

KG

11366

v. 9/16

Vol. XL



1749

1750

1751



Harvard Lunar Plates

Measures and Reductions

Mary Fowler

Volume XL

Plate No.	Date	Page
1749	1912 Mar. 29	1
1750	1912 Mar 30	11
1751	1912 Mar 30	21

3
10
1
3
14
2
2
2
4
1
7
2

1749 Stars measured.

1913 Oct 23

1.

	d	w	d	w
2	17284	18568	15850	19143
10.5	1020000	1568085	1093024	1405855
16.6	00	90	24	60
	00	80	50	45
	<u>16.7095</u>	<u>.7113</u>	<u>10.5076</u>	<u>.5086</u>
3	15330	16730	9489	11560
140	898378	1307065	947071	7070
27.6	80	72	66	11560
	30	30		
	<u>27.6350</u>	<u>.6339</u>	<u>23.9980</u>	<u>.9993</u>
4	19330	19275	15311	15500
24.2	1695756	1168084	782110	7297178
18.3	59	71	15	80
	32	88	11	00
	<u>18.2373</u>	<u>.2893</u>	<u>24.2504</u>	<u>.2524</u>

Grade 1 or 2
Remeasured (4)

	d	w		
2	15640	17836		
	854049	1493030		
	42	30		
	47	36		
	<u>16.7101</u>	<u>.7094</u>		
4	19109	16910		
	1673035	930510		
	22	98		
	10	20		
	<u>18.2380</u>	<u>.2386</u>		
1				
7.6	19096	16128	19098	15248
25.8	1129894	1394029	1487066	947070
	00	30	62	60
	00	15	05	40
	<u>25.7802</u>	<u>.7812</u>	<u>7.5765</u>	<u>.5777</u>

1749 Star Measures.

1913 Oct 23

1.

	d	n	d	n
2	17284	18568	15850	19143
10.5	1020000	1568085	1093024	1405855
116	00	90	24	60
	00	80	50	45
	<u>167095</u>	<u>7113</u>	<u>105076</u>	<u>5086</u>
3	15330	16730	9489	11560
140	898378	1307065	947071	7070
276	80	72	66	11560
	30	30		
	<u>276350</u>	<u>6339</u>	<u>239980</u>	<u>9993</u>
4	19330	19275	15311	15500
242	1675756	1168084	782110	1297178
183	59	71	15	80
	32	88	11	00
	<u>182373</u>	<u>2373</u>	<u>242504</u>	<u>2524</u>

Grade 1 & 2

Remeasures (4)

	d	n		
2	15640	17836		
	854049	1493030		
	42	30		
	47	36		
	<u>167101</u>	<u>7094</u>		
4	19109	16910		
	1673035	930510		
	22	98		
	10	20		
	<u>152380</u>	<u>2386</u>		
1				
76	19096	16128	19098	15248
258	1129894	1394029	1487066	947070
	00	30	62	60
	00	15	05	40
	<u>257802</u>	<u>7812</u>	<u>75765</u>	<u>5777</u>

1749 Moon-measures

d

y

N

d

N

N

2.

1/Scratch

17.5	18408	17812	1797.5	20250
18.3	1583148	1037570	1253030	1568560
	50	78	30	92
	00	30	69	68
	<u>18.2563</u>	<u>2549</u>	<u>17.4558</u>	<u>.4567</u>

2	18045	16090
17.0	1066180	1342435
18.7	7265	35
	35	60
	<u>18.7369</u>	<u>7338</u>

17400	17685
15840	922030
3035	20
80	80
<u>16.8439</u>	<u>.8458</u>

16258	17690
1252029	1142530
10	30
92	95
<u>16.6230</u>	<u>6265</u>

15220	16765
1428099	1767080
9290	80
24	70
<u>16.9070</u>	<u>9093</u>

6	15221	16170
17.0	1373230	767085
21.2	30	90
	30	60
	<u>21.1491</u>	<u>1521</u>

1749 known measures

2.

Scratch

17.5	18408	17812	1797.5	20250
18.3	1583.148	1037570	12530	1568560
	50	78	30	92
	00	30	69	68
	<u>182563</u>	<u>2549</u>	<u>174558</u>	<u>4567</u>

2	18045	16090
170	1066180	1342435
187	7265	35
	35	60
	<u>187369</u>	<u>7338</u>

3
169
19.0

17400	17685
11840	922030
30	20
80	80
<u>168439</u>	<u>8458</u>

4
166
200

16288	17690
12520	1142530
10	30
92	95
<u>166230</u>	<u>6265</u>

5
169
210

15220	16765
1428099	1767080
9290	80
24	70
<u>169070</u>	<u>9093</u>

6
170
212

15221	16170
13732	767085
30	90
30	60
<u>211491</u>	<u>1521</u>

1749

hwoon

3.

$\begin{array}{r} 7 \\ 18.0 \\ 21.9 \end{array}$
 $\begin{array}{r} a \\ 917065 \\ \sqrt{577} \\ 8492 \end{array}$
 $\begin{array}{r} n \\ 10075 \\ 938088 \\ 90 \end{array}$

21.9325.9311

$\begin{array}{r} 6 \\ 18.6 \\ 22.1 \\ \text{max} \\ \text{in} \\ y \end{array}$
 $\begin{array}{r} 10421 \\ 975050 \\ 50 \\ 22.0671 \end{array}$
 $\begin{array}{r} 1081008 \\ 0008 \\ 10125 \\ .0681 \end{array}$

$\begin{array}{r} 9 \\ 19.0 \\ 22.0 \end{array}$
 $\begin{array}{r} 9488 \\ 89150 \\ 150 \\ 22.0505 \end{array}$

$\begin{array}{r} 967660 \\ 6060 \\ 9142 \\ .0523 \end{array}$

possibly or
terminator

1749

huron

3.

	a	h	n	a	n
7	917065		10075		
18.0	5577		938088		
21.9	8492		90		

21.93259311

5	10421	1081008
18.6	9750.0	0008
22.1	50	10125

max

2	<u>22.0671</u>	<u>0681</u>
4		

9	9488	967660
19.0	8915.0	6060
22.0	15.0	9142
	<u>220505</u>	<u>0523</u>

possibly or
terminator

1949 Times etc.

Exp to stars 1912 Mar 29	11 ^h	39 ^m	-	11 ^h	51 ^m	
moon	11	44	36.4 ^v	11	44	36.7 ^v
Clock slow		1	44.8 ^v			
H. Sid T.	11	46	21.35 ^v			
H. time	4	44	31.05 ^v			
G. Sid T.	16	30	52.4 ^v			
Sid T. in moon	0	26	04.45 ^v			
Interval	16	04	47.95 ^v			
Reduction		2	38.06 ^v			
G. H. T.	16	02	09.89 ^v	$\theta - \alpha = +1^h 20^m 37^s$		

From Naut. Alman.	R. A.	Decl.
moon 16 ^h	10 ^h 25 ^m 39 ^s 81 ^v	+14° 05' 21.0 ^v
moon in $\alpha = 2.2321^v$		N. 099 ^v
moon $+2.1648^v$	+ 4.83 ^v	- 32.7 ^v
Tabular place	10 ^h 25 ^m 44 ^s 64 ^v	+14° 04' 48.3 ^v

Moon's age	11 days
parallax	59' 27.6 ^v
semidiameter	16' 13.6 ^v
R =	973.6 ^v
Augmentation	+14.2 ^v
Irradiation (D or C)	-0.4 ^v
R =	987.4 ^v
R =	2116.6 ^v
$a = +0.5$	(a+1) R = 2116.7 ^v
	R ² = 4480.4 ^v

From solution	R ² = 4489.5	4.5168
(a+1) R =	2118.6	2.1253
R =	2118.5	2.1252
R =	988.3	991.4

comp R = 987.4 $\theta - \alpha = +0.9$
+4.0

1949 Times etc. 9.
 Exp. total 1912 Mar 29 $11^h 39^m - 11^h 15^m$
 known 11 44 36.4 - 11 44 36.7
 Clock slow 1 44.8

H. Sid. T. 11 46 21.35
 H. long 4 44 31.05
 G. Sid. T. 16 30 52.4 ✓
 Sid. T. 2. known 0 26 09.45
 Interval 16 04 47.95
 Reduction 2 38.06
 G. H. T. 16 02 09.89 $\theta - \alpha = +1^h 20^m 37^s$

From hand Alman. R. A. Decl.
 known 16^h $10^h 25^m 39^s 81 + 14^h 05' 21''$
 known 16^h : 2.2321 15.094
 $+2.1648$ $+ 483$ $- 32.7$
 Tabular place $10^h 25^m 44^s 64 + 14^h 04' 48.3$

Means age 11 days.
 parallax 59 27.6
 semidiameter 16 13.6
 $934 = 13.1$ R = 973.6
 $9735 = 14.2$ $+ 14.2$
 Augmentation - 0.4
 Irradiation (R) R = 987.4
 R = 2116.6
 $G = +0.5$ $(\alpha + 1) R = 2116.7$
 $R^2 = 4480.4$

From solution $R = 4489.5$ 9516.8
 $R + 1 = 2118.6$ 2121.3
 $R + 1 = 2118.5$ 2125.2
 $R = 4488.3$ 991.4

Comp. R = 987.4 $\theta - \alpha = 1^h 20^m 37^s$

1749

Plate Constants

57

	2	3	4	1
2	10.5081	23.9986	24.2514	7.5771
3	12.8127	26.3095	26.5585	9.8898
2-3	-23.046	-2.3109	-23.071	-23.127

4	16.7104	27.6344	18.2383	25.7807
η	14.3769	25.2915	15.8966	23.4497
$4-\eta$	+2.3335	+2.3429	+2.3417	+2.3310

Prelim Reduction

2-3	+74	-0.52	+2.2942
1 - 2.3127 + 180 = -2.2947	4 = -2.2951	= -9	
2 - 2.3046 + 117 = -2.2929	5 = -2.2934	= +8	
3 - 2.3109 + 193 = -2.2916	12 = -2.2928	= +14	
4 - 2.3071 + 128 = -2.2943	12 = -2.2955	= -13	
mean 18.7496 + 139	= 9	= 21.0568	

$4-\eta$	-72	-4	-2.3234
1 + 2.3310 - 53 = +2.3257	-26 = +2.3231	= -3	
2 + 2.3332 - 74 = +2.3258	-17 = +2.3241	= +7	
3 + 2.3429 - 168 = +2.3261	-28 = +2.3233	= -1	
4 + 2.3417 - 169 = +2.3248	-18 = +2.3230	= -4	
19.9421 - 131	= 20	= 17.6037	

Tables	$a = +0.7$	$e = -0.6$	$a - e = +1.3$	$b + d = -1.0$
Obs	$a = +0.5$	+0.6	-0.1	+0.3
$c - 0$			+1.4	-1.3

1749

Plate Constants

57

	2	3	4	1
2	10.5081	23.9986	24.2514	75.771
3	12.8127	26.3095	26.5585	9.8898
2-3	-23.046	-23.109	-23.071	-23.127

4	16.7104	27.6344	18.2383	25.7807
3-4	14.3769	25.2915	15.8966	23.4497
2-4	+2.3332	+2.3429	+2.3417	+2.3310

Prelim Reduction

2-3	+74	-0.52	72.2942
1 - 2.3127 + 180	-2.2947	-4 - 2.2951	-9
2 - 2.3046 + 117	-2.2929	-5 - 2.2934	+4
3 - 2.3109 + 193	-2.2916	-12 - 2.2928	+14
4 - 2.3071 + 128	-2.2943	-12 - 2.2955	-13
mean 18.7496 + 139	-9		-21.0568

4-2	-72	-4	-2.3234
1 + 2.3310 - 53	+2.3257	-26 - 2.3231	-3
2 - 2.3332 - 74	+2.3258	-17 - 2.3241	+7
3 - 2.3429 - 168	+2.3261	-28 - 2.3233	-1
4 - 2.3417 - 169	+2.3248	-18 - 2.3230	-4
19.9421 - 131	-20		17.6037

Tables	a = +0.7	a = -0.6	a - a = +1.3	b + d = -1.
Obs	c = +0.5	+0.6	+0.1	+0.2
c - 0			+1.4	-1.3

pt	per. 4	residual	
1	217.5	+259	+9
2	235.4	+118	+10
3	243.6	+47	-6
4	271.5	-75	+11
5	299.8	-192	-7.2
6	304.6	-70	+46
7	339.3	+68	+44
8	0.0	+187	+19
9	6.8	+183	-40

1749

Moon's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	17.4562	-1.2932	-2	1.6728	4.5204	+4.00
2	17.0000	-1.7494	-1	3.0608	4.5194	+3.90
3	16.8448	-1.9046	-1	3.6279	4.5173	+3.69
-4	16.6248	-2.1246	0	4.5139	4.5171	+3.67
5	16.9082	-1.8412	+1	3.3897	4.5081	+2.67
6	17.0000	-1.7494	+1	3.0600	4.5186	+3.82
7	18.0000	-0.7494	+2	0.5613	4.5174	+3.70
8	18.7494	0.0000	+2	0.0000	4.5148	+3.44
9	19.0000	+0.2506	+2	0.0629	4.5091	+2.87

Comp $R^2 = 4.4804$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	18.2556	-1.6874	-1	2.8476
2	18.7354	-1.2076	-1	1.4586
3	19.0000	-0.9430	-1	0.8894
4	20.0000	+0.0570	+0	0.0032
5	21.0000	+1.0570	+1	1.1174
6	21.1506	+1.2076	+1	1.4586
7	21.9318	+1.9888	+2	3.9561
8	22.0676	+2.1246	+2	4.5148
9	22.0514	+2.1084	+2	4.4462

Approximate Center

$$x = 17.0 \quad y = 18.7354$$

$$21.1506$$

$$39.8860$$

$$\text{Mean } y = 19.9430$$

$$y - \text{max} = 22.0676$$

$$R = 2.1246$$

$$x - \text{min} = 16.6248$$

$$\text{Mean } x = 18.7494$$

$$\text{Center } \begin{cases} X_0 = 18.7494 \\ Y_0 = 19.9430 \end{cases}$$

1749

Means Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	17.4562	-1.2932	-2	1.6728	4.5204	+4.00
2	17.0000	-1.7494	-1	3.0608	4.5194	+3.90
3	16.8448	-1.9046	-1	3.6279	4.5173	+3.69
4	16.6248	-2.1246	0	4.5139	4.5171	+3.67
5	16.9082	-1.8412	+1	3.3897	4.5081	+3.67
6	17.0000	-1.7494	+1	3.0600	4.5186	+3.82
7	18.0000	-0.7494	+2	0.5613	4.5174	+3.70
8	18.7494	0.0000	+2	0.0000	4.5148	+3.44
9	19.0000	+0.2506	+2	0.0629	4.5091	+2.87

Comp $\Sigma^2 = 44804$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	18.2556	-1.6879	-1	2.8476
2	18.7354	-1.2076	-1	1.4586
3	19.0000	-0.9430	-1	0.8894
4	20.0000	+0.0570	0	0.0032
5	21.0000	+1.0570	+1	1.1174
6	21.1506	+1.2076	+1	1.4586
7	21.9318	+1.9888	+2	3.9561
8	22.0676	+2.1246	+2	4.5148
9	22.0514	+2.1084	+2	4.4462

Approximate Center

 $x = 17.0$ $y = 18.7354$ 21.1506

39.8860

Mean $y =$ 19.9430 $y - \text{mean} =$ 2.20676 $x =$ 2.1246 $x - \text{mean} =$ 1.66248mean $x =$ 18.7494Center $\left\{ \begin{array}{l} X = 18.7494 \\ Y = 19.9430 \end{array} \right.$

Formation of Normals.

1	+ 218	- 516.0	- 676.0
2	+ 212	- 682.5	- 471.9
3	+ 179	- 701.1	- 346.9
4	- 013	- 778.0	+ 22.0
5	- 195	- 491.3	+ 283.0
6	- 212	- 668.5	+ 462.2
7	- 149	- 277.5	+ 736.3
8	+ 000	+ 0.0	+ 729.3
9	+ 052	+ 71.8	+ 605.6
	+ 0.92	- 4043.1	+ 1343.6

$$[aa] = +1995 \quad [bf] = +20.69$$

$$[ag] = -11.15 \quad [be] = +4.71 \quad [cn] = +3176$$

$$+ 2.18 - 0.92 - 1.76 = - 619$$

$$+ 48.98 - 20.69 - 39.54 = -13952$$

$$+ 22.13 \quad - 12.91 = -4662$$

$$+ 49.90 \quad - 34.83 = -12608$$

$$- 18.48 \quad + 12.91 = +4674$$

$$+ 3.65 \quad = + 12$$

$$a = +3.3$$

	C	O	O - C
1	- 4 + 31 + 364 = + 391	+ 400	+ 9
2	- 6 + 22 + 364 = + 380	+ 390	+ 10
3	- 6 + 17 + 364 = + 375	+ 369	- 6
4	- 7 - 1 + 364 = + 356	+ 367	+ 11
5	- 6 - 19 + 364 = + 339	+ 267	- 72
6	- 6 - 22 + 364 = + 336	+ 382	+ 46
7	- 2 - 56 + 364 = + 326	+ 370	+ 44
8	+ 0 - 39 + 364 = + 325	+ 344	+ 19
9	+ 1 - 38 + 364 = + 327	+ 287	- 40

$$+139 - 118$$

$$\text{Average} = 29$$

1749

Hewson's Center

2

Conditional Equations

	a	b	0	c	0-c
1	-1.29	-1.69	= +400	+266 - 1.25 = +141	+259
2	-1.75	-1.21	= +390	+362 - 90 = +272	+118
3	-1.90	-0.94	= +369	+392 - 70 = +322	+47
4	-2.12	+0.06	= +367	+438 + 4 = +442	-75
5	-1.84	+1.06	= +267	+380 + 79 = +459	-192
6	-1.75	+1.21	= +382	+362 - 90 = +452	-70
7	-0.75	+1.99	= +370	+155 + 147 = +302	+68
8	+0.00	+2.12	= +344	- 0 + 157 = +157	+187
9	+0.25	+2.11	= +287	- 52 + 156 = +104	+183

Normal Equations

$$+19.95 + 0.92 = -4043$$

$$+0.92 + 20.69 = +1344$$

$$-0.92 - 0.04 = +186$$

$$+20.65 = +1530$$

$$b = +74.0$$

$$-0.04 - 0.92 = -60$$

$$+19.91 = -4103$$

$$a = -206.3$$

$$+19.95 + 0.92 - 11.15 = -4043$$

$$+0.92 + 20.69 + 4.71 = +1344$$

$$-11.15 + 4.71 + 9.00 = +3176$$

$$-0.92 - 0.04 + 0.51 = +186$$

$$+11.15 + 0.51 - 6.23 = -2260$$

$$+20.65 + 5.22 = +1530$$

$$+5.22 + 2.77 = +916$$

$$\frac{\Delta x}{\Delta y} = +1.21$$

$$-5.22 - 1.32 = -387$$

$$+1.45 = +529$$

$$c = +364$$

$$-9.83 - 5.22 = -17.27$$

$$+10.82 = -1.97$$

$$b = -18.2$$

$$\text{Corr. } \Delta x = -0.32 \quad \text{Corr. } \Delta y = +1.9$$

1749

Harvard Center Conditional Equations

2

	a	b	0	c	0-c
1	-1.29	-1.69	+400	+266-1.25	+141 +259
2	-1.71	-1.21	+390	+362-90	+272 +118
3	-1.90	-0.94	+369	+392-70	+322 -47
4	-2.12	+0.06	+367	+438+	+442 -75
5	-1.84	+1.06	+267	+380+	+79 +459 -192
6	-1.71	+1.21	+382	+362+	+90 +412 -70
7	-0.75	+1.99	+370	+155+147	+302 +68
8	+0.00	+2.12	+344	-0+157	+157 +187
9	+0.25	+2.11	+287	-52+156	+104 +183

Normal Equations

$$+1995 + 092 = -4043$$

$$+092 + 2069 = +1344$$

$$-092 - 004 = +186$$

$$+2065 = +1530$$

$$b = +74.0$$

$$-004 - 092 = -60$$

$$+19.91 = -4103$$

$$a = -206.3$$

~~Actual f. 21~~
L.S. Sol. with
3 unknowns

$$\Delta_1 = -0.59$$

$$c = +364$$

$$-983 - 522 = -1727$$

$$+1082 = -197$$

$$b = -18.2$$

$$a = +33$$

$$\text{Cor. } \Delta a = -0.32 \quad \Delta S = +19$$

$$\text{Average residual} = 29$$

Red. ad l. app

 $\delta + 13^{\circ} 36'$

$$H + \alpha \quad 3^{\circ} 45' = 56^{\circ} 15'$$

$$H \quad 17 \quad 20$$

$$\alpha \quad 10 \quad 25$$

$$G \quad 18 \quad 57$$

$$G + \alpha \quad 5 \quad 22 = 80^{\circ} 30'$$

$$l \cos \delta \quad 9.9876$$

$$L \quad 0.9854$$

$$(L) \quad 0.8930$$

$$l \cos(G + \alpha) \quad 9.2176$$

$$q \quad 0.9695$$

$$\sin \dots \quad 9.9940$$

$$\tan \delta \quad 9.3837$$

$$\frac{1}{\tan} \quad 8.8237$$

$$q' \quad 0.1871$$

$$q \quad 9.1711$$

$$L \quad +0.34$$

$$S \quad +0.15$$

$$L \quad +1.07$$

$$+1.56$$

$$l \sin \delta \quad 9.3713$$

$$\cos(H + \alpha) \quad 9.7447$$

$$L \quad 1.2747$$

$$\sin \dots \quad 9.9198$$

$$\sec \delta \quad 0.0124$$

$$\frac{1}{\sec} \quad 8.8239$$

$$L' \quad 0.3907$$

$$L \quad 0.0308$$

$$q' \quad +1.54$$

$$L' \quad +2.46$$

$$L \quad -7.82$$

$$-3.82$$

1749 Moon's mean Position (1912.0)
From solution with 3 unknowns.

$$\begin{array}{r} X_0 = 187494 \\ \frac{1}{2}a = \frac{+2}{187496} \checkmark \\ Y_0 = 199430 \\ \frac{1}{2}b = \frac{-9}{199421} \checkmark \end{array}$$

From Prelim Reduction $X = 210568$ $Y = 176037$
 " Plate Constant $ax = 0$ $ay = +5$
 $bx = -18$ $by = +8$
 $c = +11$ $d = -13$

$$\begin{array}{r} \bar{z} = +3.0568 \\ \log \bar{z} = 0.48527 \checkmark \\ \dots \cos S = 998766 \checkmark \\ \dots \cos \delta = 8.50724 \\ \dots (d-A) = 199037 \checkmark \end{array}$$

$$d-A = +137.81 \checkmark$$

$$A = 1023.03 \checkmark$$

$$d_0 = 1024.4081 \checkmark$$

$$Red = -1.56 \checkmark$$

$$\alpha = 102442.37 \checkmark$$

$$Red \text{ to standard radius} = -32$$

$$\eta = -4.3963 \checkmark$$

$$\begin{array}{r} \log \tan S = 9.3858 \checkmark \\ \dots \bar{z}^2 = 0.9677 \\ \dots \eta = 7.4069 \end{array}$$

$$\eta_1 = +25 \checkmark$$

$$\eta_0 = -4.3988 \checkmark$$

$$\begin{array}{r} \log \eta_0 = 0.64333 \checkmark \\ \dots \cos \delta = 7.3311 \checkmark \end{array}$$

$$\dots (d-D) = 3.31218 \checkmark$$

$$(S-D) = -3412.0 \checkmark$$

$$D_0 = +1409.55 \checkmark$$

$$S_0 = +1335.430 \checkmark$$

$$Red = -3.8 \checkmark$$

$$S' = +1335.392 \checkmark$$

$$Cor \text{ for stand. radius} = +1.9$$

1749 known mean Position (1912.0)
from solution with 3 unknowns

$$X_0 = 18.7494$$

$$\frac{1}{2} \text{ sec} = \frac{+2}{18.7496}$$

$$Y_0 = 19.9430$$

$$\frac{1}{2} \text{ sec} = \frac{-9}{19.9421}$$

from Prelim Reduction $X = 21.0968$ $Y = 17.6037$
Plate Constants $a_x = 0$ $a_y = +5$
 $b_x = -18$ $b_y = +8$
 $c_x = +11$ $c_y = -13$

$$Z = +3.0568$$

$$\log S = 0.48529$$

$$\cos S = 998766$$

$$\sin S = 850724$$

$$(x-A) = 199037$$

$$d-A = 113788$$

$$A = 102303$$

$$A = 102440.89$$

$$\text{Red} = 1.56$$

$$X = 102442.87$$

$$Z = -4.3963$$

$$\log \tan S = 9.3858$$

$$3^2 = 0.9677$$

$$Z_1 = 74069$$

$$Z_2 = +25$$

$$Z_3 = -43988$$

$$\log \mu = 0.64333$$

$$\text{Red} = 7.33115$$

$$(d-D) = 351218$$

$$(S-D) = 3412.0$$

$$D_1 = +140955$$

$$S_1 = +1335430$$

$$\text{Red} = 3.8$$

$$S = +1335392$$

1749 *human Parallax.*

$$\begin{array}{r} \alpha = 10^{\circ} 24' 42.37'' \\ \theta = 11 \quad 46 \quad 21.35'' \\ \theta - \alpha = +1 \quad 21 \quad 39.3'' \\ = +20^{\circ} 24' 48'' \end{array}$$

$$+ \quad \quad \quad 7 \quad 55''$$

$$+ 20 \quad 16 \quad 55''$$

$$\begin{array}{r} 9.95727'' \\ 0.00000 \\ \hline 0.02780'' \\ 9.98507'' \end{array}$$

$$f = 44 \quad 00 \quad 55''$$

$$13 \quad 35 \quad 39''$$

$$30 \quad 25 \quad 16''$$

$$\begin{array}{r} 9.82640'' \\ 8.23793'' \\ 9.70445'' \\ \hline 0.15811'' \\ 7.92689'' \end{array}$$

$$\delta - \delta' = +29 \quad 03.1''$$

$$\delta = +14 \quad 04 \quad 42.3''$$

$$\text{Mount Allen } \delta = +14 \quad 04 \quad 48.3''$$

$$\theta - \alpha$$

$$-5.8$$

$$+1.9$$

$$-4.1$$

$$\delta = +13^{\circ} 35' 39.2''$$

$$\pi = 59' 27.6''$$

$$\begin{array}{r} 9.86913'' \\ 8.23793'' \\ 9.54214'' \\ \hline 0.01324'' \\ 7.66284'' \end{array}$$

$$\alpha - \alpha' = +15' 49.09''$$

$$+ 1'' 03.27''$$

$$\alpha = 10 \quad 25 \quad 45.64''$$

$$\alpha = 10 \quad 25 \quad 44.64''$$

$$+1.00''$$

$$-3.2$$

$$-6.8$$

1749 *human Parallax*

$$\begin{array}{r} \alpha = 10^{\circ} 24' 42.39'' \\ \delta = 11^{\circ} 46' 21.35'' \\ \phi - \alpha = +1^{\circ} 21' 39.3'' \\ + 20^{\circ} 24' 45'' \end{array}$$

$$+ \quad \quad \quad 7^{\circ} 55''$$

$$+ 20 \quad 16 \quad 55$$

$$995727$$

$$000000$$

$$002780$$

$$\hline 998507$$

$$f = 44 \quad 00 \quad 55$$

$$13 \quad 35 \quad 39$$

$$30 \quad 25 \quad 16$$

$$982640$$

$$823793$$

$$970445$$

$$015811$$

$$\hline 792689$$

$$S - S' = \quad \quad \quad + 29 \quad 03.1$$

$$S = +14 \quad 04 \quad 42.9$$

$$\text{Mount Allen } S = +14 \quad 04 \quad 48.3$$

$$O - C \quad \quad \quad - 6.0$$

$$S = +13^{\circ} 35' 39.2''$$

$$\pi = 5.9 \quad 27.6$$

$$986913$$

$$823793$$

$$954257$$

$$001324$$

$$\hline 766287$$

$$\alpha - \alpha' = +15' 49.07$$

$$+ 1^{\circ} 03.27$$

$$\alpha = 10 \quad 25 \quad 45.64$$

$$\alpha = 10 \quad 25 \quad 44.69$$

$$+ 1.02$$

1750.

1913 Oct. 24.

Stars - measures.

	d	N	d	N
1	19875	19906	15158	14149
118	1509805	1469099	1390092	589005
235	00	99	00	90
mg	98	10	70	55
58	<u>23.4785</u>	<u>4788</u>	<u>11.8738</u>	<u>8759</u>
2	15730	1478080	18020	18770
268	1512628	80	1570000	1107070
321	23	14180	00	90
mg			10	82
20	<u>32.0604</u>	<u>0600</u>	<u>26.7682</u>	<u>7709</u>
3	16150	16808	17470	17319
29.5	1479000	817873	1316359	1160009
12.1	90	75	48	02
mg	35	11	56	19
67	<u>12.1355</u>	<u>1364</u>	<u>29.5693</u>	<u>5715</u>

Grade 2

1750

1913 Oct 24

11

Stars - measures

	d	N	d	N
1	19875	19906	15158	14149
118	15098.5	14490.99	13900.92	5390.05
238	00	99	00	90
289	98	10	70	55
58	<u>234785</u>	<u>4788</u>	<u>11.8738</u>	<u>8759</u>
2	15730	14780.80	18020	18770
268	15126.28	80	15700.00	11070.70
321	23	14180	00	90
289			10	82
70	<u>32.0604</u>	<u>0600</u>	<u>26.7682</u>	<u>7709</u>
3	16150	16808	17470	17319
295	14790.00	8178.73	13163.59	11600.09
121	90	75	48	02
289	35	11	56	19
67	<u>12.1355</u>	<u>1364</u>	<u>29.5693</u>	<u>5715</u>

Grade 2

1750

moon - measures

$\begin{array}{r} 1 \\ 17.0 \\ 18.2 \\ \hline 18.2148 \end{array}$

$\begin{array}{r} 15850 \\ 799069 \\ 0869 \\ 68 \\ \hline 2138 \end{array}$

$\begin{array}{r} 2 \\ 16.5 \\ 18.0 \end{array}$

$\begin{array}{r} 15372 \\ 1048199 \\ 8059 \\ 86 \\ \hline 16.5108 \end{array}$

$\begin{array}{r} 16200 \\ 1107092 \\ 92 \\ 00 \\ \hline 5109 \end{array}$

$\begin{array}{r} 3 \\ 16.5 \\ 19.6 \\ \hline \end{array}$

$\begin{array}{r} 14320 \\ 822930 \\ 3030 \\ 26 \\ \hline 16.3907 \end{array}$

$\begin{array}{r} 16253 \\ 1232328 \\ 3528 \\ 63 \\ \hline 3928 \end{array}$

$\begin{array}{r} 4 \\ 16.5 \\ 20.0 \end{array}$

$\begin{array}{r} 13300 \\ 743129 \\ 3029 \\ 99 \\ \hline 16.4131 \end{array}$

$\begin{array}{r} 15280 \\ 1114042 \\ 41 \\ 80 \\ \hline 4139 \end{array}$

$\begin{array}{r} 5 \\ 16.8 \\ 21.0 \end{array}$

$\begin{array}{r} 18193 \\ 1667190 \\ 7990 \\ 90 \\ \hline 16.8487 \end{array}$

$\begin{array}{r} 14380 \\ 689990 \\ 00 \\ 61 \\ \hline 8470 \end{array}$

$\begin{array}{r} 6 \\ 17.0 \\ 21.2 \\ \hline 21.1734 \end{array}$

$\begin{array}{r} 19360 \\ 1112010 \\ 20 \\ 68 \\ \hline 1750 \end{array}$

1750

huron - measures

$$\begin{array}{r}
 1 \\
 17.0 \\
 18.2 \\
 \hline
 152148
 \end{array}$$

$$\begin{array}{r}
 15850 \\
 799009 \\
 0809 \\
 68 \\
 \hline
 2138
 \end{array}$$

$$\begin{array}{r}
 2 \\
 16.5 \\
 19.0
 \end{array}$$

$$\begin{array}{r}
 15372 \\
 1048199 \\
 8029 \\
 86 \\
 \hline
 165108
 \end{array}$$

$$\begin{array}{r}
 16200 \\
 1107092 \\
 92 \\
 00 \\
 \hline
 5109
 \end{array}$$

$$\begin{array}{r}
 3 \\
 16.5 \\
 19.0 \\
 \hline
 16.5 \\
 19.0
 \end{array}$$

$$\begin{array}{r}
 14320 \\
 822930 \\
 30 \\
 26 \\
 \hline
 163907
 \end{array}$$

$$\begin{array}{r}
 16253 \\
 1232328 \\
 31 \\
 63 \\
 \hline
 3928
 \end{array}$$

$$\begin{array}{r}
 4 \\
 16.5 \\
 20.0
 \end{array}$$

$$\begin{array}{r}
 13300 \\
 743129 \\
 30 \\
 99 \\
 \hline
 164131
 \end{array}$$

$$\begin{array}{r}
 15280 \\
 1114042 \\
 41 \\
 80 \\
 \hline
 4139
 \end{array}$$

$$\begin{array}{r}
 5 \\
 16.8 \\
 21.0
 \end{array}$$

$$\begin{array}{r}
 18193 \\
 1607190 \\
 79 \\
 90 \\
 \hline
 168487
 \end{array}$$

$$\begin{array}{r}
 14380 \\
 689090 \\
 00 \\
 61 \\
 \hline
 8470
 \end{array}$$

$$\begin{array}{r}
 6 \\
 17.0 \\
 21.2 \\
 \hline
 16244 \\
 1452720 \\
 00 \\
 55 \\
 \hline
 211734
 \end{array}$$

$$\begin{array}{r}
 19360 \\
 1112010 \\
 20 \\
 68 \\
 \hline
 1750
 \end{array}$$

1750

4 known

13

2	15176	19445
18.0	7830	1678000
21.7	3546	00
	.88	60
	<u>21.7348</u>	<u>.7344</u>

8	14150	18480
18.5	6193	1644920
21.8	7580	2520
max	60	85
w		
4	<u>21.7975</u>	<u>.7950</u>

9	14120	18529
19.0	679090	1588070
21.7	70	70
	36	35
	<u>21.7349</u>	<u>.7342</u>

possibly or
terminator

1750

a ~

13

2	15176	19445
150	7830	1678000
21.7	3046	00
	88	60
	<u>21.7348</u>	<u>7344</u>

8	14150	18480
185	6193	1644920
21.8	7580	25
max	60	85
~	<u>21.7975</u>	<u>7950</u>
q		

2	14120	18529
190	679090	1588070
21.7	70	70
	36	35
	<u>21.7349</u>	<u>7342</u>

possibly or
terminator

$$\begin{aligned} a_1 &= +0.7 \\ a_2 &= +1.9 \\ a_3 &= +1.2 \\ a_4 &= +3.4 \end{aligned}$$

1250	Times etc						14
Epistatus 1917 Mar 30	8h 30m			- 8h 42m			
known	8 35	30.9		8 35	31.2		
close slow	1	44.8					
Red T.	8 37	15.85					
H. long	4 44	31.05					
G. Sid T.	13 21	46.90					
Sid. in moon	0 30	01.00					
Interval	12 51	45.90					
Reduction	2	06.44					
G. h. T.	12 49	39.46		$\theta - \kappa = -2^{\circ} 33'$	49.32		

From Mount Alim			R.G.		Decl.		
known 13h	11h 11m	27.24		+ 80	34'	49.2	
horizontal ~ 2.1341					16.254		
... - 10.3423		22.07		+	2	48.1	
Tabular place	11 11	05.17		+ 8	37	37.3	

Moon's age 12 days.

	parallax	59'	13.8	
	semidiam	16'	09.9	
9342 + 10.6	R =		969.9	
9702 + 11.4	Augmentation	+	11.4	
	Irradiation 121		-0.5	
	R =		980.8	
	R =		2102.5	
a = 1.0	(1+a) R =		2102.3	
	R ² =		4419.7	

17.50 Times etc 14
 Ephemeris 1917 Mar 30 8h 30m - 8h 42m
 known 8 35 30.9 - 8 35 31.2
 close slow 1 448

Hed T. 8 37 1585
 H. Long 4 44 3105
 G. Hed T. 13 21 4690
 S. Hed T. 0 30 0100
 T. Hed T. 12 51 4590
 R. Hed T. 2 0644

G. H. T. 12 49 3946 6-12-2 53 49.32

From Mant Alm R. Hed Hed
 known 13h 11h 11h 27.24 + 8° 34' 49.2
 known 1m - 2.1341 16.254
 - 10.3423 - 22.07 + 2 481
 Tabular place 11 11 0517 + 8 37 37.3

Moon's age 12 days.

parallax
 semi-diam 16' 09.9
 R = 969.9
 Augmentation + 11.4
 Irradiation 2 - 0.5
 R = 980.8
 R = 2102.5
 (1 + a) R = 2102.3
 R² = 4419.7

934 = +10.6
 970 = +11.4
 a = +10

Plato Constantine.

$$\begin{cases} A = 11^h 12^m 42^s \\ D = +8^\circ 20' 53'' \end{cases}$$

$$\begin{array}{r} x - 5. \quad + 7.44 \quad + 2 \quad - 785 \\ + 599 + 174 = + 773 + 12 = + 785 \quad = 0 \\ + 521 + 237 = + 758 + 27 = + 785 \quad = 0 \\ + 664 + 90 = + 754 + 30 = + 784 \quad = -1 \\ 18.4943 + 146 + 18 = 18.4322 \end{array}$$

1750

Plate Constants

15

x	y	R.A.			Decl		
11.8748	234786	11	09	27	+8	32	24
26.7696	320602		17	17	+9	39	05
29.5704	121360		18	42	+7	04	09
<u>68.21</u>	<u>67.67</u>		<u>44</u>	<u>86</u>		<u>75</u>	<u>38</u>
22.74	22.56	11	15	09	+8	25	13
18	-22		-2	27		-4	20
<u>4.74</u>	<u>056</u>	11	12	42	+8	20	53
31	465						
197	260						

$$\begin{cases} A = 11^h 12^m 42^s \\ D = +8^\circ 20' 53'' \end{cases}$$

$$\begin{aligned} &L-3. \quad +744 \quad +2 \quad -785 \\ &+599 +174 = +773 -12 = +785 \quad = 0 \\ &+521 +237 = +758 +27 = +785 \quad = 0 \\ &+664 +90 = +754 +30 = 7784 \quad = -1 \\ &18+943 +145 \quad +18 \quad = 18,4322 \end{aligned}$$

$$\begin{aligned} &4.2 \quad -1142 \quad -074 \quad +459 \\ &-308 -135 = -443 -16 = -459 \quad = 0 \\ &-132 -305 = -437 -22 = -459 \quad = 0 \\ &-115 -337 = -452 -8 = -460 \quad = -1 \\ &19.6938 -211 \quad -14 \quad = 19.7172 \end{aligned}$$

Tabern $a = -0.7$ $b = -1.9$ $a - b = +1.2$ $b + a = +3.4$
 m -1.0 $+0.7$ -0.3 $+4.0$
 $i = 0$ $+1.5$ -0.6

Standard and Coords

15

Cape No. 15-24 mag 5.8

Cape No. 15-40 mag 6.7

Cape No. 15-44 mag 7.0

C	11 ^h	08 ^m	50 ^s .08	11 ^h	16 ^m	39 ^s .52	11 ^h	18 ^m	05 ^s .11
L			14			58			17
B			08			50			10
Mean	11	08	50.10	11	16	39.53	11	18	05.13
Proc		+	37.40		+	37.38		+	37.23
X	11	09	27.50	11	17	16.91	11	18	42.36
A	11	12	42	11	12	42	11	12	42
(A)	-	3	14.50	+	4	34.91	+	6	00.36
(A)	-		194.49	+		274.89	+		360.32
log	2.28890			2.43916			2.55668		
cos	9.99516			9.99381			9.99669		
S	0.79830			0.44021			1.06061		
S	-6.1844			+8.7138			+11.4976		
S	-		7	+		37	+		64
S	11.8849			26.7175			29.5040		
S	11.8748			26.7696			29.5704		
	+		599	+		521	+		664

C	+8°	36'	28.6"	+9°	43'	01.1"	+7°	08'	05.0"
L			28.9			01.2			05.8
B			28.5			00.3			06.1
Mean	+8	36	28.7	+9	43	00.9	+7	08	05.6
Proc	-	3	54.6	-	3	56.3	-	3	56.6
S	+8	32	34.1	+9	39	04.6	+7	04	09.0
D	+8	20	53	+8	20	53	+8	20	53
(D)	+	11	41.1	+	18	11.6	-	16	44.0
(D)	+		701.1	+		4692.4	-		4604.8
log	2.84578			3.67140			3.66321		
log	0.17693			1.00255			0.99436		
cos	9.1766			9.2306			9.0935		
S	15.826			18.804			2.1212		
S	78.126			81.644			8.2681		
log	+1.5029			+10.0588			-9.8710		
log	+		65	+		146	+		185
log	23.5094			32.0734			12.1475		
log	23.4786			32.0602			12.1360		
log							-1.15		

Standard Coords.

15

Cape No. 11-24 mag 5.8

Cape No. 11-40 mag 6.7

Cape No. 15-44 mag 7.0

C	11	08	50.08	11	16	39.52	11	18	05.11
L			14			58			17
E			08			50			10
Mean	11	08	50.10	11	16	39.53	11	18	05.13
Proc		+	37.40		+	37.38		+	37.23
S	11	09	27.50	11	17	16.91	11	18	42.36
A	11	12	42	11	12	42	11	12	42
A-A	-	3	15.50	+	4	34.91	+	6	00.36
Sec (d-4)	-		194.49	+		274.89	+		360.32
log	2.28898			2.43916			2.55668		
\cos	999516			999381			999669		
S ₀	0.79333			0.44021			1.06061		
S ₁	-6.7862			+8.7138			+11.4976		
S ₂	-	7		+	37		+	64	
S ₃	11.8889			26.7175			29.5040		
S ₄	11.8748			26.7696			29.5704		
S ₅	+	9.18		+	5.21		+	6.64	
S ₆	5.54								

C	+8° 36'	28.6	+9° 43'	01.1	+7° 08'	05.0		
L		28.9		01.2		05.8		
E		28.5		00.3		06.1		
Mean	+8	36	28.7	+9	43	00.9		
Proc	-3	54.6	-3	56.3	-3	56.6		
S	+8	32	24.1	+9	39	04.6		
D	+8	20	53	+8	20	53		
S-D	+11	31.1	+1	18	11.6	-1	16	44.0
ln(1-D)		+761.1		+469.24		-4604.8		
log		2.84578		3.67140		3.66321		
η_0		0.17693		1.00255		0.99436		
η_1		9.1766		9.2306		9.0935		
η_2		15.871		18.804		21.212		
η_3		78.171		81.644		8.2681		
η_4		+1.5025		+10.0588		-9.8710		
η_5		+6.6		+14.6		+18.5		
η_6		23.4884		32.0734		12.1475		
η_7		23.4786		32.0602		12.1360		

pt.	mag. L	resid.
1	22 5.2	+ 1 0
2	25 0.7	- 4 8
3	27 0.0	+ 8
4	27 8.3	+ 4 2
5	30 8.4	- 1 1
6	31 4.8	+ 6 5
7	34 6.4	- 9 1
8	0.0	+ 1 0
9	13.9	+ 1 6

1750. *Linear Center* 16

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$	
1	17.0000	-1.4938	+5	2.2299	4.4203	+	6
2	16.5108	-1.9830	+2	3.9315	4.4134	-	63
3	16.3918	-2.1020	0	4.4184	4.4184	-	13
4	16.4135	-2.0803	-1	4.3281	4.4216	+	19
5	16.8478	-1.6460	-4	2.7106	4.4159	-	38
6	17.0000	-1.4938	-5	2.2329	4.4236	+	39
7	18.0000	-0.4938	-7	0.2445	4.4086	-	111
8	18.4938	0.0000	-7	0.0000	4.4192	-	5
9	19.0000	+0.5062	-7	0.2562	4.4203	+	6
				Comp. $R^2 =$	4.4197		

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	18.2143	-1.4799	-1	2.1904
2	19.0000	-0.6942	-0	0.4819
3	19.6942	0.0000	0	0.0000
4	20.0000	+0.3058	+0	0.0935
5	21.0000	+1.3058	+1	1.7053
6	21.1742	+1.4800	+1	2.1907
7	21.7346	+2.0404	+2	4.1641
8	21.7962	+2.1020	+2	4.4192
9	21.7346	+2.0404	+2	4.1641

Approximate Center

$$\begin{aligned}
 x &= 17.0 & y &= 18.2143 \\
 & & & 21.1742 \\
 & & & \hline
 & & & 39.3885 \\
 \text{mean } y &= & 19.6942 \\
 y - \text{mean} &= & 21.7962 \\
 K &= & 21.020 \\
 y = \text{min} &= & 16.3918 \\
 x_0 &= & 18.4938
 \end{aligned}$$

$$\text{Center } \begin{cases} x_0 = 18.4938 \\ y_0 = 19.6942 \end{cases}$$

1750.

Linear Center

16

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - C$	
1	170000	-14938	+5	22299	44203	+	6
2	165108	-19830	+2	39315	44134	-	63
3	163918	-21020	0	44184	44184	-	13
4	164135	-20803	-1	43281	44216	+	19
5	168478	-16460	-4	27106	44159	-	38
6	170000	-14938	-5	22329	44236	+	39
7	180000	-04938	-7	02445	44086	-	111
8	184938	00000	-7	00000	44192	-	5
9	190000	+05062	-7	02562	44203	+	6

$$\text{Comp } R^2 = 44197$$

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	182143	-14799	-1	21904
2	190000	-06942	-0	04819
3	196942	00000	0	00000
4	200000	+03058	+0	00935
5	210200	+13058	+1	17053
6	211742	+14800	+1	21907
7	217346	+20404	+2	41641
8	217962	+21020	+2	44192
9	217346	+20404	+2	41641

Approximate Center

$$x = 170 \quad y = 182143$$

$$211742$$

$$393885$$

$$\text{mean } y = 196942$$

$$y - \text{mean} = 217962$$

$$K = 21020$$

$$y = \text{mean} = 168918$$

$$x_0 = 184938$$

$$\text{Center } \begin{cases} x_0 = 184938 \\ y_0 = 196942 \end{cases}$$

Enumeration of numbers.

1
2
3
4
5
6
7
8
9

Woods Center Conditional Equations

	a	b	0	c	0-c
1	-1.49	-1.48	= +6	-15 + 18 = -3	+10
2	-1.98	-0.69	= -63	-20 + 5 = -15	-48
3	-2.10	+0.00	= -13	-21 - 0 = -21	+8
4	-2.08	+0.31	= +19	-21 - 2 = -23	+42
5	-1.65	+1.31	= -38	-17 - 10 = -27	-11
6	-1.49	+1.48	= +39	-15 - 11 = -26	+65
7	-0.49	+2.04	= -11	-5 - 15 = -20	-91
8	+0.00	+2.10	= -5	+0 - 15 = -15	+10
9	+0.51	+2.09	= +6	+5 - 15 = -10	+16

Average = 33

Mean Equations

$$1) -930 - 0.85 = -89$$

$$2) -1.47 + 7.66 = +71$$

$$+1.47 + 0.09 = +14$$

$$+7.75 = -57$$

$$b = +8.4 - 7.35$$

$$-9.30 = -89 + 4 - 85 - 93$$

$$a = +9.05 + 10.0$$

$$4) -7.65 - 1.86 = -51$$

$$5) -3.12 + 8.97 = -109$$

$$+3.12 + 0.76 = +21$$

$$+9.73 = -88$$

$$b = -9.0$$

$$-7.65 = -51 - 17 = -68$$

$$a = +8.9$$

Woods Center Conditional Equations

	a	b	c	d	e	f
1	-1.49	-1.48	=	+6	-1.5	+1.8 = -2.4
2	-1.98	-0.69	=	-63	-20	+5 = -15
3	-2.10	+0.00	=	-13	-21	-0 = -21
4	-2.08	+0.31	=	+19	-21	-2 = -23
5	-1.65	+1.31	=	-38	-17	-10 = -27
6	-1.49	+1.48	=	+39	-1.5	-1.8 = -2.6
7	-0.49	+2.04	=	+11	-5	-1.5 = -2.0
8	+0.00	+2.10	=	-5	+0	-1.5 = +1.5
9	+0.51	+2.09	=	+6	+5	-1.5 = +1.0

Average = 33

Mean Equations

$$1) -9.30 - 0.55 = -8.9$$

$$2) -1.47 + 7.66 = +7.1$$

$$+1.47 + 0.09 = +1.4$$

$$+7.75 = +5.7$$

$$b = +8.4 - 7.35$$

$$-9.30 = -8.9 + 4. - 4.5 = -9.3$$

$$a = +9.05 + 10.0$$

1750

Moon's Mean Position (1912.0)

18

$$\begin{array}{r}
 X_0 = 18.4938^{\circ} \\
 \text{add } +.5^{\circ} \\
 \hline
 18.4943^{\circ}
 \end{array}
 \quad
 \begin{array}{r}
 Y_0 = 19.6942^{\circ} \\
 \text{sub } -.4^{\circ} \\
 \hline
 19.6938^{\circ}
 \end{array}$$

From Plate Constants, $X = 18.4322$ $Y = 19.7172$

$$\begin{array}{r}
 z = +0.4322^{\circ} \\
 \log z = 9.63568^{\circ} \\
 \log \delta = 9.99570^{\circ} \\
 \log \text{const} = 8.50724
 \end{array}$$

$$\log(x-A) = 1.13274^{\circ}$$

$$x-A = +13.58^{\circ}$$

$$A = 11 \quad 12 \quad 42^{\circ}$$

$$x_0 = 11 \quad 12 \quad 55.58^{\circ}$$

$$\text{Red} = +1.60$$

$$x' = 11 \quad 12 \quad 57.18^{\circ}$$

$$\eta = -2.2828^{\circ}$$

$$\begin{array}{r}
 \log \tan \delta = 9.1569^{\circ} \\
 \log \eta = 9.2732^{\circ} \\
 \log \eta_1 = 5.4835^{\circ}
 \end{array}$$

$$\log m_0 = 0.35847^{\circ}$$

$$\log \text{const} = 7.33115^{\circ}$$

$$\log(x-D) = 3.02732^{\circ}$$

$$\delta-D = -17 \quad 44.9^{\circ}$$

$$D = +8 \quad 20 \quad 53^{\circ}$$

$$\delta_0 = +8 \quad 03 \quad 08.1^{\circ}$$

$$\text{Red} = -7.3$$

$$\delta' = +8 \quad 03 \quad 00.8^{\circ}$$

1750

Moon's Mean Position (1912.0)

18

$$X_0 = 18.4938$$

$$Y_0 = 19.6942$$

$$\begin{array}{r} 18.4938 \\ + 5 \\ \hline 18.4943 \end{array}$$

$$\begin{array}{r} 19.6942 \\ - 4 \\ \hline 19.6938 \end{array}$$

From Plate Constant, $X = 18.4322$ $Y = 19.7172$

$$z = +0.4332$$

$$\eta = -2.2828$$

$$\log z = 9.63558$$

$$\log S = 9.99570$$

$$\log \text{const} = 8.50724$$

$$\log \text{lan } S = 9.1569$$

$$z = 9.2732$$

$$\eta_1 = 5.4835$$

$$(x-A) = 1.13274$$

$$\log m_0 = 0.35847$$

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

$$A - K = 13.58$$

$$A = 11 \quad 12 \quad 42$$

$$(x-A) = 3.02732$$

$$A_0 = 11 \quad 12 \quad 55.58$$

$$S-D = -17.449$$

$$D = +8.20.53$$

$$Red = 1.60$$

$$S_0 = +8.03.08.1$$

$$x = 11 \quad 12 \quad 57.78$$

$$Red = 1.3$$

$$f' = +8.03.00.8$$

1750

Red ad E. app.

19

$$\begin{array}{rcl}
 H+Q & 4^{\circ} 29' & = 67^{\circ} 15' \\
 H & 17 & 16 \\
 Q & 11 & 13 \\
 G & 18 & 57 \\
 G+Q & 6 & 10 = 92^{\circ} 30'
 \end{array}$$

$$\begin{array}{rcl}
 \log(G+Q) & 8.6397 & m \\
 q & 0.9708 & \\
 \sin & 9.9996 & \\
 \tan & 9.1505 & \\
 \frac{1}{\sin} & 8.8239 &
 \end{array}$$

$$\begin{array}{rcl}
 g' & 9610.5 & m \\
 g & 89448 &
 \end{array}$$

$$\begin{array}{rcl}
 h & +0.34 & \\
 g & +0.09 & \\
 h & +1.17 & \\
 \hline
 & +1.60 &
 \end{array}$$

$$\delta = +8^{\circ} 03'$$

$$\begin{array}{rcl}
 \log S & 9.9957 & \\
 \sin & 0.9043 & m \\
 \cos & 0.9000 & m
 \end{array}$$

$$\begin{array}{rcl}
 \log S & 9.1462 & \\
 \log(H+Q) & 9.5874 & \\
 h & 1.2749 & \\
 \sin & 9.9648 & \\
 \sec & 0.0043 & \\
 \frac{1}{\sin} & 8.8239 &
 \end{array}$$

$$\begin{array}{rcl}
 h' & 0.0085 & \\
 h & 0.0679 &
 \end{array}$$

$$\begin{array}{rcl}
 g' & -0.41 & \\
 h' & +1.02 & \\
 i & -7.94 & \checkmark \\
 \hline
 & -7.33 &
 \end{array}$$

1750

Red. ad E. app.

19

$$\delta = +8^{\circ} 03'$$

$$\begin{array}{rcl}
 H+Q & 4^{\circ} & 29' = 67^{\circ} 15' \\
 H & 17 & 16 \\
 X & 11 & 13 \\
 G & 18 & 57 \\
 G+X & 6 & 10 = 92^{\circ} 30'
 \end{array}$$

$$\begin{array}{r}
 \log s \quad 9.9957 \\
 i \quad \underline{0.9043} \\
 i \quad 0.9000
 \end{array}$$

$$\begin{array}{r}
 \log(G+X) \quad 8.6397m \\
 q \quad 0.9708 \\
 \log \dots \quad 9.9996 \\
 \log \dots \quad 9.1505 \\
 i \quad 8.8239
 \end{array}$$

$$\begin{array}{r}
 g' \quad 9.6105 \\
 g \quad 8.9448
 \end{array}$$

$$\begin{array}{r}
 h \quad +0.34 \\
 g \quad +0.09 \\
 h \quad \underline{+1.17} \\
 \quad +1.60
 \end{array}$$

$$\begin{array}{r}
 \log s \quad 9.1462 \\
 \log(H+X) \quad 9.5874 \\
 h \quad 1.2749 \\
 \log \dots \quad 9.9648 \\
 \log \dots \quad 0.0043 \\
 i \quad 8.8239 \\
 h' \quad 0.0085 \\
 h \quad 0.0679
 \end{array}$$

$$\begin{array}{r}
 g' \quad -0.41 \\
 h' \quad +1.02 \\
 i \quad \underline{-7.94} \\
 \quad -7.33
 \end{array}$$

1750 Lunar Parallax.

$$\begin{array}{r} \alpha' = 11 \quad 12'' \quad 57.78'' \\ \delta = 8 \quad 37 \quad 15.85'' \\ - 2 \quad 3.5 \quad 41'' \\ = 38'' \quad 55' \quad 15'' \end{array}$$

$$- \quad \quad \quad 13 \quad 55''$$

$$- \quad 38 \quad 41 \quad 20''$$

$$995727$$

$$000000$$

$$010760$$

$$006487$$

$$\delta = 49^\circ 15' 50''$$

$$8 \quad 03 \quad 01''$$

$$41 \quad 12 \quad 49''$$

$$982640$$

$$823625$$

$$981880$$

$$012049$$

$$800194$$

$$\delta - \delta' = +34 \quad 31.9''$$

$$\delta = +8 \quad 37 \quad 32.7''$$

$$\text{Hant Alman } \delta = +8 \quad 37 \quad 37.3''$$

$$O-C \quad \quad \quad - 4.6''$$

$$\delta' = +8^\circ 03' 00.8'' \quad \text{W}$$

$$\pi = 59' 13.8''$$

$$986913$$

$$823625$$

$$979813$$

$$000994$$

$$790845$$

$$\alpha - \alpha' = -27 \quad 50.62''$$

$$= -1'' \quad 51.37''$$

$$\alpha = 11 \quad 11 \quad 05.81''$$

$$\alpha = 11 \quad 11 \quad 05.17''$$

$$+0.64''$$

1750 Human Parallax.

$$\begin{array}{r} \alpha' = 11 \quad 12'' \quad 57.20 \\ \omega = 8 \quad 37 \quad 15.65 \\ - 2 \quad 35 \quad 41 \\ = 38'' \quad 55' \quad 15'' \end{array}$$

$$- \quad \quad \quad 13 \quad 55$$

$$- \quad 38 \quad 41 \quad 20$$

$$995727$$

$$000000$$

$$010760$$

$$006487$$

$$\delta = 49^\circ 15' 50$$

$$8 \quad 03 \quad 01$$

$$41 \quad 12 \quad 49$$

$$982640$$

$$823625$$

$$981880$$

$$012049$$

$$800194$$

$$\delta - \delta' = +34 \quad 31.9$$

$$\delta = +8 \quad 37 \quad 32.7$$

$$\text{North Alman } \delta = +8 \quad 37 \quad 37.3$$

$$0 - \epsilon \quad \quad \quad - 4.6$$

$$\delta' = +8^\circ 03' 00''$$

$$\pi = 59' 13.8$$

$$986913$$

$$623625$$

$$979813$$

$$000494$$

$$790845$$

$$\alpha - \alpha' = -27 \quad 50.62$$

$$= -1 \quad 51.37$$

$$\alpha = 11 \quad 11 \quad 05.81$$

$$\alpha = 11 \quad 11 \quad 05.17$$

$$+0.64$$

MC1751.

Star: *Measures*

1913 Oct. W 21

	d	N	d	N
1	16458	19652	17340	14252
112	11944	14190	9520	12025
145	43	8683	1927	2230
	70	56	20	53
	<u>24.4522</u>	<u>4532</u>	<u>11.2204</u>	<u>2226</u>
2	12915	19985	16048	19186
262	4825	18080	8478	16730
328	31	8078	82	29
	30	95	50	90
	<u>32.8102</u>	<u>5092</u>	<u>26.2431</u>	<u>2455</u>
3	18852	17206	19032	18592
487	10410	15648	16449	11157
129	42	4845	4040	6160
	59	06	25	99
	<u>19.8444</u>	<u>8441</u>	<u>28.7413</u>	<u>7438</u>

Grade 2.

11
29
3
2
2
3
28
12

MC1751

Star measures

1913 Oct. 25 21

	d	N	d	N
1	16458	19652	17310	14252
112	11944	14190	9520	12025
245	43	8683	1977	2230
	70	56	20	53
	<u>244522</u>	<u>4532</u>	<u>117204</u>	<u>2226</u>
2	12915	19985	16048	19186
262	4825	18080	8478	16730
328	31	8078	82	29
	30	95	50	90
	<u>328102</u>	<u>1092</u>	<u>262431</u>	<u>2455</u>
3	18852	17206	19032	18592
287	10410	15648	16449	11157
129	12	4845	4340	61
	59	06	25	99
	<u>128444</u>	<u>8441</u>	<u>287413</u>	<u>7438</u>

Grade 2.

17.57

Moon - Measures

22

1	17.0	17832	15459
	16.6	1160090	1171022
		00	25
		38	80
		<u>18.6239</u>	<u>.6252</u>

7

16.7

19.0

18535	16350
1594844	893925
50	31
28	70
<u>16.7413</u>	<u>7433</u>

8

16.6

20.0

min

2

20

18466	16438
1340200	1147080
99	70
70	42
<u>16.4932</u>	<u>4967</u>

4

16.8

21.0

17481	15520
1494138	797765
34	75
20	12
<u>16.7525</u>	<u>7542</u>

5

17.0 15430

19388

21.3 1180515

1302020

15

21

38

86

21.3619.3633

6

18.0 11320

13680

220+ 112451

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1751

Moon - Micrometers

22

1	17.0	17832	15459
	18.6	1160090	1171022
		0090	25-22
		38	80
		<u>18.6239</u>	<u>.6252</u>

2

16.7

19.0

18535
1594844
50
28
<u>16.7413</u>

16350
893925
31
70
<u>7433</u>

3

16.6

20.0

mm

m

m

18466
1340200
99
70
<u>16.4932</u>

16438
1147080
70
42
<u>4967</u>

4

16.8

21.0

17481
1494138
34
20
<u>16.7525</u>

15520
797765
75
12
<u>7542</u>

5

17.0

21.3

mm

m

m

m

m

m

m

m

m

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m

m

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m

m

m

m

m

m

15430	19388
1180515	1302020
15	21
33	86
<u>21.3619</u>	<u>3633</u>

180	11320	13680
220	11245	7075
	3041	13572
	<u>220081</u>	<u>0103</u>

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175-1

Moon-measures

23

10264

1360809

929800

00

99

12630

22.0967.0970

Scratch

935848

11680

14660

17480

40

1108085-

865953

1352030

8735-

80

6253

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60

00

21.9388.940219.3998.3965

1751

Moon-measures

23

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
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 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
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 $\frac{10264}{929800}$
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$\frac{1}{18.1}$
 $\frac{22.1}{18.1}$
 $\frac{10264}{929800}$
 $\frac{99}{12630}$

1751 Times etc.

Right ascension 1912 Mar 30	8 ^h 46 ^m	-8 ^h 58 ^m ✓
- Moon	8 52 28.9	-8 52 29.2 ✓
Clock slow	1 44.8	
H. Sid T.	8 54 13.85	✓
Thong	4 44 31.05	✓
G. Sid T.	13 38 44.90	✓
Sid T. in moon	0 30 01.00	✓
Interval	13 08 43.90	✓
Reduction	2 09.21	✓
G. M. T.	13 06 34.69	0 - 8 = - 2 ^h 17 ^m 27 ^s ✓

From Transit. Alman.	R. A.	Decl.
Moon 13 ^h	11 ^h 11 ^m 27.24	+ 80° 34' 49.2" ✓
Motion in 1 ^m = 2.1336		16.259 ✓
" = 6.5782	+ 14.04	- 1 47.0 ✓
Tabular place	11 11 41.28	+ 8 33 02.2 ✓

Moon's age 12 days.

Parallax	59 13.6	✓
Secularian	16 09.8	✓
934 = 11.1 ✓	R = 969.8	✓
970 = 12.0	Augmentation + 12.0	✓
	Irradiation (2) - 0.5	✓
	R = 981.3	✓
	R = 2.1035	✓
a = -0.3	(1+a) R = 2.1034	✓
	R ² = 4.4243	✓

1751 Taurus etc

Extinction 1912 Mar 30	8 ^m 46 ^m	- 8 ^m 58 ^m
Woon	8 52	28.9 - 8 52 29.2
Clock slow	1	44.8
H. Ind. T.	8 ^m 54 ^m	13.85
H. long	4 44	31.05
G. Ind. T.	13 38	44.90
Sid. T. in Woon	0 30	01.00
Horizontal	13 08	43.90
Reduction	2	09.21
G. T. T.	13 06	34.69 0 - 8 - - 2 ^m 17 ^m 27 ^s

from Kent. Alms	R. A.	Decl.
Woon 13 ^m	11 ^m 11 ^m 27.24	+ 8 ^m 34' 49.2
Woon 13 ^m = 2.1336		16 25.9
6.5782	+ 14.04	- 1 47.0
Tabular place	11 11 41.28	+ 8 33 02.2

Woon age 12 days.

	parallax	
	secidiam	16' 09.8
930 = 11.1	R =	969.8
970 = 12.0	Augmentation	+ 12.0
	Irradiation (2)	- 0.5
	R =	981.3
	R =	2.1035
G = -0.3	(1+a) R =	2.1034
	R ² =	44243

1751

Rate Constant

W

	1	2	3
x	11.2215	26.2443	28.7426
3	11.8149	26.7175	29.5040
x-3	-5934	-4732	-7614

4	24.4527 [✓]	32.8097 [✓]	12.8442 [✓]
7	23.5094 [✓]	32.0734 [✓]	12.1475 [✓]
4-7	+9433	+7363	+6967

x-3	-14434	+0.32	+9460
-5934	-3529	-9463+	3:: -9460 = 0
-4732	-4736	-9468+	8:: -9460 = 0
-7614	-1854	-9468+	9:: -9459 = +1
18.5980 [✓]	-2886 [✓]	+6 [✓]	= 19.2560

4-7	+139.1 [✓]	-2.44	-1.0935
+9433	+1561	+1.0994	-59:: +1.0935 = 0
+7363	+3651	+1.1014	-79:: +1.0935 = 0
+6967	+3998	+1.0965	-31:: +1.0934 = -1
19.9940 [✓]	+2587 [✓]	-45 [✓]	= 19.1544

Tables a:	-0.9	a = -1.7	a - a = +1.3	b + a = +2.9
Obs a =	-0.3	+2.4	-2.7	+5.2
c - 0 -	0.1	-4.1	+4.0	-2.3

1751

Relative constant

25

	1	2	3
2	11.2215	26.2443	28.7426
3	11.8149	26.7175	29.5040
$\lambda - 3$	-5934	-4732	-7614
4	24.4527	32.8097	12.8442
η	23.5094	32.0734	12.1475
$4 - \eta$	+9433	+7363	+6967

$$\begin{array}{rcll}
 \lambda - 3 & -14434 & +0.32 & +9460 \\
 -5934 - 3529 & = -9463 & + 3 & = -9460 = 0 \\
 -4732 - 4736 & = -9468 & + 8 & = -9460 = 0 \\
 -7614 - 1854 & = -9468 & + 9 & = -9459 = +1 \\
 18.5980 - 2886 & & + 6 & = 19.2560
 \end{array}$$

$$\begin{array}{rcll}
 4 - \eta & +139.12 & -2.44 & -1.0935 \\
 +9433 + 1561 & = +10994 & - 59 & = +1.0935 = 0 \\
 +7363 + 3651 & = +11014 & - 79 & = +1.0935 = 0 \\
 +6967 + 3998 & = +10965 & - 31 & = +1.0934 = -1 \\
 19.9940 + 2587 & & - 48 & = 19.1544
 \end{array}$$

$$\begin{array}{rcll}
 \text{Tables } a & -0.9 & v & -1.7 & a - v & +1.3 & b + a & +2.9 \\
 \text{Obs } a & -0.3 & & +2.4 & & -2.7 & & +5.2 \\
 c - 0 & -0.1 & & -4.1 & & +4.0 & & -2.3
 \end{array}$$

kt.	pos. L	resid
1	229.3	+36
2	241.8	+63
3	270.0	-17
4	298.5	-83
5	310.7	+41
6	343.5	-39
7	0.0	-15
8	22.4	+11

1751

Moon's Center:

26

	x	$y - x_0$	Δx	$(x - x_0)^2$	$(y - x_0)^2 (y - y_0)^2$	$\sigma - c$	
1	17.0000	-1.5982	+	4	2.5530	4.4275	+32
2	16.7423	-1.8559	+	3	3.4432	4.4306	+63
3	16.4950	-2.1032	-	0	4.4234	4.4234	-9
4	16.7534	-1.8448	-	3	3.4044	4.4174	-69
5	17.0000	-1.5982	-	4	2.5555	4.4300	+57
6	18.0000	-0.5982	-	6	0.3586	4.4221	-22
7	18.5982	0.0000	-	6	0.0000	4.4243	0
8	19.3982	+0.8000	-	5	0.6392	4.4265	+22

$$\text{Coeff } K^2 = 4.4243$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	18.6246	-1.3690	-	1	1.8745
2	19.0000	-0.9936	-	1	0.9874
3	20.0000	+0.0064	0	0	0.0000
4	21.0000	+1.0064	+	1	1.0130
5	21.3626	+1.3690	+	1	1.8745
6	22.0092	+2.0056	+	2	4.0635
7	22.0968	+2.1032	+	2	4.4243
8	21.9395	+1.9459	+	2	3.7873

Approximate Center

$$x = 17.0 \quad y = 18.6246$$

$$21.3626$$

$$39.9872$$

$$\text{mean } y = 19.9936$$

$$y - \text{max} = 22.0968$$

$$R = 2.1032$$

$$y - \text{min} = 16.4950$$

$$x_0 = 18.5982$$

$$\text{Center } \begin{cases} x_0 = 18.5982 \\ y_0 = 19.9936 \end{cases}$$

1751

Known Center

26

	x	$y - y_0$		Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - L$
1	17.0000	-1.5982	+	4	2.5530	4.4275	+ 32
2	16.7423	-1.8559	+	3	3.4432	4.4306	+ 63
3	16.4950	-2.1032	-	0	4.4234	4.4234	- 9
4	16.7534	-1.8448	-	3	3.4044	4.4174	- 69
5	17.0000	-1.5982	-	4	2.5555	4.4300	+ 57
6	18.0000	-0.1982	-	6	0.3586	4.4221	- 22
7	18.5982	0.0000	-	6	0.0000	4.4243	0
8	19.3982	+0.8000	-	5	0.6392	4.4265	+ 22

Comp K^2 : 4.4243

	y	$y - Y_0$	Δy	$(y - Y_0)^2$	
1	18.6246	-1.3690	-	1	1.8745
2	19.0000	-0.9936	-	1	0.9874
3	20.0000	+0.0064	0	0	0.0000
4	21.0000	+1.0064	+	1	1.0130
5	21.3626	-1.3690	+	1	1.8745
6	22.0092	-2.0956	+	2	4.0635
7	22.0968	-2.1032	+	2	4.4243
8	21.9395	-1.9459	+	2	3.7873

Approximate Center

$$x = 17.04 = 18.6246$$

$$21.3626$$

$$34.9872$$

$$\text{mean } y = 19.9936$$

$$y - \text{max} = 22.0968$$

$$R = 2.1032$$

$$y - \text{min} = 16.4950$$

$$x_0 = 18.5982$$

$$\text{Center } \begin{cases} x_0 = 18.5982 \\ y_0 = 19.9936 \end{cases}$$

1751

Moon's Center.

27

Constitutional Equations

	a	b	c	d	e	f
1	-1.60	-1.37	+32	+6	-10	-4
2	-1.86	-0.99	+63	+7	-7	0
3	-2.10	+0.01	-9	+8	0	+8
4	-1.84	+1.08	-69	+7	-7	+14
5	-1.60	+1.37	+57	+6	+10	+16
6	-0.60	+2.02	-22	+2	-7	+15
7	+0.00	+2.10	0	-0	-7	+15
8	+0.80	+1.95	+22	-3	+14	+11

Average = 38

Mean Equations

$$-7.40 - 1.34 = +17$$

$$-1.40 + 7.44 = +59$$

$$+1.40 + 0.25 = -3$$

$$+7.69 = +56$$

$$b = +7.3$$

$$-7.40 = +17 + 10 = +27$$

$$a = -3.7$$

1751

Muir's Constant

Conditional Equations

27

	a	b	c	d	e	f	g
1	-1.60	-1.37	+32	+6	-10	-4	+36
2	-1.86	-0.49	+63	+7	-7	0	+63
3	-2.10	+0.01	-9	+8	0	+4	-17
4	-1.84	+1.04	-69	+7	-7	+14	-83
5	-1.60	+1.37	+57	+6	+10	+16	+41
6	-0.60	+2.02	-22	+2	-7	+5	+39
7	+0.00	+2.10	0	-0	+15	+15	-15
8	+0.80	+1.95	+22	-3	+14	+11	+11

Average = 38

Mean Equations

$$-7.40 - 1.34 = +17$$

$$-1.40 + 7.44 = +59$$

$$+1.40 + 0.25 = 3$$

$$+7.69 = +56$$

$$b = +7.3$$

$$-7.40 = +17 + 10 = +27$$

$$a = -3.7$$

Red. ad l. ahh

$$\begin{array}{rcl}
 H + \alpha & 4 & 29 = 67^{\circ} 15' \\
 H & 17 & 16 \\
 \alpha & 11 & 13 \\
 G & 18 & 57 \\
 G + \alpha & 6 & 10 = 92^{\circ} 30'
 \end{array}$$

$$\begin{array}{rcl}
 l \cos (G + \alpha) & 86397 & m \\
 \eta & 09708 & \\
 \sin & 99996 & \\
 \tan S & 91469 & \\
 \frac{1}{15} & 88239 &
 \end{array}$$

$$\begin{array}{rcl}
 g' & 96105 & m \\
 g & 89412 &
 \end{array}$$

$$\begin{array}{rcl}
 h & +0.34 & \\
 g & +0.09 & \\
 h & +1.17 & \\
 \hline
 & -160 &
 \end{array}$$

$$S_0 = +759$$

$$\begin{array}{rcl}
 h \cos S & 99958 & \\
 l & 09042 & m \\
 \hline
 l & 09000 & m \\
 l \sin S & 91427 & \\
 l \cos (H + \alpha) & 95874 & \\
 h & 12749 & \\
 \sin & 99648 & \\
 \sec S & 00042 & \\
 \frac{1}{15} & 88239 &
 \end{array}$$

$$\begin{array}{rcl}
 h' & 00050 & \\
 h & 00678 &
 \end{array}$$

$$\begin{array}{rcl}
 g' & -0.41 & \\
 h' & +1.01 & \\
 l & -7.94 & \\
 \hline
 & -7.34 &
 \end{array}$$

1751 Moon's Mean Position (1912.0)

28

$$\begin{array}{r}
 X = 18.5982 \quad Y = 19.9936 \\
 \hline
 \text{cor} = -2 \quad \text{cor} = +4 \\
 \hline
 18.5980 \quad 19.9940
 \end{array}$$

Journ Plate Constants $X = 19.2560$ $Y = 19.1544$

$$\begin{array}{r}
 Z = +1.2560 \\
 \log = 0.09899 \\
 \text{cor} = 9.99577 \\
 \text{cor} = 8.50724 \\
 \text{---}(X-A) = 1.59598
 \end{array}$$

$$d-A = +39.44$$

$$A = 11 \quad 12 \quad 42$$

$$A_0 = 11 \quad 13 \quad 21.44$$

$$\text{Rea} = +1.60$$

$$\alpha' = 11 \quad 13 \quad 23.04$$

$$\eta = -28456$$

$$\begin{array}{r}
 \log \tan \delta = 9.1478 \\
 \text{cor} = 0.1980 \\
 \eta_1 = 6.3492 \\
 \eta_1 = +3
 \end{array}$$

$$\eta_0 = -2.8459$$

$$\begin{array}{r}
 \log \eta_0 = 0.45422 \\
 \text{cor} = 7.33115
 \end{array}$$

$$(d-D) = 3.12307$$

$$\delta - D = -22 \quad 07.6$$

$$D = +8 \quad 20 \quad 53$$

$$\delta = +7^\circ 58' 45.4''$$

$$\text{Rea} = -7.3$$

$$\delta = +7 \quad 58 \quad 38.1$$

1751 Moon's Mean Position (1912.0)

28

$$\begin{array}{r}
 X = 18.5982 \\
 \hline
 18.5980
 \end{array}
 \qquad
 \begin{array}{r}
 Y = 19.9936 \\
 \hline
 19.9940
 \end{array}$$

from Plate Constants $X = 19.2560$ $Y = 19.1544$

$$\begin{array}{r}
 z = +1.2560 \\
 \log = 0.09899 \\
 \cos = 9.99577 \\
 \sin = 8.50724 \\
 (X-A) = 1.59598
 \end{array}$$

$$d-A = + 39.44$$

$$A = 11 \quad 12 \quad 42$$

$$A_0 = 11 \quad 13 \quad 21.44$$

$$Red = + 1.60$$

$$\alpha' = 11 \quad 13 \quad 23.04$$

$$\gamma = -2.8456$$

$$\begin{array}{r}
 \log \tan \delta = 9.1478 \\
 \tan \delta = 0.1980 \\
 \eta_1 = 6.3992 \\
 \eta_2 = + 3
 \end{array}$$

$$\gamma_0 = -2.8459$$

$$\begin{array}{r}
 \log \eta_0 = 0.45422 \\
 \cos \eta_0 = 7.33115
 \end{array}$$

$$(d-D) = 3.12307$$

$$S-D = - 22 \quad 07.6$$

$$D = + 8 \quad 20 \quad 53$$

$$\delta = + 7^\circ 58' 45.4''$$

$$Red = - 7.3$$

$$S = + 7 \quad 58 \quad 38.1$$

1751

Lunar Parallax

$$\begin{array}{r}
 \alpha' = 11^h 13^m 23.504^s \\
 \delta = 8^{\circ} 54' 13.85'' \\
 \delta - \alpha = -2^{\circ} 19' 09'' \\
 \quad \quad - 34^{\circ} 47' 15''
 \end{array}$$

$$- 13^{\circ} 38''$$

$$- 34^{\circ} 34' 37''$$

$$\begin{array}{r}
 995727 \\
 0.00000 \\
 0.08441 \\
 \hline
 004168
 \end{array}$$

$$\gamma = 47^{\circ} 44' 42''$$

$$7^{\circ} 58' 38''$$

$$39^{\circ} 46' 04''$$

$$\begin{array}{r}
 9.82640 \\
 8.23622 \\
 9.80596 \\
 0.13068 \\
 \hline
 7.99926
 \end{array}$$

$$\delta - \delta' = +34^{\circ} 19.2''$$

$$S = +8^{\circ} 32' 57.3''$$

$$\text{Hant Alm } S = +8^{\circ} 33' 0.22''$$

$$O - C = -4.9''$$

$$\delta' = +7^{\circ} 58' 38.1''$$

$$T_1 = 59' 13.6''$$

$$\begin{array}{r}
 9.86913 \\
 8.23622 \\
 9.75628 \\
 0.00485 \\
 \hline
 7.86648
 \end{array}$$

$$\alpha - \alpha' = -25' 16.72''$$

$$= -1^m 41.11''$$

$$\alpha = 11^h 11^m 41.93^s$$

$$\alpha = 11^h 11^m 41.28^s$$

$$+0.65''$$

1751

Human Parallax

$$X = 11 \quad 13 \quad 23.04$$

$$G = 8 \quad 54 \quad 13.85$$

$$G-X = -2 \quad 19 \quad 09$$

$$-34 \quad 47 \quad 15$$

$$- \quad 12 \quad 38$$

$$-34 \quad 34 \quad 37$$

$$995727$$

$$000000$$

$$0.08442$$

$$0.04168$$

$$y = 47 \quad 44 \quad 42$$

$$7 \quad 58 \quad 38$$

$$39 \quad 46 \quad 44$$

$$982640$$

$$823622$$

$$980596$$

$$0.13088$$

$$799926$$

$$S-S = +34 \quad 19.2$$

$$S = +8 \quad 32 \quad 57.3$$

$$\text{Hant Allen } S = +8 \quad 33 \quad 0.22$$

$$O-C = -4.9$$

$$S' = +7 \quad 58 \quad 38.1$$

$$T_1 = 59 \quad 13.6$$

$$986913$$

$$823622$$

$$975628$$

$$000485$$

$$786648$$

$$X-X' = -25 \quad 16.72$$

$$= -1 \quad 41.1$$

$$X = 11 \quad 11 \quad 41.93$$

$$X = 11 \quad 11 \quad 41.28$$

$$+0.65$$

