' 8 55.55

G 21 07.6

G + α 30 3.1 $\epsilon = 40^\circ 46.5'$

0 18 20. 22.6

Log Cos δ 9.9719 α 0.9091 n K' 0.8862 nLog Cos G + α 8.1311 n q 1.0696

Sum " 9.9999

Tand 9.5209

8.8239

Log Sin δ 9.99918Cos (H + α) 9.8902 α 1.2710Sum (H + α) 9.7898Sec δ 0.0226

8.8239

Log q' 9.2001 n q 9.77138 K' 0.6480 α 9.9103 f +1.305 g +0.259 K +0.813

+2.377

 $q' - 0.159$ $K' + 4.656$ $\alpha - 7.701$

-3.209

8307

Lunar Parallax

9

$$\begin{array}{rcl}
 \alpha' & 8 & 55 & 57.60 \\
 \delta & 8 & 48 & 56.50 \\
 \delta - \alpha' & - & 07 & 1.10 \\
 = & -1^{\circ} & 43' & 16.50
 \end{array}$$

$$\begin{array}{rcl}
 \delta - \alpha' & & -40.90 \\
 -1 & 48 & 35.60
 \end{array}$$

$$\begin{array}{rcl}
 9.95727 \\
 0.00000 \\
 0.00020 \\
 \hline
 9.95747
 \end{array}$$

$$\begin{array}{rcl}
 \delta & 42^{\circ} & 11' & 57.6 \\
 \delta & 18 & 20 & 16.7
 \end{array}$$

$$\delta - \delta' = 23 \quad 51 \quad 41.2$$

$$\begin{array}{rcl}
 9.82690 \\
 8.21961 \\
 9.60698 \\
 0.17282 \\
 \hline
 7.82577
 \end{array}$$

$$\delta - \delta' = 23 \quad 01.0$$

$$\delta \quad 18 \quad 43 \quad 17.8 \quad \delta \quad 8 \quad 53 \quad 52.15$$

$$\text{Ann. Eph. } \delta \quad 18 \quad 43 \quad 21.7 \quad \delta \quad 08 \quad 55 \quad 51.15$$

$$\begin{array}{rcl}
 W-C & - & 4.0 \\
 2^{\text{nd}} \text{ Ord. Ref.} & & 0.0 \\
 \text{Curv. of Plate} & & 0
 \end{array}$$

$$\text{In Corr} \quad -0.1 \quad +0.02$$

$$\delta \quad +18 \quad 43 \quad 17.3 \quad \delta \quad 08 \quad 53 \quad 52.17$$

$$W-C \quad -9.1 \quad +1.02$$

5307

Lunar Parallax

9

 $\alpha' \quad 8 \quad 55 \quad 57.60$ $\beta' \quad 18 \quad 20 \quad 19.2$ $\delta' \quad 98 \quad 56.50$ $\alpha - \alpha' \quad - \quad 07 \quad 1.10$ $\pi \quad 57 \quad 00.27$ $= -1^\circ \quad 45' \quad 16.50''$ $\alpha - \alpha' \quad - \quad 90.90$ $-1 \quad 49 \quad 35.60$ 9.86913 8.21961 8.48598 0.02361 6.59888 9.95727 0.00000 0.00020 9.95747 $\alpha - \alpha' \quad -1 \quad 21.80$ -5.95 -7.60 $\alpha \quad 92^\circ \quad 11' \quad 37.6$ $\delta \quad 78^\circ \quad 20' \quad 17.3$ $\beta \quad 18 \quad 20 \quad 16.7$ $\alpha - \beta \quad 23 \quad 51 \quad 90.2$ 7.82690 8.21961 9.60697 0.17282 7.82577 $\alpha - \beta \quad 23 \quad 01.0$ $\alpha \quad 18 \quad 43 \quad 17.9$ $\delta \quad 8 \quad 55 \quad 52.15$ $\alpha - \delta \quad 18 \quad 43 \quad 21.9$ $\epsilon \quad 08 \quad 55 \quad 51.15$ $\alpha - \epsilon \quad - \quad 4.0$ $\epsilon \quad + \quad 1.00$

Curv. of Plate

0

0

8

1

1

1

58

1

1

1

5

8316

Times & Etc.

Mar 27 '15

Exp. to Stars	8	16		8	28
" " Moon	8	21	48.3	8	21 48.6
Clock fast			.9		

H. Sid Time	8	21	47.55	$\theta - \alpha = -1^h 29^m$
H. Long	4	44	31.05	
g Sid Time	13	06	48.60	
Sid T. M. Noon	0	15	20.46	
Interval	1.2	50	58.14	
Reduction		2	6.30	
G. M. T.	12	48	51.84	

From Naut. alm.		R. A.		h. l. s.
Moon 12	9	44	11.47	+13 50 20.1
Motion in 1 ^m			2.1135	17.0314
" " 48.8640	+1	43.27		-11 25.63
Tabular Place	9	45	54.74	13 38 54.5

Moon's Age 12 days

Parallax	57'	52.75
Semid.	15'	47.8
R		947.8
Aug.		13.3
Gr. 4		-0.6
R		960.5
R		2.0589
ak		-984
(H+R)		1.9605
R		3.8436

$$939 = 12.95$$

$$\begin{array}{r}
 a = -501.7 \\
 -29 \\
 \hline
 477.7
 \end{array}$$

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Mar 27 '15

Star	8	16		8	28	
Moon	8	21	98.3 -	8	21	98.6 -
Clock fast			.9 -			

Sid Time	8	21	77.55	- 9 =	- 1" 29 ^m ✓
Long	4	74	31.05	-	
Sid Time	13	06	78.60	-	
J. M. Moon	0	15	20.46	-	
Interval	12	50	58.14	-	
Reduction		2	6.30	-	
G M. T.	12	48	51.84	-	

moon/alt. alt.		11. a.		11. a.	
moon 12	9	79	11.97	+ 13	50 20.1
rotation 1 ^m			2.1135		19.0317
" 988690	+ 3	43.27		- 11	25.63
abular Place	9	43	59.79	13	38 59.5

Moon's Age 12 days

Parallax	57	52.75	✓
Semid.	15	97.5	-
R		997.8	-
Aug.		137	-
Err.	7	- 0.6	-
R		960.5	-
R		2058.95	-
alt		- 789	-
11/11/12		1960.5	-
R		3893.6	-

937 = 12 95

a = 501.7

- 29

971.7

1
10
23

2
17
7

3
36
22

1
23
13

2
2
13

3
2
1

8316

11

Star Measures.

1	15677	13468	17538	16822
10.3	12114	6988	1001819	19356
25.7	3022	8285	020	4048
	42	52	38	18
	<u>10.3522</u>	<u>10.3528</u>	<u>25.7520</u>	<u>25.7528</u>

2	19554	18582	17392	18802
17	14910	875257	1013633	1605257
7.7	0.005	6257	30	62
	52	88	86	794
	<u>17.0148</u>	<u>17.0170</u>	<u>7.7234</u>	<u>7.7258</u>

3	15600	17372	17456
35.7	9338	13670	876768
22.8	3235	4241	7268
	598	60	98
	<u>35.6269</u>	<u>35.6274</u>	<u>22.8682</u>

Moon Measures.

1	16968	17508
23.3	14650	9870
15	7462	88266
	60	12
	<u>23.2308</u>	<u>23.2359</u>

2		18352	19152
23		16776	1406059
15.2		7279	88
		54	98
		<u>15.1878</u>	<u>15.1906</u>

3	16856	15276
22.6	12002	1012618
16	1408	10
	50	74
	<u>22.4846</u>	<u>22.4899</u>

	R	d	R	d
1	16232	15872	17190	17373
	983638	12284	12359	12202
	9038	7680	9851	02
	22	89	80	62
	<u>333616</u>	<u>3596</u>	<u>27.5165</u>	<u>5166</u>

9316

11

Star Measures

L	115647	12468	17338	16822
10.3	112119	16988	1001819	1932648
25.7	3022	8282	020	9048
	92	52	38	18
	10.3222	10.3528	12.7220	20.7528

<u>3</u>	17554	18582	17392	18802
17	17910	875257	1013633	1605257
7.7	0005	6257	30	62
	52	88	86	794
	17.0178	17.0170	17.254	17.258

<u>3</u>	12600	17370	17456
35.7	9338	13690	07674
22.8	3235	4291	72
	598	60	48
	35.6269	35.6279	22.8682

Moon Measures

L	16968	17508
23.3	14650	9670
15	7402	88288
	60	12
	23.2308	23.2339

<u>3</u>		18352	19152
23		10776	1406059
15.2		7274	78
		54	78
		12.1878	15.1906

<u>3</u>	16856	15276
22.6	12002	1012618
16	1708	10
	50	74
	22.9896	22.9899

Stars. A. G. 3898

	R	d	R	d
4.	16232	15872	17190	17373
33.3	983638	12284	12354	12202
24.6	7038	7680	4851	02
	22	84	80	62
	<u>33,3612</u>	<u>33,3596</u>	<u>24,5126</u>	<u>15166</u>

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Moon Measures.

12

$$\begin{array}{r}
 7 \\
 22.5 \\
 16.5 \\
 -7 \\
 \hline
 16882 \\
 13098 \\
 48 \\
 80 \\
 \hline
 22.3834
 \end{array}
 \qquad
 \begin{array}{r}
 15238 \\
 9098 \\
 5079 \\
 48 \\
 \hline
 22.3804
 \end{array}$$

$$\begin{array}{r}
 5 \\
 22.6 \\
 17 \\
 \hline
 15880 \\
 11658 \\
 5456 \\
 82 \\
 \hline
 22.4224
 \end{array}
 \qquad
 \begin{array}{r}
 15288 \\
 9470 \\
 6266 \\
 28 \\
 \hline
 22.4238
 \end{array}$$

$$\begin{array}{r}
 6 \\
 23. \\
 18.01 \\
 \hline
 18300 \\
 17896 \\
 2671 \\
 84 \\
 \hline
 18.0458
 \end{array}
 \qquad
 \begin{array}{r}
 17382 \\
 7800 \\
 00 \\
 76 \\
 \hline
 18.0424
 \end{array}$$

$$\begin{array}{r}
 7 \\
 24 \\
 18.6 \\
 \hline
 18768 \\
 1329788 \\
 82 \\
 68 \\
 \hline
 18.5980
 \end{array}
 \qquad
 \begin{array}{r}
 17426 \\
 1280011 \\
 922 \\
 12 \\
 \hline
 18.5992
 \end{array}$$

$$\begin{array}{r}
 8. \\
 24.2 \\
 18.7 \\
 \hline
 17718 \\
 11880 \\
 1188889 \\
 06 \\
 \hline
 18.5834
 \end{array}
 \qquad
 \begin{array}{r}
 16128 \\
 1198279 \\
 7679 \\
 34 \\
 \hline
 18.5838
 \end{array}$$

$$\begin{array}{r}
 9 \\
 25 \\
 18.5 \\
 \hline
 17670 \\
 1298982 \\
 80 \\
 64 \\
 \hline
 18.7686
 \end{array}
 \qquad
 \begin{array}{r}
 16186 \\
 10846 \\
 76 \\
 76 \\
 \hline
 18.7696
 \end{array}$$

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Moon Measures.

12

-	16882	15238
.5	13098	9098
.10	98	5079
1	80	48
	<u>22.3839</u>	<u>22.3809</u>

-	15880	15288
.6	11658	9470
	5956	6266
	82	28
	<u>22.9229</u>	<u>22.9238</u>

-	18300	17382
3.	17896	7800
5.04	3671	00
	84	76
	<u>18.0928</u>	<u>18.0929</u>

-	18768	17426
.4	1329788	1290811
8.6	82	922
	68	12
	<u>18.5980</u>	<u>18.5992</u>

5.	17718	16198
4.2	11880	1198279
8.7	1188889	7679
	06	39
1	<u>18.5839</u>	<u>18.5838</u>

2	17670	16186
5	1298982	10876
8.5	80	76
	69	76
	<u>18.7686</u>	<u>18.7696</u>

8316

x	y						13
10.35-25	25.75-29	9.39	06.28	19	29	39.6	
17.01-59	7.72-56	9.42	51.90	11	57	42.9	
35.62-69	22.86-82	9.53	17.32	19	00	43.1	
33.36-09	29.51-66	9.52	01.32	19	19	27.6	
4) 96.35-57	80.86-28	4) 186	76.82	43	95	150.2	
29.08-89	20.25-57	9.46	49.20	13	39	22.5	
22	18	-1	07.73		-17	13.3	
- 2.08-89	- 2.21-57	9.45	44.47	13	22	09.2	
31.5	466.5						
- 69.73	- 17' 13.3	Plate Center		$\begin{cases} A = 9 & 45 & 49 \\ D = 13 & 22 & 09 \end{cases}$			

$$\begin{array}{rclclclcl}
 x-3 & +500x & & +12.5y & & +1.7x & & -12999 \\
 +7433 & +5176 & = & +12609 & + & 322 & = & +12931 & + & 18 & = & +12949 & = & 0 \\
 +4315 & +8308 & = & +12823 & + & 97 & = & +12920 & + & 29 & = & +12949 & = & 0 \\
 -5210 & +17813 & = & +12603 & + & 286 & = & +12889 & + & 61 & = & +12950 & = & +1 \\
 24.3740 & +12172 & & +208 & & +41 & = & & & & & 24.2942
 \end{array}$$

$$\begin{array}{rclclclcl}
 y-n & +500y & & -15.8x & & +1y & & -9708 \\
 -3330 & +12876 & = & +9546 & - & 169 & = & +9382 & + & 26 & = & +9408 & = & 0 \\
 +5806 & +3863 & = & +9669 & - & 269 & = & +9400 & + & 8 & = & +9408 & = & 0 \\
 -1985 & +11439 & = & +9454 & - & 563 & = & +9386 & + & 23 & = & +9409 & = & +1 \\
 16.6192 & +8310 & & -385 & & +17 & = & & & & & 16.4726
 \end{array}$$

Tables	$a = 0$	$e = -.5$	$a-e = +.5$	$b+d = +1.$
Obs	$= -501.7$	$= -501$	$= -.7$	$= +3.3$
O-C	$= -501.7$	$= -500.5$		$= +2.3$

not used

9 5² 1 12 97

+ 48.85

9 5 2 01 32

9 9 5 99

+ 6 17 32

+ 37 727

2 57 6 45

9 9 8 6 93

1 0 7 0 39

PSI -

XSI +

PCRX 1 + 1581

XUSL +

P-X

$$= PPSI + = 81 + 1E PSI + = 222 + 100001 + = 2512 + 00PT +$$

$$= PPSI + = P2 + 02PSI + = 7P2 + 1E PSI + = 8000 + 00PT +$$

$$= 00PSI + = 13 + PPSI + = 222336000 + = 00PT + 0120 -$$

- 4030

OFF -

P1 +

192.1/28 38.35 000 +

H-P

$$0 = 80PP + = 25 + 2800 = 901 - 2500 + 2500 + 0000 -$$

$$0 = 80PP + = 8 + 0000 = 900 - 9000 + 2000 + 1000 +$$

$$1T = 90PP + = 05 + 2800 = 000 - 9000 + = 9000 + = 0000 -$$

19 19 29.6

13 22 09

+ 52 15.6

+ 51 35.8

3 79 6 35

0 50 27 50

9 40 75

2 19 07

8 59 86

+ 6 72 20

+ 00 397

29 76 17

29 51 66

- 24 31

= 678

= 2-0

= 0

John
Wolbach

8316

A	Y								
10.35 25	23.75 29	9.39	06.28	19	29	39			
17.01 59	7.72 56	9.42	57.90	11	57	42			
23.62 69	22.86 82	9.53	17.32	19	00	43			
33.36 09	29.51 66	9.52	01.32	19	19	29			
49.63 57	80.86 28	9.16 6	76.82	53	95	13 0			
29.08 89	20.21 57	9.96	99.20	13	39	22			
22	15	-1	09.73		-17	13			
-20.88 9	-2.21 57	9.95	94.47	13	22	09			
315	466								
-64.73	-17.13.3	Plate Center			$\left\{ \begin{array}{l} A = 9.95.99 \\ D = 13.22.09 \end{array} \right.$				

$$29.3740 + 12172 \quad + 198 \quad + 91 = 29.2912^{\circ}$$

$$16.6192 + 8340 \quad - 385 \quad + 17 = 16.4726^{\circ}$$

Tables $a = 0$ $e = .5$ $a - e = +.5$ $1 - d = +1.$
 Obs $= -501.7$ $= -501$ $= -.1$ $= +3.3$

2.9 ^{not used} 3898
9 51 12.47

+48.85
9 52 01.32
9 45 49,
+ 6 17.32
+ 37 72 7

5 4 Δ 5 - 55 + 94 12.57 66 5
9 9 8 6 4 5
1 +11.76 +6.72 +5.3 - 59 = -6 + 3 = -3 1.07 03 4
2 -12.38 +8.07 -6.5 + 62 = -3 + 3 = 0
3 -5.81 -10.86 -20 + 27 = +7 - 4 = +3 1.75 81
4 +14.14 +7.96 +76 - 71 = +5 - 2 = +3 +53
3 3 7 6 3 4
M +2.29 -1.53 -11 0 -12.33 36 0 9
- 4 0 3 0

Δ 4 - 44 -124 +6
+20 - 27 = +3 -1 = +2 17 18 38.5
+42 - 32 = +10 -2 = +8
-38 + 43 = +5 +2 = +7
+28 + 20 = +48 -1 = +47 -4 13.9

0 +6 0 +12
17 17 24.6
13 22 09
+ 52 15.6
+ 31 35.8

3.49 63 5
0.82 75 0

9.40 45
2.14 07
8.59 86

+ 6.72 20
+ 0.03 97
27 76 17
27.51 66
- 24 51

8316

Standard Coordinates.

A

	Cape No 1335-5.6	Cape No 1342-6.7	Cape No 1360-8.7
e	9 38 17.21	09 42 03.44	09 52 28.62
l	17.22	a.g. 03.56	28.56
E	17.20		28.59
Mean	9 38 17.21	09 42 03.50	09 52 28.59
Proc	+49.07	+48.90	+48.73
α	9 39 06.28	09 42 51.90	09 53 17.32
A	9 45 44	09 45 44	9 45 44
$\delta-A$	- 6 37.72	- 2 52.10	+07 33.32
$\sin(R-A)$	- 397.66	- 172.10	+ 453.259
log "	2.59952 n	2.23578 n	2.65634
cos	9.98611	9.99047	9.98688
γ_0	1.09287 n	0.73349 n	1.15046
γ_0	-12.3843	-5.4136	+14.1403
γ_1	-65	-20	+76
γ_2	9.6092	16.5844	36.1479
χ	10.3525	17.0159	35.6269
$\chi-\gamma$	+ .7433	+ .9315	- .5210
E	14 28 45.3	+ 12 06 50.9	+ 14 07 58.6
l	45.2	a.g. 50.9	59.2
E	44.8		58.9
Mean	14 28 45.1	12 01 50.6	14 04 58.7
Proc	- 4 05.5	- 04 07.7	- 04 15.6
δ	14 24 39.6	11 57 42.9	14 00 43.1
D	13 22 09	13 22 09	13 22 09
$\delta-D$	+ 1 02 30.6	- 1 24 26.1	+ 38 34.1
$\tan(\delta-D)$	+ 3751.0	- 5067.1	+ 2314.0
log "	3.57415	3.70476 n	3.36736
μ No	0.90530	1.03591 n	0.69551
$\tan \delta$	9.4099	9.3260	9.3972
γ_0	2.1857	1.9669	2.3009
γ_1	8.6490	7.8463	8.7515
γ_0	+8.0908	-10.8620	+4.9603
γ_1	+00446	+00070	+0.0564
γ_2	26.0854	7.1450	23.0169
γ	25.7524	7.7256	22.8682
$\gamma-\gamma_0$	- 3330	+5806	-1485

8316

Tamarix canadensis

H

Cape No 1335-5.6 Cape No 1342-6.9 Cape No 1360-8.7

C 9 38 17.21 09 42 03.79 09 52 28.62

L

E

Mean 9 38 17.21 09 42 03.50 09 52 28.59

Prec +49.07 +48.14 +48.73

K 9 37 06.28 09 42 51.90 09 53 17.32

H 9 45 99 09 45 99 9 45 99

(-A - 6 37.72 - 2 52.10 +07 33.32

amb-A) - 377.66 - 172.10 +453.25

-y " 2 59 95.54 2 23 57.84 2 65 63.9

amb 9 9 61.1 9 9 07.7 9 9 68.8

76 1 07 28.74 0 73 39.94 1 15 09.6

76 -1 23 89.3 -5 41 36 +1 9.19 03

76 -65 -20 +76

76 9 60 9.2 16 58 9.4 36 19 7.9

X 10 35 25 17 01 3.9 32 62 6.9

X-7 + 74 3.3 + 93 1.5 - 52 1.0

C 19 28 95.3 12 01 50.9 19 09 58.6

L

E

Mean 19 28 95.1 12 01 50.6 19 09 58.7

Prec -4.25.5 -09 07.7 -09 15.6

S 19 29 39.6 11 57 92.9 19 00 43.1

D 13 22 09 13 22 09 13 22 09

S-D +1 02 30.6 -1 29 26.1 +38 34.1

amb-D +370.10 -506.71 +2319.0

-y " 3.57 91.5 370.9 764 3349.36

76 0.905.30 1 03 37.14 06 95.31

amb S 9 9 99.9 9 9 26.0 9 9 7.2

76 2.185.7 19 66.9 230.09

76 8 69 9.0 7 84 6.3 875.15

76 +8.09 0.8 -10 36 2.0 +796.03

76 +0.09 9.6 +0.00 7.0 +0.056.8

76 36 08.57 7 17 5.0 23 01.67

76 25 75.24 7 72 5.6 22 86.82

76 -333.0 +580.6 -143.8

$$A \sim -1$$

$$B \sim +9$$



8816

Moon's Center

15-

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)^2$	$D - C$
1	23,2331	-1,1129	+2	1,2381	3,8531	+95
2	23,0000	-1,3460	+1	1,8114	3,8503	+67
3	22,9895	-1,8616	+1	3,4648	3,8455	+19
4	-22,3819	-1,9641	+0	3,8577	3,8577	+141
5	22,4231	-1,9229	-0	3,6975	3,8442	+6
6	23,0000	-1,3460	-1	1,8120	3,8489	+53
7	24,0000	-0,3460	-2	0,1198	3,8516	+80
8	24,3460	0,0000	-2	0,0000	3,8683	+247
9	25,0000	+0,6540	-2	0,4274	3,8584	+148

 $R^2 = 3,8936$

	y	$y - y_0$	Δy	$(y - y_0)^2$	L
1	15,0000	-1,6170	-1	2,6150	215
2	15,1892	-1,4278	-1	2,0389	223
3	16,0000	-0,6170	-0	0,3807	217 218
4	16,6170	-0,0000	-0	0,0000	270
5	17,0000	+0,3830	+0	0,1467	281
6	18,0941	+1,4271	+1	2,0369	316
7	18,5486	+1,9316	+2	3,7318	350
8	+18,5836	+1,9666	+2	3,8683	360
9	18,4691	+1,8521	+2	3,4310	19

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Approximate Center

$$x = 23 \quad y = 15,1892$$

$$18,0941$$

$$33,2333$$

$$y_0 = 16,6166$$

$$y_{\max} = 18,5836$$

$$R = 1,9670$$

$$x_{\min} = 22,3819$$

$$x_0 = 24,3489$$

Moon's Center

$$x_0 = 24,3460$$

$$y_0 = 16,6170$$

8316

Moons Center

	x	$x - x_0$	$y - y_0$	$(x - x_0)^2$	$(y - y_0)^2$	$(x - x_0)(y - y_0)$
1	23.2331	-1.1121	2.1238	1.2381	3.8031	+93
2	23.0000	-1.3460	1.8114	1.8114	3.8003	+67
3	22.9495	-1.4615	1.3464	1.3464	3.8955	+19
4	22.3819	-1.9641	3.4577	3.4577	3.4577	+191
5	22.7231	-1.7229	3.6915	3.6915	3.8942	+6
6	23.0000	-1.3460	1.8120	1.8120	3.8989	+53
7	29.0000	0.3460	0.1198	0.1198	3.8016	+80
8	29.3460	0.0000	0.0000	0.0000	3.8683	+297
9	23.0000	+0.6480	0.4274	0.4274	3.8589	+178

 $R^2 = 3.8956$

	x	$x - x_0$	$y - y_0$	$(x - x_0)^2$	$(y - y_0)^2$	$(x - x_0)(y - y_0)$
1	15.0000	-1.6170	2.6130	2.6130	21.5	
2	15.1892	-1.4278	2.0389	2.0389	22.3	
3	16.0000	-0.6170	0.3807	0.3807	21.7	
4	16.6170	0.0000	0.0000	0.0000	27.0	
5	17.0000	+0.3830	0.1967	0.1967	28.1	
6	18.0971	+1.4211	2.0369	2.0369	31.6	
7	18.5986	+1.9316	3.7318	3.7318	35.0	
8	18.9836	+1.9666	3.8683	3.8683	36.0	
9	18.9691	+1.8521	3.9310	3.9310	19	

Approximate Center

$$x = 23 \quad y = 15.1892$$

$$18.0971$$

$$33.2333$$

$$y_0 = 16.6166$$

$$y_{\max} = 18.5836$$

$$R = 1.9670$$

$$x_{\min} = 22.3819$$

$$y_0 = 29.3489$$

Moons Center

$$x_0 = 29.3480$$

$$y_0 = 16.6170$$

Formation of Normals.

$$\begin{array}{r}
 1 \quad + 1.80 \\
 2 \quad + 1.93 \\
 3 \quad + 1.15 \\
 4 \quad + 0.00 \\
 5 \quad - 0.73 \\
 6 \quad - 1.93 \\
 7 \quad - 0.67 \\
 8 \quad - 0.00 \\
 9 \quad + 1.20 \\
 \hline
 + 6.08 \\
 - 3.33 \\
 \hline
 + 2.75
 \end{array}$$

$$\begin{array}{r}
 - 10.55 \\
 - 9.05 \\
 - 3.50 \\
 - 2.76 \\
 - 1.15 \\
 - 7.15 \\
 - 2.80 \\
 + 0.00 \\
 + 9.60 \\
 \hline
 + 9.60 \\
 - 6.18 \\
 \hline
 - 5.22
 \end{array}$$

$$\begin{array}{r}
 - 15.40 \\
 - 9.60 \\
 - 1.20 \\
 - 0.00 \\
 + 2.35 \\
 + 7.55 \\
 + 15.95 \\
 + 4.86 \\
 + 2.74 \\
 \hline
 + 9.92 \\
 - 2.62 \\
 \hline
 + 7.30
 \end{array}$$

		a	b	c	new 0-c
a	-60	+ 11	- 8	-13 [✓]	+110
b	+ 5	+ 13	- 7	-10 [✓]	+67
c	-16	+ 19	- 3	0 [✓]	- 27
		+ 20	0	+4 [✓]	+68
		+ 19	+ 2	+5 [✓]	-81
		+ 13	+ 7	+4 [✓]	- 58
		+ 3	+ 10	-3 [✓]	-21
		0	+ 10	-6 [✓]	+155
		- 6	+ 9	-13 [✓]	+69 +79

$$\begin{aligned}
 +2.75 + 18.27 &= +3.89 \\
 +1.1 + 0.53 &= -1.79
 \end{aligned}$$

$$+17.71 = +5.68$$

$$+16.72 = -9.25 - 0.88 = 10.13$$

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Moon's Center

Conditional Equations 16

		D		C	$D-C$
1	- 1.11 - 1.62 = +95		+ 43 - 71 = - 28		+ 123
2	- 1.35 - 1.73 = +67		+ 53 - 63 = - 10		+ 77
3	- 1.86 - 0.62 = +19		+ 73 - 27 = + 46		- 24
4	- 1.96 - 0.00 = +141		+ 77 - 00 = + 77		+ 64
5	- 1.92 + 0.38 = + 6		+ 75 + 17 = + 92		- 86
6	- 1.35 + 1.43 = +53		+ 53 + 62 = + 115		- 62
7	- 0.35 + 1.93 = +80		+ 47 + 84 = + 98		- 18
8	0.00 + 1.97 = +247		00 + 86 = + 86		+ 161
9	+ 0.65 + 1.85 = +198		- 25 + 81 = + 56		+ 92
			+ 317		- 193

$$+16.42 + 2.75 = -5.22 \quad -9.25$$

$$+2.75 + 18.24 = +7.30.5 \quad +3.89$$

$$+2.75 + 0.46 = -87.4 \quad +0.32$$

$$0 + 18.70 = +817.9 \quad b = +4.3.8$$

$$16.42 = -5.22 - 120.5 = -672.5 \quad a = -39.55$$

$$-0.62$$

Arc Measured 1640

 $\frac{p}{h} .216$

$$\frac{\Sigma v}{h} = +36$$

In 2 ΔR 1.96

$$-2RC = -1.78$$

$$\frac{+36}{.216} = +172 \quad \Delta R = +2.1$$

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

$$\Delta L = -0.25$$

$$\Delta \delta = -0.1$$

$$\Delta R = +1.9$$

$$\Delta a = +0.98$$

$$\Delta \alpha = +0.02$$

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Moon's Center

Conditional Equations 16

D

C

D-C

- 1.11 - 1.64 = -2.75	+ 93 - 71 = + 22	+ 123
- 1.35 - 1.73 = -3.08	+ 53 - 63 = - 10	+ 77
- 1.86 - 0.64 = -2.50	+ 72 - 27 = + 45	- 27
- 1.96 - 0.00 = -1.96	+ 77 - 00 = + 77	+ 69
- 1.92 + 0.38 = -1.54	+ 75 + 17 = + 92	- 86
- 1.35 + 1.73 = + 0.38	+ 53 + 62 = + 115	- 62
- 0.35 + 1.73 = + 1.38	+ 47 + 89 = + 136	- 18
0.00 + 1.97 = + 1.97	00 + 86 = + 86	+ 161
+ 0.65 + 1.85 = + 2.50	- 23 + 81 = + 58	+ 92

$$+ 517 - 193$$

$$+ 16.92 + 2.75 = -5.22$$

$$+ 2.75 + 18.29 = + 7.50$$

$$+ 2.75 + 0.96 = - 47.7$$

$$0 + 18.70 = + 817.7$$

$$b = + 43.8$$

$$16.92 = -5.22 - 120.5 = - 672.5$$

$$a = - 37.05$$

Are Measured 1694

$$\frac{P}{h} = 215$$

$$\frac{\Sigma v}{h} = + 36$$

$$\frac{+ 36}{215} = + 172$$

$$\Delta R = + 2.1$$

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Moon's Mean Position.

17

$$\begin{array}{r} \gamma_0 = 24.3960'' \\ - 20'' \\ \hline 24.3760'' \end{array}$$

$$\begin{array}{r} \gamma_0 = 16.6170'' \\ + 22'' \\ \hline 16.6192'' \end{array}$$

From Plate Constants.

$$\chi = 24.2962''$$

$$\eta = 16.9726''$$

$$\xi = +2.2962''$$

$$\eta = -1.5274''$$

$$\begin{array}{r} \log \xi \quad 0.36010'' \\ \log \eta \quad 9.98872'' \\ \hline 8.50727'' \\ 1.86444 \end{array}$$

$$\begin{array}{r} \log \tan \delta \quad 9.3691'' \\ \xi'' \quad 0.7202'' \\ \eta'' \quad 7.0537'' \\ \hline 7.1427'' \end{array}$$

$$\delta - A \quad + 73.18''$$

$$\eta_1 + .0017''$$

$$\eta_0 - 1.5288''$$

$$A \quad 9 \quad 45 \quad 49''$$

$$\log h_0 \quad 0.18935''$$

$$\alpha_0 \quad 9 \quad 46 \quad 57.18''$$

$$\begin{array}{r} 7.33115'' \\ \hline 2.85320'' - 713.18 \end{array}$$

$$\text{Red} \quad + 2.77''$$

$$\alpha' \quad 9 \quad 46 \quad 59.66''$$

$$\delta - D \quad - 11 \quad 53.2''$$

$$D \quad + 13 \quad 22 \quad 09.50$$

$$\delta_0 \quad + 13 \quad 10 \quad 15.8''$$

$$\text{Red} \quad - 79''$$

$$\delta' \quad 13 \quad 10 \quad 07.9''$$

8316

Mason's Mean Position

17

$$\begin{array}{r} \gamma_0 = 29.3960'' \\ - 20'' \\ \hline 29.3990'' \end{array}$$

$$\begin{array}{r} \gamma_0 = 16.6170'' \\ + 22'' \\ \hline 16.6192'' \end{array}$$

From Plate Constants

$$x = 29.2982''$$

$$y = 16.9726''$$

$$\xi = +2.2982''$$

$$\eta = -1.5279''$$

$$\begin{array}{r} \log \gamma = 0.56010'' \\ \log \delta = 998882'' \\ 8.50729'' \\ \hline 186999 \end{array}$$

$$\begin{array}{r} \log \tan \delta = 9.3691'' \\ \gamma'' = 0.7202'' \\ 1 = 7.0539'' \\ \hline 7.1427'' \end{array}$$

$$l-A = +73.19''$$

$$h_0 = +0.019''$$

$$h_0 = -1.5288''$$

$$A = 9 \ 75 \ 99''$$

$$\log h_0 = 0.18935''$$

$$q_0 = 9 \ 76 \ 57.18''$$

$$\begin{array}{r} 7.33115 \\ \hline 283220'' - 713.18 \end{array}$$

$$\text{Red} = +2.76''$$

$$S-D = -11 \ 58.2$$

$$l' = 9 \ 76 \ 59.66''$$

$$D = +13 \ 22 \ 09.5$$

$$S_0 = 13 \ 10 \ 15.8$$

$$\text{Red} = -79$$

$$S' = 13 \ 10 \ 07.5$$

$$\begin{array}{r} 9 \quad 9 \quad 58.91 \\ 56.61 \\ \hline + 2.30 \end{array}$$

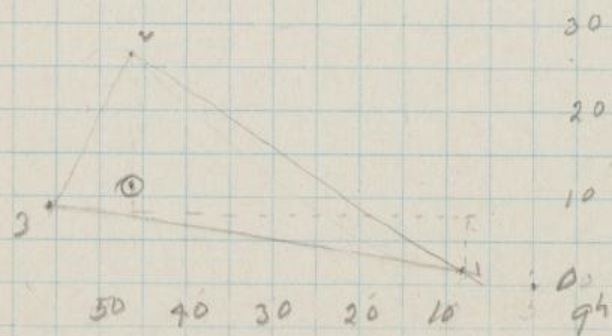
$$\begin{array}{r} + 2 \quad 40 \quad 16.6 \\ 27.73 \\ \hline - 8.13 \end{array}$$

$$\begin{array}{r} 9 \quad 47 \quad 58.78 \\ 55.92 \\ \hline + 2.86 \end{array}$$

$$\begin{array}{r} 26 \quad 24 \quad 23.5 \\ 28.29 \\ \hline - 4.79 \end{array}$$

$$\begin{array}{r} 9 \quad 55 \quad 45.88 \\ 43.37 \\ \hline + 2.51 \end{array}$$

$$\begin{array}{r} 8 \quad 26 \quad 59.6 \\ 27 \quad 9.09 \\ \hline - 9.49 \end{array}$$



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Reduction to Apparent Place.

18

$49^{\circ} 51.7$
 $H + \alpha 27 \quad 19.95$
 $H \quad 17 \quad 32.5$
 $\alpha \quad 9 \quad 46.95$
 $G \quad 21 \quad 7.5$
 $G + \alpha 30 \quad 54.45$

 $103^{\circ} 36.7$

$\ell \cos (G + \alpha) \quad 9.3717^{\circ}$
 $g \quad 1.0719$
 $\sin \quad 9.9876^{\circ}$
 $\tan \delta \quad 9.3592^{\circ}$
 8.8239

$\delta \quad 13 \quad 10 \quad 15.8$
 $\log \cos \delta \quad 9.9889$
 $i \quad 0.9083^{\circ}$
 $h \quad 0.8967^{\circ}$

$\log \sin \delta \quad 9.3576^{\circ}$
 $\cos (H + \alpha) \quad 9.8092$
 $h \quad 1.2792$
 $\sin (H + \alpha) \quad 9.8839$
 $\sec \delta \quad 0.0146^{\circ}$
 8.8239

$\log g' \quad 0.4431^{\circ}$
 $g \quad 9.2521^{\circ}$

$h' \quad 0.4850^{\circ}$
 $h \quad 9.9931^{\circ}$

$\ell + 1.311$
 $g + 0.178^{\circ}$
 $h + 0.989^{\circ}$
 $+ 2.465$
 $+ 2.473$

$g' - 2.777^{\circ}$
 $h' \quad 2.761^{\circ}$
 $i - 7.889$
 $- 8.013$
 $- 7.897$

8316 Reduction to Apparent Mass.

18

99° 21.7

H + x 27 19.90

H 17 32.5

x 9 96.90

G 21 7.5

G + x 30 59.93

103° 36.7

C as (G+x) 93717 n

g 10719

Sum 99876 n

found 92692 n

58239

d 13 10 15.8

log cos d 9.9869

x 0.9083 n

60.8767 n

log S as d 9.3576 n

as (H+x) 98092

h 12792

S as (H+x) 98839

Sum 0.0116 n

58239

log g' 0.9931 n

g 92521 n

f + 1.311

g + 0.178 n

h + 0.789 n

~~1.2765~~

+ 2.973

L 10.9910 n

L 9.9931 n

g' - 2.779 n

h' - 2.761 n

i - 7.889

~~- 8.012~~

- 7.897

8316

Lunar Parallax.

19

α'	9	46	59.66 [✓]	δ'	13	10	07.8 [✓]
δ	8	21	47.55 [✓]	π		57	52.7 [✓]
$\delta - \alpha'$	-1	25	12.11 [✓]	log		9.86	913 [✓]
$=$	-21°	18'	1.65 [✓]			8.22	621 [✓]
$\frac{1}{2} \delta - \alpha'$		-8	00.18 [✓]			9.56	022 [✓]
$\frac{1}{2}$	-21	10	04.77 [✓]			0.01	249 [✓]
			9.95727 [✓]			7.66	800 [✓]
			0.00000 [✓]				
			0.03034 [✓]				
			9.98761 [✓]				

δ	49°	40	57.6 [✓]
δ	13	10	07.9 [✓]
$\delta - \delta$	31°	00	49.7 [✓]

9.82690
 8.22621
 9.71222
 0.15679
 7.92162

 $\delta - \delta' + 28 \quad 42.1$ $\delta + 13 \quad 38 \quad 50.0 \quad \alpha' \quad 9 \quad 45 \quad 55.64[✓]$ Ann Eph $\delta + 13 \quad 38 \quad 54.5[✓] $\alpha \quad 9 \quad 45 \quad 54.79[✓]$$ $10 - c \quad - 7.5 \quad 09c \quad + 0.90[✓]$ Curv. of Plate $+ 0.6 \quad - .03$

y of 3rd Star not measured carefully - too near edge
 2nd ϕ h. Ref 0.0
 Irr Corr $- 0.1 \quad + 0.02$

$\delta + 13 \quad 38 \quad 49.9 \quad \alpha \quad 9 \quad 45 \quad 55.66$
 $10 - c \quad - 7.6 \quad + 0.92$

8316

Lunar Parallax

19

λ'	9	46	59.46"	δ	13	40	57.8
μ	8	21	97.55"	π		57	51.7 -
$\delta - \lambda'$	-1	23	12.14"	$\log$		9.56	9.13"
$= -21^{\circ}$	18		1.65	δ		8.2	2.621"
$\lambda - \lambda'$	-8		00.18"			9.56	0.22"
λ	-21	10	00.97"			0.01	2.99"
			9.93727"			7.66	8.00"
			0.00000"				
			0.03038"	$\delta - \lambda'$		-16'	0.036"
			9.98765"	$=$		-1"	9.92"

 λ 49° 10 57.6"

 δ 13 40 07.9"

 $\delta - \lambda$ 31° 00 29.9"

9.82690
 8.22621
 9.71222
 0.15679
 7.92162

 $\delta - \delta'$ 28 82.1

 δ 13 38 50.0

Ann. Ephed 13 38 59.5"

 $\mu - \mu$ - 9.5 076

Curv. of Plate +0.6

 λ 9 45 55.64"

 λ 9 45 59.79"

 $+0.90"$
 -0.3

1
9.
26
2
16
8
3
3
2
1
23
15
2
2
13
2
22
16

8317

Star Measures.

27

1	15438	17078	17518	16640
9.6	10036	12990	8358	15792
26.9	36	9492	4250	92
	30	64	18	30
	<u>9.5398</u>	<u>9.5958</u>	<u>26.9168</u>	<u>26.9152</u>
2	13800	17022	19032	17232
16.1	12584	8276	10910	15858
8.9	7278	76	0407	5255
	12	22	36	38
	<u>16.1224</u>	<u>16.1257</u>	<u>8.8628</u>	<u>8.8622</u>
3	16610	19332	18044	17270
39.8	8628	12359	8868	16750
23.9	3230	5052	6966	4045
	28	40	44	60
	<u>34.7992</u>	<u>34.8018</u>	<u>23.9178</u>	<u>23.9176</u>
4	16440	17860	17718	17182
32.6	11058	13269	11952	12948
25.6	58	6263	5051	4742
	58	60	16	82
	<u>32.5390</u>	<u>32.5902</u>	<u>25.5766</u>	<u>25.5760</u>

Moon Measures.

1	16308	19550	16466	18286
23.9	13940	11938	14042	11740
15.6	40	4039	1030	3839
	06	60	66	302
	<u>23.2368</u>	<u>23.2382</u>	<u>15.5930</u>	<u>15.5940</u>
2			16488	18800
23			9496	15800
15.7			508502	00
			70	96
			<u>15.6974</u>	<u>15.6902</u>
3	15508	16198		
22.7	8628	13117		
16	28	0007		
	12	98		
	<u>22.6882</u>	<u>22.6910</u>		

3317

Star Measures

27

1	15438	17078	17518	16640
9.6	10036	12490	8358	12792
26.9	36	9972	4250	92
	30	69	18	30
	<u>9.5398</u>	<u>9.5918</u>	<u>26.9168</u>	<u>26.9152</u>
2	13800	17022	19032	17232
16.1	12584	8276	10910	15858
8.7	72	76	04	52
	12	22	30	38
	<u>16.1224</u>	<u>16.1259</u>	<u>8.8628</u>	<u>8.8622</u>
3	16610	19332	18044	17270
39.8	8628	12359	8868	16950
22.7	32	5032	6966	40
	28	40	44	60
	<u>34.7992</u>	<u>34.8018</u>	<u>23.9178</u>	<u>23.9176</u>
4	16440	17860	17718	17182
32.6	11058	13269	11952	12998
23.6	58	62	50	99
	58	60	16	82
	<u>32.5390</u>	<u>32.5902</u>	<u>23.5766</u>	<u>23.5760</u>

Meron Measures

1	16308	19350	16466	18286
23.9	13940	11938	14072	17740
15.6	40	4039	1030	38
	06	60	66	302
	<u>23.2368</u>	<u>23.2382</u>	<u>15.5930</u>	<u>15.5940</u>
2			16488	18800
23			9996	15800
15.7			508	00
			70	9.6
			<u>15.6974</u>	<u>15.7902</u>
3	15508	16198		
22.7	8628	13119		
4.6	28	00		
	12	98		
	<u>22.6882</u>	<u>22.6910</u>		

8317

Times & Etc.

10-7

22

Mar 27/15

Exp. to Stars	8	33		8	45
" " Moon	8	38	43.7	8	38 43.8
Clock fast			.9		

H. Sid Time	8	38	42.85	$\delta - \alpha = -1^h$	8 ^m
H Long	4	44	30.05		
G Sid. T.	13	23	13.90		
Sid. T M.N.	0	15	20.46		
Interval	13	07	53.74		
Reduction		2	9.08		
G.M.T	13	05	44.36		

From Naut. Alm.

R.A.

Dec.

Moon 13 ^h	9	46	18.27	+13.36	17.7
Motion in 1 ^m			2.11264		-19.087
Time in 5.7393			+12.12	-1	20.9
Tabular Place	9	46	30.39	+13.37	56.8

Moon's age

12 days

Parallax	57'	53".32
Semid.	15"	98'.0
R		978.0
Aug.		13.7
Gr 4		-0.6
R		961.4
R		2.0608
AR		-986
(1+AR)		1.9618
R		3.8798

934 = 13.3

 $\alpha = -502.7$

28

-478.4

2317 *Mercury* + Etc. 10-7 22

Mar 27'15

Sp. to Stars 8 33 8 40
 " Moon 8 38 93.7" 8 38 93.8"
 Clock fast 1"

+ Sid Time 8 38 92.45" 8-9 = -1" 8m"
 + Long 7 49 34.05"
 - Sid T 13 23 13.90"
 Sid T M N 0 12 20.46"
 Laternal 13 07 53.49"
 Reduction 2 1.08"
 G M T 13 05 49.36"

From Naut Alm. R.A. Dec.
 Moon 13" 9 46 18.27 13 36 17.7
 Motion in 1^m 211264 74.027
 Tabular 5.7393 +1212 -1 20.9
 Tabular Place 9 46 30.39" 13 34 56.8"

Mercury's Age 12 days

Parallax 57' 53.32"
 Semid. 15" 98.0"
 R 998.0"
 Aug 13.7"
 Lib -0.6"
 R 961.1"
 R 2.0602"
 R -1.86"
 Parallax 1.9616"
 R 97.78"

939 - 13.25

a = 502.7

m = 24

-478.4

8317

Moon Measures.

23

<u>4</u>	14598	17662
22.3	12114	10172
17	1617	6066
	614	72
	<u>22.2484</u>	<u>22.2496</u>
<u>5</u>	12616	17674
22.3	12332	992017
17+	2428	1417
-X	26	46
	<u>22.2290</u>	<u>22.2272</u>
<u>6</u>	14682	16572
22.4	10930	10336
18	28	3807
	92	84
	<u>22.3756</u>	<u>22.3756</u>

15332	15886
711703	1908070
092	60
18	80
<u>18.8218</u>	<u>18.8186</u>

<u>8</u>	12032	16960
23.3	9204	9780
19	1610	9286
	39	58
	<u>23.2822</u>	<u>23.2828</u>

<u>9</u>	14986	17686	16970
24	12336	1233635	9062
19.2	3435	34	8963
	64	64	34
	<u>2196</u>	<u>19.2196</u>	<u>19.2128</u>

<u>10</u>		14592	16938
24.1		1235852	918079
19.2		76	7879
+24		80	74
		<u>19.2238</u>	<u>19.2236</u>

Moon Measures.

23

8317		
9	19598	17662
22.3	12114	10172
17	1617	6066
	619	72
	<u>22.2989</u>	<u>22.2996</u>
5	19616	17694
12.3	12332	9920
7+	29 ²⁸	1917
-X	26	46
	<u>22.2290</u>	<u>22.2272</u>
6	19682	16572
2.9	10930 ²⁹	10336
18	28	38 ³⁷
	92	84
	<u>22.3756</u>	<u>22.3756</u>

15332	15886
71.703	19080.0
092	60
18	80
<u>18.8218</u>	<u>188186</u>

8	12032	16960
23.3	9209	9780
19	16 ¹⁰	9286
	39	58
	<u>23.2822</u>	<u>23.2828</u>

17686	16990
12036.5	9062
39	6963
69	39
<u>19.2196</u>	<u>19.2128</u>
19592	16938
12358.52	9180.79
96	78
80	99
<u>19.2238</u>	<u>19.2236</u>

9	17686
29	12358.52
19.2	96
	80
	<u>21.76</u>

10
29.1
19.2
-91

X
3
X
7
+
+
+

3817

Plate center.

27

$$\begin{array}{rclcl}
 \chi & 9.5408 & 1.61239 & 34.8005 & 32.5396 \\
 \xi & 9.6092 & 16.5844 & 36.1479 & 33.7637 \\
 \chi-\xi & -684 & -9605 & -13474 & -12238
 \end{array}$$

$$\begin{array}{rclcl}
 \eta & 26.9160 & 8.8625 & 23.9177 & 25.5763 \\
 \eta & 26.0834 & 7.1950 & 23.0167 & 24.7617 \\
 \eta-\eta & +8306 & +17175 & +9010 & +8146
 \end{array}$$

$$\chi-\xi \quad +500\chi \quad -39.4 \quad +24\chi \quad -3195$$

$$\begin{array}{l}
 -684 + 9770 = +9086 - 915 = +3171 + 23 = +3194 = -1 \\
 -9605 + 8062 = +3457 - 301 = +3156 + 39 = +3195 = -0 \\
 -13474 + 17400 = +3926 - 813 = +3113 + 83 = +3196 = +1 \\
 29.1903 + 12095 = -587 \quad +58 = 29.0274
 \end{array}$$

$$\begin{array}{l}
 \eta-\eta \quad +500\eta \quad +31.8\chi \quad +2.8\eta \quad -22193 \\
 +8306 + 13408 = +21764 + 303 = +22067 + 75 = +22142 = -1 \\
 +17175 + 4431 = +21606 + 513 = +22119 + 25 = +22144 = +1 \\
 +9010 + 11959 = +20969 + 1107 = +22076 + 67 = +22143 = 0 \\
 17.2605 + 8630 = +769 \quad +48 = 15.9909
 \end{array}$$

$$\begin{array}{lclcl}
 \text{Tables} & a = +.6 & e = -.4 & a-e = +1. & b+d = +1.0 \\
 \text{Obs} & = -502.7 & = -502.8 & = +.7 & = +2.2
 \end{array}$$

$$-503.0 \quad -502.4 \quad +1.2$$

8317

29

X	9.5908	16.1239	39.8805	32.5396
Y	092	16.5899	36.1479	33.7639
1-Y	-689	-9605	-13979	-12238

Y	26.9160	8.8623	23.9177	25.5763
Y	26.8839	7.1950	22.0167	29.7617
Y-Y	+8306	+17175	+9010	+8196

X-Y	+5008	-394	+297	-3195
-----	-------	------	------	-------

-689	+9270	= +9086	-912	= +3171	+23	= +3199	= -1
-9605	+8062	= -3957	-301	= +3156	+39	= +3195	= -1
-13779	+17900	= +3926	-813	= +3113	+83	= +3196	= +1
29.1903	+12095	=	-587	=	+58	=	22.0279

Y-Y	+5007	+31.5A	+4.57	-2019			
+8306	+13928	= +21767	+503	= +22067	+75	= +22142	= -1
+17175	+7931	= +21606	+993	= +22119	+25	= +22144	= +1
+9010	+11959	= +20969	+1107	= +22076	+67	= +22143	= 0
172605	+8630	=	+769	=	+48	=	159100

Tables	a = +.6	e = -.4	a-e = +1.	b+d = +1.0
Obs	= -502.7	= -202.8	= +.9	= +2.2

$$A = -.8$$

$$B = +.9$$

8817

Moon's Center

	x	$x-x_0$	Δx	$(x-x_0)^2$	$(x-x_0)(y-y_0)$	$y-y_0$	$(y-y_0)^2$	$10-C$
1	23,2375	-0.9555	+1	0.9130	3.8566	+76		
2	23,0000	-1.1930	+1	1.4230	3.8732	+242		
3	22,6896	-1.5034	+1	2.2599	3.8462	-38		
4	22,2490	-1.9440	+0	3.7791	3.8462	-28		
5	22,2281	-1.9640	-0	3.8573	3.8573	+83		
6	22,3756	-1.8186	-0	3.3073	3.8564	+74		
7	23,0000	-1.1930	-1	1.4234	3.8610	+120		
8	23,2825	-0.9105	-1	0.8292	3.8610	+120		
9	24,0000	-0.1930	-2	0.0373	3.8389	+99		
10	24,1930	+0.0000	-2	0.0000	3.8608	+118		
					$R = 3.8790$	Corr + 12		
	y	$y-y_0$	Δy	$(y-y_0)^2$				
1	15,5935	-1.7155	-2	2.9436	209			
2	15,6938	-1.5652	-1	2.4503	217			
3	16,0000	-1.2590	-1	1.5853	230			
4	17,0000	-0.2590	-0	0.0671	262			
5	17,2590	+0.0000	+0	0.0000	270			
6	18,0000	+0.7410	+0	0.5491	292			
7	18,8202	+1.5612	+1	2.4376	323			
8	19,0000	+1.7410	+2	3.0318	332			
9	19,2137	+1.9547	+2	3.8216	354			
10	19,2237	+1.9647	+2	3.8608	360	1570		

Approximate Center

$$\begin{aligned}
 x &= 23 & y &= 15.6938 \\
 & & & 18.8202 \\
 & & & \hline
 & & & 34.5140 \\
 & & y_0 &= 17.2570 \\
 \text{apex } x &= 19.2237 \\
 R &= 1.9667 \\
 x_{\text{min}} &= 22.2281 \\
 x_0 &= 24.1948
 \end{aligned}$$

Pluto's Center

$$\begin{cases}
 y_0 = 17.2590 \\
 x_0 = 24.1930
 \end{cases}$$

8317

Munroe's Center

20

	x	$x-x_0$	x_1	$x-x_1$	$x-x_0/(x-x_1)$	$0C$
1	23.2375	-0.9555	1	0.9330	3.8366	76
2	23.0000	-1.1930	1	1.9230	3.8732	292
3	22.6896	-1.5034	1	2.2599	3.8952	39
4	22.2990	-1.9990	0	3.7791	3.8762	29
5	-22.2281	-1.9690	0	3.8073	3.8073	43
6	22.3756	-1.8186	0	3.3013	3.8064	74
7	23.0000	-1.1930	1	1.9230	3.8610	126
8	23.2825	-0.9105	1	0.8292	3.8610	126
9	29.0000	-0.1930	2	0.0373	3.8389	99
10	29.1930	+0.0000	2	0.0000	3.8608	118
					3.8970	

	y	$y-y_0$	y_1	$y-y_1$	L
1	15.5935	-1.7155	2	2.7736	209
2	15.6938	-1.5652	1	2.9000	217
3	16.0000	-1.2590	1	1.5803	230
4	17.0000	0.2590	0	0.0671	262
5	17.2590	+0.0000	0	0.0000	270
6	18.0000	+0.7710	0	0.5791	292
7	18.8202	+1.5612	1	2.7376	323
8	19.0000	+1.7410	2	3.0318	332
9	19.2137	+1.9547	2	3.8216	359
10	19.2237	+1.9647	2	3.8008	360

Approximate Center:

$$x = 23 \quad y = 15.6938$$

$$18.8202$$

$$39.3140$$

$$y_0 = 17.2570$$

$$y_{min} = 19.2237$$

$$H = 1.9667$$

$$x_{min} = 22.2281$$

$$x_0 = 29.1998$$

Munroe's
Center

$$\begin{cases} x = 17.2590 \\ y_0 = 29.1930 \end{cases}$$

Formation of Normals.

1	+ 1.63	- 72.2	- 11	- 131.0	- 21
2	+ 1.86	- 288.0	- 19	- 378.0	- 19
3	+ 1.89	+ 57.0	- 18	+ 48.0	- 15
4	+ 0.50	+ 57.0	- 23	+ 73.0	- 31
5	- 0.00	- 162.5	- 23	+ 00.0	+ 0
6	- 1.35	- 135	- 22	+ 54.5	+ 89
7	- 1.86	- 143	- 14	+ 187.0	+ 19
8	- 1.58	- 109.5	- 11	+ 209.0	+ 21
9	- 0.37	- 19.0	- 2	+ 193.0	+ 23
10	+ 0.00	+ 00.0	+ 0	+ 231.0	+ 23
	+ 5.88	+ 111.0		+ 995.5	
	- 5.16	- 929.2		- 509.0	
	+ 0.72	- 818.2		+ 486.5	
		- 138		+ 89.0	
		- 956.2		+ 575.5	

	a	b	c	new o-cv	
a	+10	-9	+5	-20"	+55"
b	-3	-12	+5	-23"	+200
c	-16	-15	+4	-27"	-110
		-19	+1	-34"	-105
		-20	-0	-36"	-5
		-18	-2	-36"	-83
		-12	-5	-33"	-24
		-9	-5	-30"	-12
		-2	-6	-27"	+7
	+0	-6	-22"	+38"	

$$+0.72 + 20.77 = +3.15 \Delta$$

$$+ [] + 0.03 - 0.97 \Delta$$

$$+ 20.71 = +3.62 \Delta$$

$$+17.83 = -11.65 \Delta - 0.12 \Delta$$

8317

Conditional Equations.

26

			+12 0		c	0-c	
1	- 0.95	- 1.72	= + 7.6	+ 52	- 51	= + 1	+ 75
2	- 1.19	- 1.56	= + 24.2	+ 65	- 46	= + 19	+ 223
3	- 1.50	- 1.26	= - 38	+ 82	- 37	= + 45	- 83
4	- 1.94	- 0.26	= - 28	+ 51	- 8	= + 43	- 171
5	- 1.96	+ 0.00	= + 83	+ 52	+ 0	= + 52	+ 31
6	- 1.82	+ 0.74	= + 74	+ 99	+ 22	= + 121	- 77
7	- 1.19	+ 1.56	= + 120	+ 65	+ 46	= + 111	+ 9
8	- 0.91	+ 1.74	= + 120	+ 50	+ 52	= + 102	+ 18
9	- 0.19	+ 1.95	= + 99	+ 10	+ 38	= + 68	+ 31
10	+ 0.00	+ 1.96	= + 118	- 0	+ 58	= + 58	+ 60
							+ 997 - 201

$$+ 17.83 + 0.72 = - 818.2 \quad - 956.2 \quad - 11.65 \Delta$$

$$+ 0.72 + 20.74 = + 986.5 \quad + 575.5 \quad + 3.15 \Delta$$

$$+ 0.72 + 0.03 = - 38.5$$

$$+ 20.77 = + 614.0$$

$$+ 0.17 \Delta$$

$$b = + 28.6$$

$$+ 17.83 = - 856.2 - 243 = - 977.5$$

$$a = - 58.6$$

$$- .66 \Delta$$

Arc Measured 151°

$$\frac{p}{n} .18$$

$$\frac{\Sigma V}{n} = + 24.6$$

$$\text{In } 4 \quad R \quad 1.96 \quad + 24.6 = + 137$$

$$- 2RC = - 0.78 \quad .18$$

$$\Delta R = + 1.7$$

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

$$\Delta b = + 0.13$$

$$\Delta s = + 0.1$$

$$\Delta R = + 1.5$$

$$\Delta a = - 0.52$$

$$\Delta \tau = - 0.02$$

8317

Conditional

Equations

26

+12

0

C

0 C

- 0.92	- 1.72	= + 76	+ 52	- 51	= + 1	+ 75
- 1.19	- 1.56	= + 292	+ 63	- 96	= + 19	+ 223
- 1.50	- 1.28	= + 28	+ 82	- 37	= + 95	- 83
- 1.99	- 0.26	= + 28	+ 51	- 8	= + 93	- 710
- 1.96	+ 0.00	= + 83	+ 52	+ 0	= + 52	+ 311
- 1.82	+ 0.79	= + 77	+ 99	+ 22	= + 121	- 97
- 1.19	+ 1.56	= + 120	+ 65	+ 96	= + 111	+ 9
- 0.91	+ 1.77	= + 120	+ 50	+ 52	= 102	+ 18
- 0.19	+ 1.92	= + 49	+ 10	+ 58	= + 68	+ 311
+ 0.00	+ 1.96	= + 118	= 0	+ 58	= + 58	+ 60
					+ 9.97	- 201

+ 17.83	+ 0.72	= - 818.4	- 956.2	- 11.65 Δ
+ 0.72	+ 20.79	= + 986.5	+ 575.5	+ 3.15 Δ
+ 0.72	+ 0.03	= - 38.5		+ 0.17 Δ
	+ 20.77	= + 619.0	b =	+ 29.6
+ 17.83	= - 956.2 - 213	= - 977.5	a =	- 59.6
				- .66 Δ

Arc Measured 15.1°

$$\frac{p}{h} .18 \quad \frac{\Sigma V}{h} = + 29.6$$

$$\text{In } 9 \quad 10 \quad 1.96 + 28.6 = + 137 \quad \Delta R = + 1.7$$

$$- 2 RC = - 0.78 \quad .18 \quad \text{Corr} = + 0.2$$

$$\Delta b = + 0.13 \quad \Delta \delta = + 0.1 \quad \Delta R = + 1.5$$

$$\Delta a = - 0.52 \quad \Delta \gamma = - 0.02$$

X=

8317. Moon's Mean Position

27

$$\begin{array}{r} x_0 = 27.1930 \\ - 27 \\ \hline 27.1903 \end{array}$$

$$\begin{array}{r} y_0 = 17.2690 \\ + 15 \\ \hline 17.2605 \end{array}$$

From Plate Constants.

$$x = 26.0278$$

$$y = 15.9909$$

$$z = +3.0278$$

$$n = -2.0091$$

$$\begin{array}{r} \log s \quad 0.98107 \\ \log s \quad 9.98856 \\ \hline 8.50724 \\ 1.98527 \end{array}$$

$$\begin{array}{r} \log \tan s \quad 9.3668 \\ z^2 \quad 0.9621 \\ \hline 7.0539 \\ 7.3823 \end{array}$$

$$d-A \quad +96.66$$

$$n_1 +1.0029$$

$$A \quad 9 \quad 45 \quad 99$$

$$n_0 -2.0115$$

$$d_0 \quad 9 \quad 47 \quad 20.66$$

$$\begin{array}{r} \log n_0 \quad 0.30352 \\ 7.33115 \\ \hline 2.97237 \end{array}$$

$$\text{Red} \quad +2.98$$

$$d' \quad 9 \quad 47 \quad 23.14$$

$$s-D \quad -15 \quad -3.8.7$$

$$D \quad +13 \quad 22 \quad 09$$

$$s_0 \quad 13 \quad 06 \quad 30.6$$

$$\text{Red} \quad -7.9$$

$$s' \quad 13 \quad 06 \quad 22.7$$

311. *Uranus Mean Position*

27

$$\begin{array}{r} \lambda_0 = 29.1930 \\ - 27 \\ \hline 29.1903 \end{array}$$

$$\begin{array}{r} \gamma_0 = 17.2590 \\ + 15 \\ \hline 17.2605 \end{array}$$

From Plate Constants.

$$\lambda = 25.0279$$

$$\gamma = 15.9909$$

$$\delta = +3.0279$$

$$\eta = -2.0091$$

$$\begin{array}{r} \log s \quad 0.98107 \\ \log s \quad 998856 \\ \hline 15.0727 \\ 1.98527 \end{array}$$

$$\begin{array}{r} \log \tan \delta \quad 9.3668 \\ \gamma \quad 0.9621 \\ \hline 7.0539 \\ 7.3428 \end{array}$$

$$q-A \quad +96.64$$

$$h \quad +0.029$$

$$A \quad 9 \quad 75 \quad 99$$

$$h_0 \quad -2.0115$$

$$\lambda_0 \quad 9 \quad 77 \quad 20.67$$

$$\begin{array}{r} \log h_0 \quad 0.30852 \\ \hline 7.53115 \\ 2.97237 \end{array}$$

$$\text{Red} \quad +2.98$$

$$\lambda' \quad 9 \quad 77 \quad 23.17$$

$$\delta-D \quad -1.5 \quad -3.4$$

$$D \quad +13 \quad 22 \quad 09$$

$$s \quad 13 \quad 06 \quad 30.6$$

$$\text{Red} \quad -7.9$$

$$s' \quad 13 \quad 06 \quad 22.7$$

8317 Reduction to Apparent Place

28

$$\begin{aligned}
 &= 49 \quad 57.0 \\
 H + \alpha & 27 \quad 19.8 \\
 H & 17 \quad 32.3 \\
 \alpha & 9 \quad 47.34 \\
 G & 21 \quad 7.5 \\
 G + \alpha & 30 \quad 54.8 \\
 &= 103^\circ \quad 42.0
 \end{aligned}$$

$$\begin{aligned}
 \log \cos G + \alpha & 9.3747n \\
 q & 1.0715 \\
 \sin & 9.9875 \\
 \tan \delta & 9.3759 \\
 & 8.8239
 \end{aligned}$$

$$\begin{aligned}
 \log g' & 0.4469n \\
 g & 9.2588
 \end{aligned}$$

$$\begin{aligned}
 f & + 1.312 \\
 g & + 0.181 \\
 h & + 0.986 \\
 \hline
 & + 2.479
 \end{aligned}$$

$$\begin{aligned}
 \delta & 13 \quad 22 \quad 03.7 \\
 \log \cos \delta & 9.9881 \\
 l' & 0.9083n \\
 l & 0.8964n
 \end{aligned}$$

$$\begin{aligned}
 \log \sin \delta & 9.3639 \\
 \cos H + \alpha & 9.8085 \\
 h & 1.2742 \\
 \sin H + \alpha & 9.8839 \\
 \sec \delta & 0.0119 \\
 & 8.8239
 \end{aligned}$$

$$\begin{aligned}
 L' & 0.4466 \\
 L & 9.9939
 \end{aligned}$$

$$\begin{aligned}
 g' & - 2.792 \\
 h' & + 2.797 \\
 v & - 7.878 \\
 \hline
 & - 7.873
 \end{aligned}$$

2317 Reduction to Apparent Place

28

$$= 8.9 \quad 51.0$$

$$M + \alpha \quad 27 \quad 11.1$$

$$H \quad 11 \quad 32.3$$

$$K \quad 9 \quad 97.39$$

$$-G \quad 21 \quad 7.5$$

$$G + \alpha \quad 30 \quad 39.8$$

$$= 103^\circ \quad 92.0$$

$$\log \cos G + \alpha \quad 9.5799n$$

$$q \quad 1.0715$$

$$\sin \alpha \quad 9.9875$$

$$\tan \delta \quad 9.3759$$

$$8.8239$$

$$\log q' \quad 0.9757n$$

$$q \quad 9.2588$$

$$\delta \quad 13 \quad 22 \quad 03.7$$

$$\log \cos \delta \quad 9.9881$$

$$L \quad 0.9053n$$

$$C \quad 0.8969n$$

$$\log \sin \delta \quad 9.3639$$

$$\cos H + \alpha \quad 9.8085$$

$$h \quad 1.2772$$

$$\sin H + \alpha \quad 7.8839$$

$$\sin \delta \quad 0.0119$$

$$8.8239$$

$$L' \quad 0.9466$$

$$L \quad 9.9939$$

$$f + 1.312$$

$$g + 0.181$$

$$L + 0.986$$

$$12.977$$

$$g' - 2.792$$

$$L' + 2.999$$

$$L - 7.878$$

$$-1.873$$

Lunar Parallax

29

8317.

$$\begin{array}{r}
 \alpha' \quad 9 \quad 77 \quad 23.17 \\
 \delta \quad 8 \quad 38 \quad 42.85 \\
 \alpha - \alpha' \quad -1 \quad 08 \quad 40.29 \\
 = \quad -17 \quad 10 \quad 4.35
 \end{array}$$

$$\begin{array}{r}
 1/2 \text{ (2)} \quad - \quad 6 \quad 30.25 \\
 -17 \quad 3 \quad 34.20
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 0.01957 \\
 \hline
 9.97681
 \end{array}$$

$$\delta \quad 73^\circ \quad 28' \quad 16.1$$

$$\delta \quad 13 \quad 06 \quad 22.7$$

$$\delta - \delta' \quad 30 \quad 24 \quad 53.8$$

$$\begin{array}{r}
 9.82670 \\
 8.22630 \\
 9.70373 \\
 0.16272 \\
 \hline
 7.91845
 \end{array}$$

$$\delta - \delta' \quad +28 \quad 31.1$$

$$\delta \quad 13 \quad 34 \quad 53.8$$

$$\text{Ann Eph } \delta + 13 \quad 34 \quad 56.8$$

$$\delta' \quad 13 \quad 21 \quad 55.5$$

$$\pi \quad 57 \quad 53.32$$

$$\begin{array}{r}
 9.86913 \\
 8.22630 \\
 9.47008 \\
 0.01232 \\
 \hline
 7.57783
 \end{array}$$

$$\alpha - \alpha' \quad -13 \quad 00.29$$

$$\begin{array}{r}
 = \quad -52.02 \\
 23.17
 \end{array}$$

$$\delta \quad 9 \quad 76 \quad 31.12$$

$$\delta \quad 9 \quad 76 \quad 30.39$$

$$\alpha - \alpha' \quad +3.0 \quad \alpha - \alpha' \quad +0.73$$

$$2^{\text{nd}} \text{ Order Ref.} \quad 0.0$$

$$\text{Curv. of Plate} \quad +0.6 \quad -0.03$$

$$\text{Inv Corr} \quad +0.1 \quad -0.02$$

$$\delta \quad +13 \quad 34 \quad 53.9 \quad \alpha \quad 9 \quad 76 \quad 31.10$$

$$\alpha - \alpha' \quad -2.9 \quad +0.71$$

Lunar Parallax

29

1317.

J 13 21 53

K 9 71 18

F 8 38 92.5

π 51 32

-1 08 90.28

-17 10 935

986913

822630

-6 30 23

997008

-17 3 38.20

001292

757783

995727

000000

001958

997681

L -13 0039

-52.02

23.15

2 73° 28' 16.3

13 06 22.7

30 21 53.8

982670

922630

970873

016292

791845

+28 31.1

13 39 53.8

9 76 31.12

Lunar Eph +13 39 56.8

9 76 30.39

U-C +3.0

Q-C +0.98

Curv. of Plate +0.6

-0.3

