

KG

11366

n.940

Volume LXIV



2992

2994

3008

Harvard Lunar Plates.

Measures and Reductions.

Mary Fowler.

Volume LXIII.

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1
8
12

3
10
27

3
3
2

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Stars - Measures

1914 Mar. 5

1

	α	δ	α	δ	α	δ	α	δ
	1 4 6 9 5	9 4 6 4	1 9 4 4 7	1 4 3 1 8				
$\frac{1}{8.3}$	0 0 9 6	9 2 7 7 2 9	1 1 4 9 0 8 2	1 2 2 7 9				
12.9	1 4 4 5 4	2 3	8 1 8 0	8 0 7 6				
			5 1	2 0				
	<u>1 2.9 7 5 7</u>	<u>.9 7 6 2</u>	<u>8.2 0 3 3</u>	<u>.2 0 4 0</u>				
$\frac{2}{10.0}$	1 6 8 7 1	1 9 8 0 9	1 3 7 8 0	1 3 2 3 0				
27.5	1 2 4 0 0	1 4 2 8 9 9 0	1 3 7 0 3	3 1 2 6				
	0 1 0 0	9 0	0 0 9 7	1 3 1 4 6				
	8 3	1 4						
	<u>2 7.4 4 7 6</u>	<u>.4 4 7 8</u>	<u>9.9 9 2 0</u>	<u>.9 9 1 7</u>				
$\frac{3}{30.0}$	1 6 7 4 5	1 8 2 3 0	1 0 3 0 0	1 4 1 2 3				
23.3	1 4 5 2 9	1 0 4 5 9 6 3	9 8 9 9	1 3 6 6 5				
	3 1 3 0	7 1	9 8 4 1	6 1 6 4				
	4 8	4 0						
	<u>2 3.2 2 1 6</u>	<u>.2 2 2 6</u>	<u>3 0.0 4 5 8</u>	<u>.0 4 6 0</u>				

Grade 3 or 4

2992

Stars: measures

1914 Mar. 5

1

	α	δ	α	δ	α	δ	α	δ
	1 4 6 9 5	9 4 6 4	1 9 4 4 7	1 4 3 1 8				
$\frac{1}{8.3}$	0 0 9 6	9 2 2 7 2 9	1 1 4 9 0 8 2	1 2 2 7 9				
129	1 4 4 5 4	2 3	8 1 5 0	8 0 7 6				
			5 1	2 0				
	<u>1 2 9 7 5 7</u>	<u>9 7 6 2</u>	<u>8 2 0 3 3</u>	<u>2 0 4 0</u>				
$\frac{2}{100}$	1 6 8 7 1	1 9 8 0 9	1 3 7 8 0	1 3 2 3 0				
275	1 2 4 0 0	1 4 2 8 9 9 0	1 3 7 0 3 9 7	3 1 2 6				
	0 1 0 0	9 0	0 0 9 7	1 3 1 4 6				
	8 3	1 4						
	<u>2 7 4 4 7 6</u>	<u>4 4 7 8</u>	<u>9 9 9 2 0</u>	<u>9 9 1 7</u>				
$\frac{3}{200}$	1 6 7 4 5	1 8 2 3 0	1 0 3 0 0 9 9	1 4 1 2 3				
233	1 4 5 2 9	1 0 4 5 9 6 3	9 8	1 3 6 6 5 6 4				
	3 1 3 0	7 1	9 8 4 1	6 1 6 4				
	4 8	4 0						
	<u>2 3 2 2 1 6</u>	<u>2 2 2 6</u>	<u>3 0 0 4 5 8</u>	<u>0 4 6 0</u>				

Grade 3 or 4.

2992

Moon-measures

2

1 scratch.

18.5 15778

16.5 10414

10

86

16.5367

14361

972926

21

73

.5358

16733

11375

7880

22

18.4650

14608

996962

6962

18

.4646

3 15320

18.0 799002

16.7 02

29

16.7329

14336

1166952

59

49

.7321

3

17.6

17.0

14640

11064

5971

29

17.6429

16141

9749

3040

50

.6407

4

17.1

18.0

1009194

8894

9830

17.0261

11400

1114088

3088

.0264

5

16.9

18.5

min

26

8791

8265

7171

16.9498

12939

3036

12439

.9502

6

17.0

19.0

8790

8748

5345

16.9959

12490

8989

12456

.9967

2992

Lyon - Measures

2

d

4

N

d⁷⁵

N

1/ scratch.

18.5 15778

16.5 10414₂₁

10

86

16.53.67

14361

9729₂₆

21

73

5358

16733

11375

78⁵⁰

22

18.4650

14608

9969₆₂

69

18

.46462 15320150 7990₀₂

167 02

29

16.7329

14336

11669₅₂

59

49

73213

176

17.0

14640

11064

59⁷¹

29

17.6429

16141

9749₄₀

30

50

.64074

17.1

18.0

1009194

88⁹⁴

9830

17.0261

11400

11140₃₈30³⁸.02645

169

18.5

min

26

26

8791

8265⁷¹

71

16.9498

12939

30₃₆

12439

.95026

17.0

19.0

8790

8745⁴⁵53⁴⁵16.9959

12490

89⁸⁹

12456

.9967

2992

d

y

moon-measures

N

d

m

w

w

$$\begin{array}{r} 7 \\ 175 \\ \hline 25.0 \end{array}$$

$$\begin{array}{r} 13762 \\ 884948 \\ 48 \\ 64 \\ \hline 17.5085 \end{array}$$

$$\begin{array}{r} 18020 \\ 1290609 \\ 09 \\ 28 \\ \hline .5116 \end{array}$$

$$\begin{array}{r} 8 \\ 180 \\ \hline 20.5 \end{array}$$

$$\begin{array}{r} 20081 \\ 1606970 \\ 70 \\ 87 \\ \hline 20.4013 \end{array}$$

$$\begin{array}{r} 18730 \\ 1272722 \\ 22 \\ 39 \\ \hline .3989 \end{array}$$

$$\begin{array}{r} 9 \\ 190 \\ \hline 20.6 \end{array}$$

$$\begin{array}{r} 19039 \\ 1217067 \\ 64 \\ 49 \\ \hline 20.6879 \end{array}$$

$$\begin{array}{r} 19781 \\ 1664950 \\ 60 \\ 83 \\ \hline .6871 \end{array}$$

2992

d

4

known-measures

N

d

72

N

64

$$\begin{array}{r} 2 \\ 175 \\ \hline 20.0 \end{array}$$

$$\begin{array}{r} 13762 \\ 884948 \\ 48 \\ 64 \\ \hline 17.5085 \end{array}$$

$$\begin{array}{r} 18020 \\ 1290609 \\ 09 \\ 28 \\ \hline .5116 \end{array}$$

$$\begin{array}{r} 8 \\ 180 \\ \hline 20.0 \\ 20081 \\ 1606970 \\ 70 \\ 87 \\ \hline 204013 \end{array}$$

$$\begin{array}{r} 18730 \\ 1272722 \\ 22 \\ 39 \\ \hline 3989 \end{array}$$

$$\begin{array}{r} 9 \\ 19.0 \\ 20.6 \\ \hline 19039 \\ 1217067 \\ 64 \\ 49 \\ \hline 20.6879 \end{array}$$

$$\begin{array}{r} 19781 \\ 1664950 \\ 60 \\ 83 \\ \hline .6871 \end{array}$$

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Times etc.

4

Extraneous 1913 Mar. 17, 10^h 51^m - 11^h 03^m
 " Moon 10 57 04.0 - 10 57 04.4
 clock fast 0 58.3

H Sid T. 10 56 05.9 $\theta - \alpha = +2^{\circ} 57'$
 H long 4 44 31.05
 G Sid T. 15 40 36.95
 Sid T. w. Moon 23 37 48.85
 Interval 16 02 48.10
 Reduction 2 37.73
 G. in T. 16 00 10.37

From Kant. Alman R. A. Decl.
 Moon 16^h 7^m 59^s 05.50 + 25[°] 35' 00.2
 Motion in 25807^s 8.417
 " 0.173 + 0.45 - 1.5
 Tabular place 7 59 05.95 + 25 34 58.7

Moon's age 10 days.
 " parallax 59' 40.90
 " semidiam 16 17.2
 R 977.2
 Augmentation + 13.25
 Irradiation (3) or (4) - 0.75
 R 989.7
 R 2.1215
 (1 + α)/R 2.1214
 R² 4.5003

934 = 12.1
 977 = 13.25

$\alpha = 0.6$

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Transits

Sept. 1913 Mar 17, 10^h 51^m - 11^h 03^m
 Moon 10 57 04.0 - 10 57 04.4
 clock fast 0 58.3

H. heli. 10 56 05.9 $\theta - x = +2^{\circ} 57'$
 H. long 4 44 31.05
 G. heli. 15 40 36.95
 S. T. in Moon 23 37 48.85
 Interval 16 02 48.10
 Radiation 2 37.73
 G. in T. 16 00 10.37

Frankfort, Ohio R. A. Meas.
 Moon 16^h 7^m 59^s 0.550 + 25^s 35' 00.2
 Motion 2.5807 8.417
 0.173 + 0.44 - 1.5
 Tabular race 7 59 05.44 + 25^s 34 58.7

lunar age 10 days
 " parallax 59' 40" 90
 " semidiam 16 17.2
 934 = 12.1 R 977.2
 977 = 13.25 Augmentation + 13.25
 Irradiation (3) + (4) - 0.75
 R 989.7
 R 2121.5
 (17) a/R 2121.4
 R² 4500.3
 a = 0.6

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Plate constants

	²	³	⁴	R.9	Recd.
8.2236	129760	75047	+242730		
99918	274477	75130	262012		
30.0459	232221	80305	254822		
3 4806	16365	2210482	1759564		
1602	2122	75507	+253201		
-18	-22	+101	+604		
198	078	75608	+253805		
31	466 $\frac{1}{2}$				
613	364"	A = 7 ^h 56 ^m 08 ^s	D = +25° 38' 05"		

$$\begin{array}{rclcl}
 2-3 & = 85.64 & +.62 & +2302 \\
 -1195 & -1112 & = -2307 & +5 = -2302 & = 0 \\
 +43 & -2352 & = -2309 & +6 = -2303 & = -1 \\
 -330 & -1990 & = -2320 & +18 = -2302 & = 0 \\
 119.0715 & -1589 & +11 & = 191439 & \checkmark
 \end{array}$$

$$\begin{array}{rclcl}
 4-4 & +86.24 & -.94 & -778 \\
 +84 & +707 & = +791 & -12 = +779 & = +1 \\
 -58 & +861 & = +803 & -25 = +778 & = 0 \\
 -1791 & +2590 & = +799 & -21 = +778 & = 0 \\
 185667 & +1644 & -17 & = 186516 & \checkmark
 \end{array}$$

Tables $a = -0.6$ $e = -0.1$ $a - e = -0.5$ $b + a = -1.5$
 Obs. $a = -0.6$ $e = +0.9$ $a - e = -1.5$ $b + a = -0.6$

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Plate constants

K 9

Need

8 0 2 3 6	1 2 9 7 6 0	7 5 0 4 7	+ 2 4 2 7 3 0
9 9 9 1 8	2 7 4 4 7 7	7 5 1 3 0	2 6 2 0 1 2
3 0 0 4 5 9	2 3 2 2 2 1	8 0 3 0 5	2 5 4 8 2 2
3 4 8 0 6	1 6 3 6 5	1 2 2 1 0 4 8 2	1 7 5 9 5 6 4
1 6 0 2	2 1 2 2	7 5 5 0 7	+ 2 5 3 2 0 1
1 5	2 2	+ 1 0 1	+ 6 0 4
1 9 8	0 7 8	7 5 6 0 8	+ 2 5 3 8 0 5
3 1	4 6 6		
6 1 3	3 6 4	A = 7° 56' 08"	D = +25° 38' 05"

2-3	- 8 5 6 4	+ 6 2	+ 2 3 0 2
- 1 1 9 5	- 1 1 4 2	- 2 3 0 2	= 0
+ 4 3	- 2 3 5 2	- 2 3 0 9	= - 1
- 3 3 0	- 1 9 9 0	+ 1 8	= 0
1 1 9 0 7 1 5	- 1 5 8 9	+ 1 1	= 1 9 1 4 3 9

4-4	+ 8 6 2 4	- 9 4	- 7 7 8
+ 8 4	+ 7 0 7	+ 7 9 1 - 1 2	= + 1
- 5 8	+ 8 6 1	+ 7 8 0 3 - 2 5	= 0
- 1 7 9 1	+ 2 5 9 0	+ 7 9 9 - 2 1	= 0
1 8 5 6 4 7	+ 1 6 4 4	- 1 7	= 1 8 6 5 1 6

Tables $a = -0.6$ $e = -0.1$ $a - e = -0.5$ $b + a = -1.9$
 Obs $a = -0.6$ $e = +0.9$ $a - e = -1.5$ $b + a = -0.6$

2992 Standard Coordinates

6

Capella 1108 mag 8.8 Capella 1111 mag 8.2

Capella 1138 mag 8.1

C	7 ^h	49 ^m	50 ^s .54	7 ^h	50 ^m	42 ^s .45	8 ^h	02 ^m	18 ^s .00
L						47			04
E						39			17.95
mean				7	50	42.44	8	02	18.00
Proc			46.95			47.56			47.17
α	7	50	37.49	7	51	30.00	8	03	05.17
A	7	56	08	7	56	08	7	56	08
$\alpha - A$		-5	30.51		-4	38.00		+6	57.17
$\sin(\alpha - A)$			-33048			-279.99			+417.11
log			2.51914			2.44402			2.62025
WGS			9.9591.7			9.95241			9.95438
β_0			098555			090367			108187
β_0			-9.6728			-8.0107			+12.0744
β_1			41			18			45
β			8.3231			9.9875			30.0789
β			8.2036			9.9918			30.0459
$\beta - \beta_0$			-1195			+43			-330

C	+24°	29'	30".2	+26°	22'	13".3	+25°	50'	34".8
L						13.8			33.9
E						13.6			34.4
mean				+26	22	13.6	+25	50	34.4
Proc			2 00.6			2 01.4			2 12.9
δ	+24	27	29.6	+26	20	12.2	+25	48	21.5
D	+25	38	05	+25	38	05	+25	38	05
$\delta - D$	-1	10	35.4		+42	07.2		+10	16.5
$\tan(\delta - D)$			-4236.0			+2527.3			+616.5
log			3.62696			3.40266			2.78993
η_0			095811			073381			012108
TanS			9.6579			9.6946			9.6844
η^2			19714			18073			21637
η_1			86824			85353			89015
η_0			-9.0805			+5.4176			+1.3215
η_1			+481			+359			+797
η			129676			27.4535			23.4012
η			129760			27.4477			23.2221
$\eta - \eta_0$			+84			-58			-1791

Standard Coordinates											
2992				Capeh 1118 m 988				Capeh 1118 m 981			
C	7°	49'	50.54"	7°	50'	42.45"		8°	02'	18.00"	
L						47				04	
E						39				17.95	
mean				7	50	42.44		8	02	18.00	
Proc			46.95			47.56				47.17	
A	7	50	47.49	7	51	30.00		8	03	05.17	
A	7	56	08	7	56	08		7	56	08	
A-A		-5	30.51		-4	38.00			+6	57.17	
tan(A-A)			-33.098			-279.99				+417.11	
log		2	50.974		2	44.402			2	62.025	
log		9	95.917		9	95.241			9	95.438	
log		0	98.855		0	90.367			1	08.187	
log		-9	67.28		-8	01.97			+1	2.0744	
log		-	49		-	78			+1	45	
log		8	32.34		9	98.75			3	0.0789	
log		8	20.36		9	99.18			3	0.0459	
log		-1	19.5		+1	43			-3	30	
C	+24°	29'	30.2"	+26°	22'	13.3"		+25°	50'	34.8"	
L						13.8				33.9	
E						13.6				34.9	
mean				+26	22	13.6		+25	50	34.4	
Proc		-2	00.6		-2	01.4			-2	12.9	
S	+24	27	29.6	+26	20	12.2		+25	48	21.5	
D	+25	38	05	+25	38	05		+25	38	05	
S-D	-1	10	35.4		+42	07.2			+10	16.5	
tan(S-D)			-4.2360			+25.27.3				+6.165	
log		3	62.696		3	40.266			2	78.993	
log		0	95.811		0	73.381			0	12.108	
Tan S		9	65.79		9	69.46			9	68.44	
log		1	97.14		1	80.73			2	16.37	
log		8	68.24		8	55.53			8	90.15	
log		-9	08.05		+5	41.76			+1	32.15	
log		+4	83		+3	54			+7	97	
log		1	29.676		2	74.535			2	34.012	
log		1	29.760		2	74.477			2	32.221	
log		+1	84		-5	8			-1	7.1	

	μ	$\mu - c$	$\lambda_{\text{new}}(\mu - c)$	$(3C/2)(\mu - c)$	λ	corr.	Haym	ω	$\omega - c$
	196.6	185.7	+0.5	+6.1	-5.3	-1.2	-110	-90	+20
	210.4	199.5	+1.8	+5.8	-3.7	+0.4	+37	+130	+93
3	222.4	211.5	+2.8	+5.3	-2.2	-0.1	-9	-10	-1
4	254.5	243.6	+4.8	+2.8	+2.3	+0.4	+37	+45	+8
5	270.0	259.1	+5.3	+1.2	+4.4	+1.0	+92	+9	-88
6	281.8	270.9	+5.9	-0.0	+5.7	-1.6	-147	-64	+83
7	312.6	301.7	+4.6	-3.3	+8.2	+0.1	+9	-84	-93
8	329.6	318.7	+3.5	-4.7	+8.5	+0.7	+64	+85	+21
9	0.0	349.1	+1.0	-6.1	+7.4	+0.2	+18	+28	+10

$$\lambda = -5.4$$

$$\beta = -6.2$$

$$c = 10.9$$

	$\Delta\omega - c$	Haym.	$\lambda_{\text{new}}(\omega - c)$
1	-123	-110	-13
2	+94	+37	+57
3	-45	-9	-36
4	+17	+37	-20
5	-17	+92	-109
6	-79	-147	+68
7	-81	+9	-90
8	+99	+64	+35
9	+55	+18	+37

2992 Moon's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	18.4648	-0.6062	-4	0.3679	4.4880	-123
2	18.0000	-1.0710	-4	1.1479	4.5097	+94
3	17.6918	-1.4292	-3	2.0434	4.4958	-45
4	17.0262	-2.0448	-1	4.1816	4.5020	+17
-5	16.9500	-2.1210	0	4.4986	4.4986	-17
6	16.9963	-2.0747	+1	4.3040	4.4924	-79
7	17.5100	-1.5610	+3	2.4358	4.4922	-81
8	18.0000	-1.0710	+4	1.1462	4.5102	+99
9	19.0000	-0.0710	+4	0.0050	4.5058	+55

Comp R^2 : 4.5003

	y	$y - y_0$	$(y - y_0)^2$
1	16.5362	-2.0298	4.1201
2	16.7325	-1.8335	3.3618
3	17.0000	-1.5660	2.4524
4	18.0000	-0.5660	0.3204
5	18.5660	0.0000	0.0000
6	19.0000	+0.4340	0.1884
7	20.0000	+1.4340	2.0564
8	20.4001	+1.8341	3.3640
+9	20.6875	+2.1215	4.5008

Approx. Center

$$x = 18.0 \quad y = 16.7325$$

$$\underline{20.4001}$$

$$37.1326$$

$$y_0 = 18.5663$$

$$y - \text{max} = 20.6875$$

$$R = 2.1212$$

$$x - \text{min} = 16.9500$$

$$x = 19.0712$$

$$\text{Center } \begin{cases} x_0 = 19.0710 \\ y_0 = 18.5660 \end{cases}$$

2992 Inuous Center

	z	$z - X_0$	Δz	$(z - X_0)^2$	$(z - X_0)^2 + (y - Y_0)^2$	$0 - C$
1	18.4648	-0.6062	-4	0.3679	4.4880	-123
2	18.0000	-1.0710	-4	1.1479	4.5097	+94
3	17.6418	-1.4292	-3	2.0434	4.4958	-45
4	17.0262	-2.0448	-1	4.1816	4.5020	+17
-5	16.9500	-2.1210	0	4.4986	4.4986	-17
6	16.9963	-2.0747	+1	4.3040	4.4924	-79
7	17.5100	-1.5610	+3	2.4358	4.4922	-81
8	18.0000	-1.0710	+4	1.1462	4.5102	+99
9	19.0000	-0.0710	+4	0.0050	4.5058	+55

Compu R² = 4.5003

	y	$y - Y_0$	$(y - Y_0)^2$
1	16.5362	-2.0298	4.1201
2	16.7325	-1.8335	3.3618
3	17.0000	-1.5660	2.4524
4	18.0000	-0.5660	0.3204
5	18.5660	0.0000	0.0000
6	19.0000	+0.4340	0.1884
7	20.0000	+1.4340	2.0564
8	20.4001	+1.8341	3.3640
9	20.6875	+2.1215	4.5008

Optimum Center

$$z = 18.0 \quad y = 16.7325$$

$$\underline{20.4001}$$

$$37.1326$$

$$Y_0 = 18.5663$$

$$y_{\text{max}} = 20.6875$$

$$R = 2.1212$$

$$z_{\text{min}} = 16.9500$$

$$X = 19.0712$$

$$\text{Center } \begin{cases} X = 19.0710 \\ Y = 18.5660 \end{cases}$$

Formation of Hourals.

	ab	an	bn		
1	+ 1.24	+ 75.0	+ 250.0	+ 7.9	+ 26.4
2	+ 1.96	- 100.8	- 172.0	- 61.0	- 104.2
3	+ 2.24	+ 64.3	+ 70.6	+ 51.5	+ 56.5
4	+ 1.16	- 34.6	- 9.7	+ 40.8	+ 11.4
5	- 0.00	+ 36.0	- 0.0	+ 231.5	- 0.0
6	- 0.89	+ 163.5	- 34.0	- 140.8	+ 29.2
7	- 2.23	+ 226.2	- 115.8	+ 140.5	- 126.8
8	- 1.96	- 106.0	+ 181.0	- 37.4	+ 64.0
9	- 0.15	- 3.8	+ 116.8	- 2.6	+ 78.5
	+ 1.37	+ 219.8	+ 286.9	+ 230.4	+ 33.0

Resid. with Haysin Corrections.

	O	C	O - C
1	- 13	- 6 - 2 = - 8	- 5
2	+ 57	- 12 - 2 = - 14	+ 71
3	- 36	- 16 - 1 = - 17	- 19
4	- 20	- 22 - 0 = - 22	+ 2
5	- 109	- 23 + 0 = - 23	- 86
6	+ 68	- 22 + 0 = - 22	+ 90
7	- 90	- 17 + 1 = - 16	- 74
8	+ 35	- 12 + 2 = - 10	+ 45
9	+ 37	- 1 + 2 = + 1	+ 36

+ 244 - 184

Average = 48

2992 Moon's Center Conditional Equations

	a	b	c	0 - c
1	-0.61	-2.03	-1.23	-90
2	-1.07	-1.83	+94	+130
3	-1.43	-1.57	-45	-10
4	-2.04	-0.57	+17	+45
5	-2.12	+0.00	-17	+4
6	-2.07	+0.43	-79	-64
7	-1.56	+0.43	-81	-84
8	-1.07	+1.83	+99	+85
9	-0.07	+2.12	+55	+28
				+292 - 248
				Average: 60

Normal Equations

$$+20.13 + 1.37 = +220 \quad (+220)$$

$$+ 1.37 + 20.36 = +287 \quad (+33)$$

$$- 1.37 - 0.09 = -15 \quad -16$$

$$+20.27 = +272 \quad (+17)$$

$$b = +13.9 \quad (+0.8)$$

$$+20.13 = +220 - 18 = +202$$

$$= (+230 - 11) = +219$$

$$a = +10.0 \quad (+10.8)$$

$$\text{Arc measured} = 163^\circ \quad \text{Average } (0 - c) = +5$$

$$\frac{pc}{n} = 0.22$$

$$+ \frac{5}{22} = +0.23 \quad \Delta n = +0.3$$

2992 Moon's Center Conditional Equations

	a	b	0	c	0 - c
1	-0.61	-2.03	-1.23	-6 - 27 = -33	-90
2	-1.07	-1.83	+9.4	-11 - 25 = -36	+130
3	-1.43	-1.57	-4.5	-14 - 21 = -35	-10
4	-2.04	-0.57	+1.7	-20 - 8 = -28	+45
5	-2.12	+0.00	-1.7	-21 + 0 = -21	+4
6	-2.07	+0.43	-7.9	-21 + 6 = -15	-64
7	-1.56	+0.43	-8.1	-16 + 19 = +3	-84
8	-1.07	+1.83	+9.9	-11 + 25 = +14	+85
9	-0.07	+2.12	+5.5	-1 + 28 = +27	+28
					+292 = 298
					Average: 61

Normal Equations

$$+20.13 + 1.37 = +220$$

$$+1.37 + 20.36 = +287$$

$$-1.37 - 0.09 = -15$$

$$+20.27 = +272$$

$$b = +13.9$$

$$+20.13 = +220 - 18 = +202$$

$$a = +10.0$$

$$\text{Arc measured} = 143^\circ \quad \text{Average } (0 - c) = +5$$

$$\frac{pc}{n} = 0.22$$

$$+ \frac{5}{22} = +0.23 \quad 0.22 = +0.5$$

2992 Moon's Mean Position (1913.0)

$$X_0 = 19.0710^\circ$$

$$Y_0 = 18.5660^\circ$$

$$+a = +5^\circ$$

$$19.0715^\circ$$

$$+b = +7^\circ$$

$$18.5667^\circ$$

$$(18.5660)$$

Hayn

From Plate Constant $X = 19.1439^\circ$ $Y = 18.6516^\circ$
(18.6509)

$$\bar{x} = +1.1439^\circ$$

$$\eta = -33484^\circ (-33491)$$

$$\log 3 = 0.05839^\circ$$

$$\cos 5 = 9.95657^\circ$$

$$8.50724$$

$$\log \tan 5 = 9.6752^\circ$$

$$0.1168^\circ$$

$$7.0534^\circ$$

$$6.8454^\circ$$

$$(x-A) = 1.59458^\circ$$

$$x-A = +3932^\circ$$

$$A = 7^\circ 56' 08''$$

$$X_0 = 7^\circ 56' 47.32''$$

$$\text{Red} = +1.58^\circ$$

$$x' = 7^\circ 56' 48.90''$$

$$\eta_1 = +7^\circ$$

$$\eta_0 = -33491^\circ (-33498)$$

$$\log \eta_0 = 0.52493^\circ (52502)$$

$$7.3311^\circ$$

$$3.19378^\circ (319387)$$

$$(y-D) = -26^\circ 02.4' (02.7)$$

$$D = +25^\circ 38' 05''$$

$$S_0 = +25^\circ 12' 02.6'' (02.3)$$

$$\text{Red} = +5.8^\circ$$

$$s' = +25^\circ 12' 08.4'' (08.1)$$

2992 Moon's Mean Position (1913.0)

$$\begin{array}{r} x_0 = 19.0710 \\ + 5 \\ \hline 19.0715 \end{array} \quad \begin{array}{r} y_0 = 18.5660 \\ + 7 \\ \hline 18.5667 \end{array}$$

From Plate Constant $x = 19.1439$ $y = 18.6516$

$$\bar{x} = +1.1439$$

$$\eta = -3.3484$$

$$\begin{array}{r} \log 3 \\ \cos \\ \hline 0.05839 \\ 9.95657 \\ 8.50724 \end{array}$$

$$\begin{array}{r} \log \tan 5 \\ \hline 9.6752 \\ 0.1168 \\ 7.0534 \\ 6.8454 \end{array}$$

$$(x - A) = 1.59458$$

$$\eta_1 = +7$$

$$x - A = +3.932$$

$$\eta_0 = -3.3491$$

$$A = 7.5608$$

$$\begin{array}{r} \log \eta_0 = 0.52493 \\ 7.33115 \\ 3.19378 \end{array}$$

$$y_0 = 7.5647.32$$

$$\text{Red} = +1.58$$

$$(b-D) = -2.6024$$

$$x' = 7.564890$$

$$D = +25.3805$$

$$S_0 = +25^{\circ} 12' 02.6''$$

$$\text{Red} = +5.8$$

$$S' = +25.12084$$

2992

Red. ad locum app.

$$S = +25^{\circ} 12'$$

$$H + \alpha \quad 2^{\text{h}} \quad 10 = 32^{\circ} 30'$$

$$H \quad 18 \quad 13$$

$$\alpha \quad 7 \quad 57$$

$$G \quad 19 \quad 29$$

$$G + \alpha \quad 3 \quad 26 = 51^{\circ} 30'$$

$$\log \cos S \quad 9.9566$$

$$i \quad 0.9104$$

$$(i) \quad 0.8670$$

$$\log \cos(G + \alpha) \quad 9.7942$$

$$S \quad 1.0156$$

$$\sin \quad 9.8935$$

$$\tan S \quad 9.6726$$

$$H \quad 8.8239$$

$$S' \quad 0.8098$$

$$9 \quad 9.4056$$

$$f \quad +0.59$$

$$g \quad +0.25$$

$$h \quad +0.74$$

$$+1.58$$

$$L \sin S \quad 9.6292$$

$$\cos(H + \alpha) \quad 9.9260$$

$$h \quad 1.2738$$

$$\sin \quad 9.7302$$

$$\sec S \quad 0.0434$$

$$\frac{1}{11} \quad 8.8239$$

$$h' \quad 0.8290$$

$$h \quad 9.8713$$

$$g' \quad +6.45$$

$$h' \quad +6.75$$

$$i \quad -7.36$$

$$+5.84$$

2992

Rec. ad. brown app.

$$S = +25^{\circ} 12'$$

$$\begin{array}{rcl}
 H + \alpha & 2 & 10 = 32^{\circ} 30' \\
 H & 18 & 13 \\
 \alpha & 7 & 57 \\
 G & 19 & 29 \\
 G + \alpha & 3 & 26 = 51^{\circ} 30'
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos S & 9.9566 \\
 i & 0.9104 \\
 (i) & 0.8670
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos (G + \alpha) & 9.7942 \\
 & 1.0156 \\
 & 9.8935 \\
 \log S & 9.6726 \\
 \frac{1}{H} & 8.8239 \\
 & 0.8098 \\
 & 9.4056 \\
 f & +0.59 \\
 g & +0.25 \\
 h & +0.74 \\
 & +1.58
 \end{array}$$

$$\begin{array}{rcl}
 \log S & 9.6292 \\
 \cos (H + \alpha) & 9.9260 \\
 h & 1.2738 \\
 \sin i & 9.7302 \\
 \sec S & 0.0434 \\
 \frac{1}{H} & 8.8239 \\
 h' & 0.8290 \\
 h & 9.8713 \\
 g & +6.45 \\
 h & +6.75 \\
 i & -7.36 \\
 & +5.84
 \end{array}$$

2992

Lunar Parallax.

$$\alpha = 7^h 56^m 48^s.90^v$$

$$\delta = 10^{\circ} 56' 05.9''^v$$

$$\alpha - \alpha' = +2^h 59^m 17.0''^v$$

$$= +44^{\circ} 49' 15''^v$$

$$+ 17' 15''^v$$

$$+44' 32' 00''^v$$

$$9.95727^v$$

$$9.99999^v$$

$$0.14706^v$$

$$0.10427^v$$

$$\gamma = 51' 48'' 46''^v$$

$$25' 12'' 08''^v$$

$$26' 36'' 38''^v$$

$$9.82640^v$$

$$8.23955^v$$

$$9.65121^v$$

$$0.10458^v$$

$$7.82174^v$$

$$\delta - \delta' = +22' 48.3''^v$$

$$(56.4)''^v$$

$$\delta = +25^{\circ} 34' 56.7''^v$$

$$\alpha = 7^h 59^m 06.92''^v$$

$$\text{Nautical. } \delta = +25^{\circ} 34' 58.7''^v$$

$$\alpha = 7^h 59^m 05.95''^v$$

$$O.C. - 2.0''^v$$

$$+0.97''^v$$

$$\text{with Hayn's Corrections } (-2.3)''^v$$

$$(40.97)''^v$$

$$\delta' = +25^{\circ} 12' 08.4''^v$$

Hayn
(08.1)

$$\mu = 59' 40.9''^v$$

$$9.86913^v$$

$$8.23955^v$$

$$9.84812^v$$

$$0.04481^v$$

$$8.00161^v$$

$$\alpha - \alpha' = +34' 30.33''^v$$

$$- + 2'' 18.02''^v$$

2992

Lunar Parallax.

$$\alpha = 7^h 56^m 48^s 90$$

$$\delta = 10 56 05.9$$

$$O - \alpha = +2 59 17.0$$

$$= +44^0 49' 15''$$

$$= 17 15$$

$$+44 32 00$$

$$9.95727$$

$$9.99999$$

$$014700$$

$$010427$$

$$\delta = 51 48 46$$

$$25 12 08$$

$$26 36 38$$

$$9.82640$$

$$8.23955$$

$$9.65121$$

$$010458$$

$$782174$$

$$S - S' = +22 48.3$$

$$S = +25 34 56.7$$

$$\text{Näntöläinen } \delta = +25 34 58.7$$

$$O - c = 20$$

$$S' = +25^0 12' 08'' 4$$

$$11 = 59' 40.9$$

$$9.86913$$

$$8.23955$$

$$9.84812$$

$$004481$$

$$800161$$

$$\alpha - \alpha' = +34' 30.33$$

$$= +2'' 18.02$$

$$\alpha = 7 59 06.92$$

$$\alpha = 7 59 05.95$$

$$+0.97$$

2

 $\frac{1}{6.5}$
14.7 $\frac{2}{8.3}$
24.1 $\frac{3}{28.4}$
24.1

2994 Stars - Measure.

d	N
1 14901	15871
65 13125	80 3642
14.2 2018	37
00	61
<u>14.1780</u>	<u>.1775</u>

1914 Mar. 19.

d	N
17810	17118
13232	1168080
3331	8080
08	10
<u>6.5423</u>	<u>.5434</u>

3 18263	15192
207 11689	1176972
9094	7272
72	72
<u>28.6578</u>	<u>.6586</u>

18115	14317
10878	1156060
7881	51
30	02
<u>8.2753</u>	<u>.2756</u>

3 16255	14279
28.4 11217	932419
24.5 1522	2019
41	85
<u>24.5030</u>	<u>.5039</u>

16516	14529
9965	1106969
6069	61
5456	30
00	
<u>28.3456</u>	<u>.3463</u>

Grade 4.

2994

Stars - Measure

d

4

N

1 14901
 65 1312.5
 142 2018
 00

14.1780

15871
~~96~~ 3642
 37
 61

1775

2
 23 18263
 207 11689
 90
 72

28.6578

15192
 11769
 7272
 72

6586

3 16265
 244 11217
 245 1522
 41

24.5030

14279
 9324
 2019
 85

5039

Grade 4.

1914 Mar 19.

12

d

2

N

17810
 13232
 3831
 08

6.5423

17118
 11680
 80
 10

5439

18115
 10878
 7881
 30

38.2753

14317
 11560
 51
 02

2756

16516
 9965
 6069
 5456
 00

28.3456

14529
 11069
 61
 30

3463

2994

moon - measures.

	d	4	1	d	12	W
✓	20025	15650				
18.0	17700	791906				
17.4	0501	11				
	10	58				
	<u>17.2320</u> ✓	<u>.2256</u> ✓				

✓ scratch

17.5	20018	16432	14094	18809
17.5	1427179	1218971	948181	1341922
	80	7572	9181	21
	05	40	86	20
	<u>17.5733</u>	<u>.5741</u>	<u>17.5394</u>	<u>.5394</u>

3

17.3		17930	18821
18.0		1001012	1675146
		11	51
		38	30
		<u>17.2075</u>	<u>2074</u>

4 scratch

16.9	18522	17045	12835	1579100
18.6	1206565	1352019	1238177	90
	69	1819	72	15349
	22	55		
	<u>186456</u>	<u>6470</u>	<u>16.9542</u>	<u>.9555</u>

5

16.9		12820	1623630
19.0		1194240	42
min		35	15359
2			
2		<u>16.9119</u>	<u>9123</u>

6

17.2		18100	19106
20.0		928790	1790510
		95	10
		00	11
		<u>17.1191</u>	<u>1199</u>

2994 moon-measures

	d	h	d	h
✓	20025	15650		
180	17700	791906		
174	0501	11		
	10	58		
	<u>17.2320</u>	<u>2256</u>		

2 scratch

17.5	20018	16432	14094	18809
17.5	1427179	1218971	948181	1341922
	80	7572	91	21
	05	90	86	20
	<u>17.5733</u>	<u>5741</u>	<u>17.5394</u>	<u>5394</u>

3

173		17930	18821
180		1001012	1675146
		11	51
		38	30
		<u>17.2075</u>	<u>2074</u>

4 scratch

169	18522	17045	12835	1579100
18.6	12065	1352019	1232177	90
	69	18	72	15349
	22	55		<u>9555</u>
	<u>18.6456</u>	<u>6470</u>	<u>16.9542</u>	<u>1623630</u>

5

16.9		12820	1623630
19.0		1194240	42
		35	15359
		<u>16.9119</u>	<u>9123</u>

6

172		18100	19106
200		928790	1790510
		95	10
		00	11
		<u>17.1191</u>	<u>1199</u>

2994 α γ moon measures α γ

7 12043 40 15-044

18.0 12045 40 14357 48

20.9 11367 47

20.9323

.9307

8 16845- 19347

19.0 14857 55- 1133835-

21.2 57 3335-

max 42 45

8 21.1988 .1990

max in γ may be
a little larger

9 scratch.

19.4 16400

21.2 14889 86

00

21.1515

16139

7666 550

40

.1517

15635-

1027070

70

45-

19.4630

15801

1116570

6870

07

.4636

2994

lunar measures

2 12043
180 12043 40
W9 11367

15-044
1435-948
47

20.93239307

16845-

19347

19.0 1485755-

1133835-

21.2 57

33

W9 42

45

2 21.1988

1990

9 scratch:

19.4 16400

16139

21.2 14889

7666

8086

5520

00

40

21.15151517

15635-

15801

1027070

11165-

70

6870

45-

07

1.946304636

may be
a little larger

2999	Trines etc						
Exhstar 1913 Mar 17,	1 1'	19	✓	-11	h	31	✓
... Moon	11	24	56 0	✓	-11	24	56 2
Clock fast		0	58.3	✓			
H SidT	11	23	57.8	✓	$\theta - \alpha' = +3^h$	24	✓
Hhony	4	44	31.05				
G SidT	16	08	2885	✓			
SidT-Moon	23	37	4885	✓			
Interval	16	30	4000	✓			
Reduction		2	42.80	✓			
G. M.T.	16	27	5770	✓			

From Kant Alm			R.A.		Decl.	
moon 16	7 ^h	59 ^m	05.50	✓	+25°	35' 00.2" ✓
motion in ^m = 2.5800				✓	8.459	✓
... 279617	+ 1	1214			- 3	56.5 ✓
Tabula place	8 00.	17.64			+25	31 03.7 ✓

moon age 10 days.

" parallax	59'	41.77	✓
" semidiameter	16	17.5	✓
R		977.5	✓
Augmentation		+123	✓
Irradiation (4)		- 0.8	✓
R		9890	✓
R		2.1201	✓
(1+a)/R		2.1200	✓
R ²		9.4944	✓

$$934 = 11.2$$

$$925 = 12.3$$

$$a = -0.6$$

2999 Times etc
 4th Star March 17, 11' 19" - 11' 31"
 Moon 11 24 56.0 - 11 24 56.2
 Clock fast 0 58.3

H SidT 11 23 57.8 $\theta - \alpha' = + 3'' 24''$
 H Hour 4 44 31.05
 G SidT 16 08 24.85
 SidT in Moon 23 37 48.85
 Interval 16 30 40.00
 Radiation 2 42.80
 G SidT 16 27 57.70

From Mount Allen RA Merid
 Moon 16 7ⁿ 59^m 05.50 + 25° 35' 09.2
 Motion in R 2 58.89 8.559
 27.9417 + 1 12.14 - 3 56.5
 Tabular place 8 00 17.64 + 25 31 03.7

moon age 10 days

parallel 59' 41.77
 semidiam 16 17.5
 R 977.5
 Augmentation + 12.3
 Irradiation (4) - 0.8
 R 989.0
 R 2.1200
 $a = -0.6$ (1 + a/R) 2.1200
 R 9.4944

2994

Plate Constants

	1	2	3
x	65428	82754	283460
y	83231	99875	300789
$x-3$	-17803	-17121	-17329

y	141728	286582	245034
y	129676	274535	234012
$y-\eta$	+12102	+12047	+11022

$$\begin{array}{rclcl}
 x-3 & -47.14 & +0.6x & +1.8466 & \\
 -17803 & -668 & = -1.8471 & +4 & = -1.8467 = -1 \\
 -17121 & -1350 & = -1.8471 & +5 & = -1.8466 = 0 \\
 -17329 & -1154 & = -1.8483 & +17 & = -1.8466 = 0 \\
 19.0312 & -899 & +11 & & = 20.7890 \checkmark
 \end{array}$$

$$\begin{array}{rclcl}
 y-\eta & +50.62 & -2.34 & -1.2400 & \\
 +12102 & +331 & = +1.2433 & -33 & = +1.2400 = 0 \\
 +12047 & +419 & = +1.2466 & -66 & = +1.2400 = 0 \\
 +11022 & +1434 & = +1.2456 & -56 & = +1.2400 = 0 \\
 19.0787 & +963 & -44 & & = 17.9306 \checkmark
 \end{array}$$

$$\begin{array}{lclcl}
 \text{Tables } a: -1.0 & e: -0.3 & a+e = -0.7 & b+a = -2.4 \\
 \text{Obs } a: -0.6 & e: +2.3 & a-e = -2.9 & b+a = -3.5
 \end{array}$$

2994

Rate Constants

$$\begin{array}{rcl}
 x & 6.5428 & 8.2754 \quad 28.3460 \\
 y & 8.3231 & 9.9875 \quad 30.0789 \\
 x-y & -1.7803 & -1.7121 \quad -1.7329
 \end{array}$$

$$\begin{array}{rcl}
 y & 14.1778 & 28.6582 \quad 24.5034 \\
 y & 12.9676 & 27.4535 \quad 23.4012 \\
 4-y & +1.2102 & +1.2047 \quad +1.1022
 \end{array}$$

$$\begin{array}{rcl}
 x-y & -47.14 & +0.62 \quad +1.8466 \\
 -1.7803 & -668 & = -1.8471 + 4 = -1.8467 = -1 \\
 -1.7121 & -1.350 & = -1.8471 + 5 = -1.8466 = 0 \\
 -1.7329 & -1.154 & = -1.8483 + 17 = -1.8466 = 0 \\
 19.0312 & -899 & +11 = 20.7890
 \end{array}$$

$$\begin{array}{rcl}
 4-y & +50.62 & -234 \quad -1.2400 \\
 +1.2102 & +331 & = +1.2433 - 33 = +1.2400 = 0 \\
 +1.2047 & +419 & = +1.2466 - 66 = +1.2400 = 0 \\
 +1.1022 & +1434 & = +1.2456 - 56 = +1.2400 = 0 \\
 19.0787 & +963 & -44 = 1.79306
 \end{array}$$

$$\begin{array}{lcl}
 \text{Tables } a: -1.0 & c: -0.3 & a-c = -0.7 \quad b+a = -2.4 \\
 \text{Obs } a: -0.6 & c: +2.3 & a-c = -2.9 \quad b+a = -3.5
 \end{array}$$

1913pnae

	α	$\rho - c$	$\lambda \sin(\rho - c)$	$\lambda \cos(\rho - c)$	ρ	Conversion			θ	$\theta - c$
1	209.1	198.2	+1.7	+5.9	-3.9	-0.4	-37	-75	-38	
2	224.8	213.9	+3.0	+5.1	-1.8	0.0	0	-34	-34	
3	229.3	228.4	+4.0	+4.1	+0.2	-0.5	-46	-37	+9	
4	258.2	247.3	+5.0	+2.4	+2.9	+0.1	+9	+45	+36	
5	270.0	259.1	+5.3	+1.2	+4.4	+1.0	+92	+24	-68	
6	295.8	284.9	+5.2	-1.6	+7.1	-0.5	-46	+1	-47	
7	330.9	320.0	+3.5	-4.8	+8.6	-0.9	-83	+1	-84	
8	0.0	349.1	+1.0	-6.1	+7.4	+0.2	+18	+10	-8	
9	11.7	0.8	-0.0	-6.2	+6.5	+0.3	+28	-11	-139	

$$\lambda = -5.4$$

$$\rho = -6.2$$

$$c = 10.9$$

	$\text{old}(\theta - c)$	Hayn	$\text{new}(\theta - c)$
1	-11	-37	+26
2	+29	0	+29
3	+20	-46	-26
4	+89	+9	+80
5	+60	+92	-32
6	+7	-46	+53
7	-31	-83	+52
8	-48	+18	-63
9	-172	+28	-200

2994

Lucas's Center.

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2$	$0 - c$
1	18.0000	-1.0320	-5	1.0660	4.4933	-11
2	17.5394	-1.4926	-4	2.2290	4.4973	+29
3	17.2074	-1.8246	-3	3.3302	4.4964	+20
4	16.9148	-2.0772	-1	4.3152	4.5033	+89
5	16.9121	-2.1199	0	4.4940	4.5004	+60
6	17.1195	-1.9125	+2	3.6569	4.5031	+7
7	18.0000	-1.0320	+5	1.0640	4.4913	-31
8	19.0000	0.0320	+6	0.0010	4.4899	-45
9	19.4633	+0.4313	+6	0.1865	4.4772	-172

Computed $R^2 = 4.4944$

	y	$y - y_0$	Δy	$(y - y_0)^2$	$(y - y_0)^2$
1	17.2285	-1.8515	+2	3.4273	
2	17.5737	-1.5063	+2	2.2683	
3	18.0000	-1.0800	+1	1.1662	
4	18.6463	-0.4337	+0	0.1881	
5	19.0000	0.0800	+0	0.0064	
6	20.0000	+0.9200	-1	0.8462	
7	20.9315	+1.8515	-2	3.4273	
8	21.1989	+2.1189	-2	4.4889	
9	21.1516	+2.0716	-2	4.2907	

Approx. Center.

$$x = 18.04 = 17.2285$$

$$209315$$

$$381600$$

$$y_0 = 19.0800$$

$$y = \max = 21.1990$$

$$R = 21.190$$

$$x = \min = 16.9121$$

$$x_0 = 19.0371$$

$$\text{Center } \begin{cases} x_0 = 19.0320 \\ y_0 = 19.0800 \end{cases}$$

2994

Lucas Center

	z	$z - X_0$	Δz	$(z - X_0)^2$	$(z - X_0)^2$	$0 - 6$
1	180000	-10320	-5	10660	44933	-11
2	175394	-14926	-4	22290	44973	+29
3	172074	-18246	-3	33302	44964	+20
4	169548	-20772	-1	43152	45033	+89
5	169121	-21199	0	44940	45009	+60
6	171195	-19125	+2	36569	45031	+7
7	180000	-10320	+5	10640	44913	-31
8	190000	00320	+6	00010	44899	-45
9	194633	+04313	+6	01865	44772	-172

comp $R^2 = 44944$

	y	$y - Y_0$	Δy	$(y - Y_0)^2$	$(y - Y_0)^2$
1	172285	-18515	+2	34273	
2	175737	-15063	+2	22643	
3	180000	-10800	+1	11662	
4	186463	-04337	+0	01885	
5	190000	00800	+0	00064	
6	200000	+09200	-1	08462	
7	209315	+18515	-2	34273	
8	211989	+21189	-2	44889	
9	211516	+20716	-2	42907	

Alfonso Center

 $z = 1809 = 172285$ 209315 381600 $Y = 190800$ $y = \text{max} = 211990$ $R = 21190$ $z = \text{min} = 169121$ $X = 190311$ Center $\begin{cases} X_0 = 190320 \\ Y_0 = 190800 \end{cases}$

Formation of Annuals.

With Hayn Correction

	ab	ac	bc	-	26.8	-	48.1
1	+1.91	+11.3	+20.4	-	43.2	-	43.8
2	+2.25	-45.2	-43.8	+	47.4	+	28.1
3	+1.96	-36.4	-21.6	-	166.5	-	34.4
4	+0.88	-185.0	-38.2	+	68.0	+	2.6
5	+0.17	-127.2	-4.8	-	101.3	+	48.7
6	-1.75	-13.4	+6.4	-	53.6	+	96.4
7	-1.91	+32.0	-57.4	+	1.9	-	133.4
8	-0.06	+1.4	-95.4	-	86.0	-	414.0
9	+0.89	-74.0	-356.0	-	360.1	-	497.9
	+434	-434.5	-590.4				

Resids with Hayn Correction

	b	c	O-C
1	+26	+13+41 = +54	-26
2	+29	+19+33 = +52	-23
3	-26	+24+24 = +48	-74
4	+80	+27+9 = +36	+44
5	-32	+28+2 = +30	-62
6	+53	+25-20 = +5	+48
7	+52	+13-41 = -28	+80
8	-63	+0-47 = -47	-16
9	-200	+6-46 = -52	-148
			+172-349
			Average = 58

2994

Moon's Center Conditional Equations

	a	b	0	c	0 - c
1	-1.03	-1.85	-1.1	+16 + 48 = +64	-75
2	-1.49	-1.51	+29	+24 + 39 = +63	-34
3	-1.52	-1.08	+20	+29 + 28 = +57	-37
4	-2.08	-0.43	+89	+33 + 11 = +44	+45
5	-2.12	-0.08	+60	+39 + 2 = +41	+24
6	-1.91	+0.92	+7	+30 - 24 = +6	+1
7	-1.03	+1.85	-31	+16 - 48 = -32	+1
8	-0.03	+2.12	-45	+0 - 55 = -55	+10
9	+0.43	+2.07	-172	-7 - 54 = -61	-111

$$+ 81 = 257$$

$$\text{Average} = 37$$

Normal Equations

$$\begin{aligned}
 + 20.34 + 434 &= -434 \quad (\text{Haupt}) \\
 + 4.34 + 20.11 &= -590 \quad (-498) \\
 - 4.34 - 0.93 &= +93 \quad (+77) \\
 + 19.18 &= -497 \quad (-421)
 \end{aligned}$$

$$b = -25.9 \quad (-220)$$

$$\begin{aligned}
 + 20.34 &= -434 + 112 = -322 \\
 &= (-360 + 95) = -265
 \end{aligned}$$

$$a = -15.8 \quad (-13.1)$$

$$\text{Arc measured} = 163^\circ \quad \text{Average } 0 - c = -19$$

$$\frac{pc}{n} = 0.22$$

$$-\frac{19}{22} = -0.86 \quad \Delta z = -0.9$$

2994

Linear Center Conditional Equations

	a	b	0	c	0-c
1	-103	-185	-11	+16448	+64
2	-149	-151	+29	+24+39	+63
3	-142	-108	+20	+29+28	+57
4	-208	-043	+89	+33+11	+44
5	-212	-008	+60	+39+2	+36
6	-191	+092	+7	+30-24	+6
7	-103	+185	-31	+16-48	-32
8	-003	+212	-45	+0-55	-55
9	+043	-207	-172	-7-54	-61

$$+ 81 = 257$$

$$\text{Average} = 27$$

Normal Equation

$$+ 2034 + 434 = -434$$

$$+ 434 + 2011 = -590$$

$$- 434 - 043 = +93$$

$$+ 1918 = -497$$

$$b = -25.9$$

$$- 2034 - 434 + 112 = -322$$

$$a = -15.8$$

$$\text{Angle assumed} = 163^\circ$$

$$\text{Average } c/2 = 19$$

$$\frac{P_c}{a} = 0.22$$

$$- \frac{19}{.22} = -0.86 \quad \Delta 2 = -0.9$$

Red ad locum app

$$S = +25^{\circ} 06'$$

$$H + \alpha \quad 2 \quad 11 = 32^{\circ} 45'$$

$$H \quad 18 \quad 13$$

$$\alpha \quad 7 \quad 58$$

$$G \quad 19 \quad 29$$

$$G + \alpha \quad 3 \quad 27 = 51^{\circ} 45'$$

$$l \cos(H + \alpha) \quad 9.7918$$

$$q \quad 1.0156$$

$$\sin \quad 9.8950$$

$$\tan S \quad 9.6706$$

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

$$(q') \quad 0.8074$$

$$(q) \quad 9.4051$$

$$b \quad +0.59$$

$$s \quad +0.25$$

$$l \quad +0.75^{\vee}$$

$$\quad +1.59^{\vee}$$

$$l \cos S \quad 9.9569$$

$$i \quad 0.9109^{\vee}$$

$$16) \quad 0.8673^{\vee}$$

$$\sin S \quad 9.6276$$

$$l \cos(H + \alpha) \quad 9.9298$$

$$h \quad 1.2738$$

$$\sin \quad 9.7332^{\vee}$$

$$\sec S \quad 0.0431$$

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

$$(h') \quad 0.8262$$

$$(h) \quad 9.8740$$

$$s' \quad +6.42$$

$$s \quad +6.70$$

$$i \quad -7.37$$

$$\quad +1.575^{\vee}$$

2994 Moon's Mean Position (1913.0)

$$X_0 = 19.0320 \quad Y_0 = 19.0800$$

$$\Delta\alpha = -8 \quad \Delta\delta = -13$$

$$19.0312 \quad 19.0787$$

$$\text{Hayn} (19.0313) \quad (19.0789)$$

From Plate Constants $X = 20.7890 \quad Y = 17.9306$

$$(20.7891) \quad (17.9308)$$

$$\xi = +2.7890 \quad (\eta = -4.0694)$$

$$\log \xi = 0.44545 \quad (\log \tan \delta = 9.6687)$$

$$\log \xi^2 = 0.8909$$

$$8.50724 \quad 7.0534$$

$$\log \eta_1 = 7.6130$$

$$\log (\alpha - A) = 1.98132 \quad (1.98133)$$

$$\log \eta_1 = +41$$

$$\log A = +1.3579 \quad (35.79)$$

$$\log \eta_0 = -4.0735 \quad (-4.0733)$$

$$A = 7.5608$$

$$\log \eta_0 = 0.60996 \quad (6.0999)$$

$$X_0 = 7.574379 \quad 7.33115$$

$$\log \eta_0 = 3.27881 \quad (3.27879)$$

$$\log \alpha = 1.59 \quad ((\alpha - 1))$$

$$\log \delta = 31.403 \quad (40.2)$$

$$\alpha' = 7.574538$$

$$\delta - D = -31.403 \quad (40.2)$$

$$D = +25.3805$$

$$S_0 = +25.06247 \quad (24.8)$$

$$\log \eta_0 = +5.8$$

$$S' = +25.06305 \quad (30.6)$$

2994 known mean Position (1913.0)

$$\begin{array}{r} X_0 = 19.0320 \\ \text{cor} = \quad - 8 \\ \hline 19.0312 \end{array} \quad \begin{array}{r} Y_0 = 19.0800 \\ \text{cor} = \quad - 13 \\ \hline 19.0787 \end{array}$$

From Plate Constants $X = 20.7890$ $Y = 17.9306$

$$S = +27890$$

$$\eta = -4.0694$$

$$\begin{array}{r} \log S = 0.44545 \\ \log 5 = 0.69897 \\ \hline 8.550724 \end{array}$$

$$\begin{array}{r} \log 10 S = 9.6687 \\ \log 5^2 = 0.8909 \\ \hline 7.0534 \\ \eta_1 = 7.6130 \end{array}$$

$$(X-A) = 198132$$

$$\eta_1 = +41$$

$$A - H = +13579$$

$$\eta_2 = -4.0735$$

$$H = 75608$$

$$\begin{array}{r} \log \eta_0 = 0.60996 \\ \hline 7.33115 \end{array}$$

$$X_0 = 7574379$$

$$(S-1) = 3.27881$$

$$\text{Red} = +159$$

$$S-D = -31403$$

$$\alpha = 7574538$$

$$D = +25^{\circ} 38' 05''$$

$$S_0 + 25^{\circ} 06' 24.7''$$

$$\text{Red} = +58$$

$$S' = +25^{\circ} 06' 30.5''$$

2994 Lunar Parallax

$$\begin{array}{r}
 \alpha' = 7^{\circ} 57' 45.38'' \checkmark \\
 \theta = 11^{\circ} 23' 57.8'' \checkmark \\
 + 3^{\circ} 26' 12.4'' \checkmark \\
 + \quad 51^{\circ} 33' 06'' \checkmark
 \end{array}$$

$$\begin{array}{r}
 + \quad \quad \quad 19' 10'' \checkmark \\
 + \quad \quad \quad 51' 13' 56'' \checkmark
 \end{array}$$

$$\begin{array}{r}
 995727 \checkmark \\
 9.99999 \checkmark \\
 0.20331 \checkmark \\
 \hline
 0.16057 \checkmark
 \end{array}$$

$$\begin{array}{r}
 \delta = 55^{\circ} 21' 30'' \checkmark \\
 \quad 25^{\circ} 06' 30'' \checkmark \\
 \quad 30^{\circ} 15' 00'' \checkmark
 \end{array}$$

$$\begin{array}{r}
 9.82640 \checkmark \\
 8.23966 \checkmark \\
 9.70224 \checkmark \\
 0.08475 \checkmark \\
 \hline
 7.85305 \checkmark
 \end{array}$$

$$S - \delta' = +24^{\circ} 30.6'' \checkmark \quad \alpha = 8^{\circ} 00' 18.69'' \checkmark$$

$$\delta = +25^{\circ} 31' 01.1'' (0.12)$$

$$\text{hant Alm } \delta = +25^{\circ} 31' 03.7'' \checkmark \quad \alpha = 8^{\circ} 00' 17.64'' \checkmark$$

$$O - C \quad - 2.6'' \checkmark$$

$$\text{with Haug's correction } (-2.5'')$$

$$+ 10.5'' \checkmark$$

$$(+ 10.5'')$$

$$\begin{array}{r}
 \delta = +25^{\circ} 06' 30.5'' \checkmark \\
 (30.6) \\
 \pi = 59' 41.8'' \checkmark
 \end{array}$$

$$\begin{array}{r}
 9.86913 \checkmark \\
 8.23966 \checkmark \\
 9.89386 \checkmark \\
 0.04457 \checkmark \\
 \hline
 8.04722 \checkmark
 \end{array}$$

$$\begin{array}{r}
 \alpha - \alpha' = +38' 19.63'' \checkmark \\
 + 2^{\circ} 33' 31'' \checkmark
 \end{array}$$

2994 Lunar Parallax

$$\begin{array}{r}
 \alpha = 7^{\circ} 57' 45.38'' \\
 \delta = 11^{\circ} 23' 57.8'' \\
 + 3 \\
 + 51^{\circ} 33' 06''
 \end{array}$$

$$+ 19' 10''$$

$$+ 51' 13' 56''$$

$$995727$$

$$999999$$

$$020331$$

$$016057$$

$$\delta = 55^{\circ} 21' 30''$$

$$25^{\circ} 06' 30''$$

$$30^{\circ} 15' 00''$$

$$982640$$

$$823966$$

$$970224$$

$$008975$$

$$785305$$

$$S - 8' = + 24' 30.6''$$

$$S = + 25' 31' 01.1''$$

$$\text{humboldt } S = + 25' 31' 03.7''$$

$$O - C = - 2.6''$$

$$\delta = + 25^{\circ} 06' 30.5''$$

$$\Pi = 59' 41.8''$$

$$986913$$

$$823966$$

$$989386$$

$$004457$$

$$804722$$

$$\alpha - \alpha' = + 38' 19.63''$$

$$+ 2^{\circ} 33' 31''$$

$$\alpha = 8^{\circ} 00' 18.69''$$

$$\alpha = 8^{\circ} 00' 17.64''$$

$$+ 1.05''$$

4 Stars measures

2.5	16591	19200	17889	14477
12.6	1023138	1553941	1227979	1005661
	29	39	71	61
	74	19	70	76
	<u>17.6348</u>	<u>6332</u>	<u>28.4397</u>	<u>4418</u>

62 109	1327069 71 12280	14931 1394949 51	19509 1185148 50 22	18151 1583019 27 48
30.9010	9019	6.2331	2325	

3008

Stars Measures

	d	n	d	n
1	20239	16650	18476	15912
53	1474948	1213235	1086150	1352920
136	54	32	51	21
	15	55	78	24
	<u>13.5472</u>	<u>5480</u>	<u>5.2376</u>	<u>2392</u>
2	17199	15669	18231	15329
25	905968	1379992	1285959	1070911
337	7570	94	70	15
	19	52	46	41
	<u>33.8150</u>	<u>8129</u>	<u>22.4629</u>	<u>4623</u>
3	16591	19200	17889	14477
85	1023138	1553941	1227979	1005661
76	29	39	71	61
	74	19	70	76
	<u>17.6348</u>	<u>6332</u>	<u>28.4397</u>	<u>4418</u>

Grade 3.

62	1377069	14931	19509	18151
309	71	1394949	1185148	1583019
	12780	51	50	27
			22	48
	<u>30.9010</u>	<u>9019</u>	<u>6.2331</u>	<u>2325</u>

3008 Moon Measures

α	δ	α	δ
1 scratch	17260		
18.4 16251	1224139	16388	16509
18.5 1127574	40	9928	1397991
82	79	2421	82
65		01	18
<u>18.4981</u>	<u>4971</u>	<u>18.3528</u>	<u>3528</u>

<u>2</u>		
18.0 15278	18239	
18.8 720698	1625958	
02	65	
87	51	
<u>18.8083</u>	<u>8020</u>	

20392	18331
1876765	998075
61	76
85	39
<u>17.8374</u>	<u>8360</u>

19329	19389
1380008	1488089
84	84
35	04
<u>17.4472</u>	<u>4512</u>

19300	19493
1361101	1520102
01	09
05	17
<u>17.4301</u>	<u>4299</u>

18269	19560
1392400	1390102
1604	10
79	52
<u>17.5638</u>	<u>5652</u>

3
17.8
19.0

4
17.5
19.0

5
17.4
19.3
min
max

6
17.6
19.0

20.08 *Hydrogen measures*

d	u	v	d	u	v
1 scratch		17260			
18.4	16251	1229139	16388	16509	
18.5	1127574	40	9928	1297991	
	82	79	24	82	
	65		01	18	
<u>184981</u>	<u>4971</u>		<u>183528</u>	<u>3528</u>	

2					
180	15278	18239			
188	720698	16255			
	02	65-58			
	87	51			
<u>185083</u>	<u>8020</u>				

3					
178			20392		18331
190			1876765		998075
			61		76
			85		39
			<u>178374</u>		<u>8360</u>

4					
175			19329		19389
200			1380008		1488089
			04		84
			35		04
			<u>174472</u>		<u>4512</u>

5					
174			19300		19493
203			1361101		1520102
			01		09
			05		17
			<u>174301</u>		<u>4299</u>

6					
176			18269		19560
210			1392400		1390102
			1604		10
			79		52
			<u>175638</u>		<u>5652</u>

3008

Moon - measures.

$$\begin{array}{r}
 \text{a} \quad \text{b} \quad \text{c} \quad \text{d} \quad \text{e} \\
 \hline
 2 \quad 17380 \quad 19385 \\
 18.0 \quad 10150 \quad 1660919 \\
 21.6 \quad 48 \quad 99 \\
 \quad 82 \quad 94 \\
 \hline
 21,7234 \quad .7221
 \end{array}$$

$$\begin{array}{r}
 8 \\
 18.4 \\
 22.0
 \end{array}$$

$$\begin{array}{r}
 17455 \\
 1050590 \\
 \quad 01 \\
 \quad 43 \\
 \hline
 18,3052
 \end{array}$$

$$\begin{array}{r}
 156657 \\
 1257179 \\
 \quad 9679 \\
 \quad 70 \\
 \hline
 3085
 \end{array}$$

$$\begin{array}{r}
 9 \\
 19.0 \quad 16619 \quad 14905 \\
 22.4 \quad 1331916 \quad 8226 \\
 \quad 15 \quad 2122 \\
 \quad 36 \quad 11 \\
 \hline
 22,3307 \quad .3314
 \end{array}$$

$$\begin{array}{r}
 10 \\
 19.5 \quad 16600 \quad 15929 \\
 22.4 \quad 1246149 \quad 1008986 \\
 \text{may} \quad 43 \quad 8586 \\
 \quad 19 \quad 457 \\
 9 \quad 22,4157 \quad .4145
 \end{array}$$

$$\begin{array}{r}
 11 \\
 20.0 \quad 15590 \quad 15959 \\
 22.4 \quad 1184927 \quad 969902 \\
 \quad 29 \quad 97 \\
 \quad 88 \quad 60 \\
 \hline
 22,3754 \quad .3739
 \end{array}$$

not very clean image of moon.

3008

Moon - becomes

$$\begin{array}{r} 2 \overline{) 17380} \\ 180 \end{array}$$

$$\begin{array}{r} 180 \end{array}$$

$$\begin{array}{r} 21.6 \end{array}$$

$$\begin{array}{r} 82 \end{array}$$

$$\begin{array}{r} 21.7234 \end{array}$$

$$\begin{array}{r} 19385 \end{array}$$

$$\begin{array}{r} 1660919 \end{array}$$

$$\begin{array}{r} 99 \end{array}$$

$$\begin{array}{r} 94 \end{array}$$

$$\begin{array}{r} 7221 \end{array}$$

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

$$\begin{array}{r} 18.4 \end{array}$$

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

$$\begin{array}{r} 17455 \end{array}$$

$$\begin{array}{r} 1050590 \end{array}$$

$$\begin{array}{r} 01 \end{array}$$

$$\begin{array}{r} 43 \end{array}$$

$$\begin{array}{r} 18.2052 \end{array}$$

$$\begin{array}{r} 156657 \end{array}$$

$$\begin{array}{r} 1257179 \end{array}$$

$$\begin{array}{r} 9679 \end{array}$$

$$\begin{array}{r} 70 \end{array}$$

$$\begin{array}{r} 3085 \end{array}$$

$$\begin{array}{r} 9 \end{array}$$

$$\begin{array}{r} 190 \end{array}$$

$$\begin{array}{r} 224 \end{array}$$

$$\begin{array}{r} 11 \end{array}$$

$$\begin{array}{r} 36 \end{array}$$

$$\begin{array}{r} 223307 \end{array}$$

$$\begin{array}{r} 14905 \end{array}$$

$$\begin{array}{r} 8226 \end{array}$$

$$\begin{array}{r} 2122 \end{array}$$

$$\begin{array}{r} 11 \end{array}$$

$$\begin{array}{r} 3314 \end{array}$$

$$\begin{array}{r} 10 \end{array}$$

$$\begin{array}{r} 19.5 \end{array}$$

$$\begin{array}{r} 224 \end{array}$$

$$\begin{array}{r} 1246149 \end{array}$$

$$\begin{array}{r} 43 \end{array}$$

$$\begin{array}{r} 19 \end{array}$$

$$\begin{array}{r} 22.4157 \end{array}$$

$$\begin{array}{r} 15929 \end{array}$$

$$\begin{array}{r} 1008980 \end{array}$$

$$\begin{array}{r} 85 \end{array}$$

$$\begin{array}{r} 45 \end{array}$$

$$\begin{array}{r} 4145 \end{array}$$

$$\begin{array}{r} 11 \end{array}$$

$$\begin{array}{r} 200 \end{array}$$

$$\begin{array}{r} 224 \end{array}$$

$$\begin{array}{r} 29 \end{array}$$

$$\begin{array}{r} 88 \end{array}$$

$$\begin{array}{r} 223754 \end{array}$$

$$\begin{array}{r} 15959 \end{array}$$

$$\begin{array}{r} 969902 \end{array}$$

$$\begin{array}{r} 97 \end{array}$$

$$\begin{array}{r} 60 \end{array}$$

$$\begin{array}{r} 3739 \end{array}$$

not very clear image of moon.

3008	Times etc.							
Exp. to stars 1913 Mar. 18	10 ^h	04 ^m			- 10 ^h	16 ^m		
" " Moon	10	10	27.5 ^s		- 10	10	27.8 ^s	
clock fast		0	58.6 ^s					
H. Sid. T.	10	09	29.05 ^s		0-X=+1 ^h 11 ^m			
H. long	4	44	31.05 ^s					
G. Sid. T.	14	54	00.10 ^s					
Sid. T. Moon	23	41	45.40 ^s					
Interval	15	12	14.70 ^s					
Reduction		2	29.45 ^s					
G. M. T.	15	09	45.25 ^s					

From Cent. Allen	R. A.		Decl.	
Moon 15 ^m	8 ^h 57 ^m	26.39 ^s	+ 21° 36'	15.5 ^s
Motion in 1 ^m 2.4867 ^s			12.242 ^s	
" " 9.7542 ^s		+ 24.26 ^s	- 1	59.4 ^s
Tabular place	8 57	50.65 ^s	+ 21 34	16.1 ^s

Moon's age 11 days

	parallax	60'	21.00 ^s
	semidiam.	16'	28.2 ^s
	R		988.2 ^s
934 = 14.10 ^s ✓	Augmentation		+ 15.8 ^s
988 = 15.4 ^s ✓	Irradiation (3)		- 0.7 ^s
	R		100.33 ^s
	R		215.07 ^s
a = +1.5 ^s ✓	(1+a) R		2.1510 ^s
	R ²		4.6268 ^s

2008

Trines etc

Exp. to stars 1913 Mar. 18	10 ^h	04 ^m	- 10 ^h	16 ^m
known	10	10	27.5	10 10 27.8
clock fast		0	58.6	

H. list I.	10	09	29.05	0 - x = +1 ^h 11 ^m
H. long	9	44	31.05	
G. list I.	14	54	00.10	
Sec. T. in known	23	41	45.40	
Interval	15	12	14.70	
Reduction		2	29.45	
G. list T.	15	09	45.25	

From Cent. Allen	R. A.	Block.
Moon 15 ^h	8 ^h 57 ^m 26.39	+ 21 ^h 36 ^m 15.5
Motion at 2.4867		12.242
" 9.7542	+ 24.26	- 1 59.4
Tabular place	8 57 50.65	+ 21 34 16.1

Moon's age 11 days.

	parallax	60' 21" 00
	semidiam.	16' 28" 2
	R	9882
434: 14.15	Amplitude	+ 15.8
488: 15.8	Immersion B,	- 0.7
	R	10033
	R	21507
a = +1.5	(1700) R	21510
	R ²	46268

3008

Rate Constants

R.A.

Decl.

52384	135476	848	57	+20	1748
224624	338140	858	23	22	5720
284408	176340	901	46	20	5146
3)5614	6500	25107	126	+62	125114
18.71	21.97	856	22	+21	2218
-18	-22	-	22	+	236
71	33	856	00	+21	2454
31	466 $\frac{1}{2}$				
22 ⁵	156"				

$$A = 8^h 56^m 00^s$$

$$D = +21^\circ 24' 54''$$

2-3-1154	-1.52	+11-18
+37-1558	-1521	-8:-1529
+2057-3554	-1497	-9:-1506
+2394-3889	-1495	-34:-1529
+564-2028	-1464	-43:-1507
19.5817-2330 ^v	-29 ^v	= 19.4976 ^v

4-7	+114.12	-0.54	-1705
+1097	+598	-7:-	+1688
+1026	+712	-15:-	+1723
-859	+2563	-17:-	+1687
-1513	+2246	-9:-	+1724
202632 ^v	+2234 ^v	-10 ^v	= 20.3151 ^v

Tables $a = +0.7$ $x = +0.5$ $a - x = +0.2$ $b + a = -0.3$
 Obs $a = +1.5$ $x = +0.5$ $a - x = +1.0$ $b + a = +0.9$

3008

Rate constant

RA

Decl.

5.2389	13.5476	8 48	57	+ 20	17 48
22.4624	33.8140	8 58	23	22	57 20
28.4408	17.6340	9 01	46	22	51 46
3 5.614	16.500	25 10 7	126	- 62	125 11 4
18.71	21.97	8 56	22	+ 21	22 18
- 18	22	-	22	+	2 36
71	33	8 56	00	- 21	24 54
31	46.62				
22	15.6				

$$A = 8^h 56^m 00^s$$

$$D = +21^\circ 24' 54''$$

2 - 3 - 11 54	- 1.52	+ 11 18
+ 37 - 15 58	- 15 21	- 8 - 15 29
+ 20 57 - 35 54	- 14 97	- 9 - 15 06
+ 23 94 - 38 89	- 14 95	- 34 - 15 29
- 564 - 20 28	- 14 64	- 43 - 15 07
19 58 17 - 23 30	- 29	= 19 49 7 6

4 - 7 + 114.12	- 0.54	- 17 05
+ 10 97 - 598	- 7 - 16 88	- 17
+ 10 26 + 712	+ 17 38 - 15	+ 17 23
- 859 + 2563	+ 17 04 - 17	+ 16 87
- 1513 + 7246	+ 17 33 - 9	+ 17 24
20 26 32 + 2234	- 10	= 20 31 51

$$\text{ables } a = +0.7 \quad \lambda = +0.5 \quad a - \lambda = +0.2 \quad b + a = -0.3$$

$$\text{Obs } a = +1.5 \quad \lambda = +0.5 \quad a - \lambda = +1.0 \quad b + a = +0.9$$

Calculation 1230. mag 8.0

8 48 31.83

86

77

8 48 31.82

+ 45.17

8 49 16.99

8 56 00

- 6 43.01

- 402.95

2.60526 m

9.96547

1.07797 m

- 11.9667

- 62

6.0271

6.2328

+ 2.057

+ 22 35 44.8

45.3

+ 3.5

+ 22 35 44.5

- 2 57.7

+ 22 32 46.8

+ 21 24 59

+ 1 07 52.8

+ 4073.3

3.60994

0.94109

9.6182

2.1559

8.8275

+ 8.7316

+ 6.72

30.7988

30.9014

+ 1.026

3008

Standard Coordinates - Stars

26

Cape No. 1228 mag 6.8

Cape No. 1248 mag 8.1

Cape No. 1255 mag 7.7

C	8	48	12.17	8	57	37.36	9	01	01.06
L			22			41			00.95
E			14			34			01.01
Mean	8	48	12.18	8	57	37.37	9	01	01.01
Proc			+ 44.71			+ 45.20			+ 44.54
S	8	48	56.89	8	58	22.57	9	01	45.55
A	8	56	00	8	56	00	8	56	00
S-A	-	7	03.11	+	2	22.57	+	5	45.55
Mid-S-A	-	4	23.04	+	1	42.57	+	3	45.51
log			2.62638			2.15403			2.53846
cos			9.97216			9.96417			9.97055
tan			1.10578			0.62544			1.01625
30	-	12.7580		+	4.2212		+	10.3812	
31	-	73		+	18		+	32	
32		52.347			22.2230			28.3844	
33		52.384			22.4624			28.4408	
cos		+	37		+	2394		+	564
C	+ 20°	20'	43.8	+ 23°	00'	23.0	+ 20°	54'	54.8
L			43.2			22.3			54.3
E			43.3			22.0			54.2
Mean	+ 20	20	43.4	+ 23	00	22.4	+ 20	54	54.4
Proc	-	2	54.9	-	3	02.6	-	3	08.1
S	+ 20	17	48.5	+ 22	57	19.8	+ 20	51	46.3
D	+ 21	24	54	+ 21	24	54	+ 21	24	54
S-D	-	1	07	05.5	+	1	32	25.8	-
Mid-S-D	-	4	02.6		+	55	47.2		- 19.87.8
log			3.60487			3.74408			3.29838
cos			0.93602			1.07523			0.62953
Tan			9.5680			9.6269			9.5811
32			22.116			12.509			20.325
31			88.330			79.312			86.670
30	-	8.6302		+	1.18914		-	4.2612	
31	+	681		+	85		+	465	
32		13.4379			33.8999			17.7853	
33		13.5476			33.8140			17.6340	
34	+	1097			- 859			- 1513	

3008				Standard Coordinates - Slam				26			
Cape W. 228 mgl 8				Cape W. 1248 mgl 8.1				Cape W. 1255 mgl 7.7			
C	8	48	12.17	8	57	37.36	9	01	01.06		
L			22			41			00.95		
E			14			34			01.01		
mean	8	48	12.18	8	57	37.37	9	01	01.01		
Proc			+ 44.71			+ 45.20			+ 44.59		
X	8	48	56.89	8	58	22.57	9	01	45.55		
A	8	56	00	8	56	00	8	56	00		
A-A	-	7	03.11	+	2	22.57	+	5	45.55		
M(A-A)	-	4	23.04	+	1	42.57	+	3	45.51		
log			2.62638			2.15403			2.53846		
W.S.			9.97216			9.96417			9.97055		
E			1.10578			0.62544			1.01625		
3	-		12.7580	+	4	22.12	+	1	0.3812		
3	-		73	+		18	+		32		
3			5.2347			22.2230			28.3844		
2			5.2384			22.4624			28.4408		
2-3			+ 37			+ 2394			+ 564		
C	+ 20°	20'	43.8	+ 23°	00'	23.0	+ 20°	54'	54.8		
L			43.2			22.3			54.3		
E			43.3			22.0			54.2		
mean	+ 20	20	43.4	+ 23	00	22.4	+ 20	54	54.4		
Proc	-	2	54.9	-	3	02.6	-	3	08.1		
S	+ 20	17	48.5	+ 22	57	19.8	+ 20	51	46.3		
D	+ 21	24	54	+ 21	24	54	+ 21	24	54		
i-1)	- 1	07	05.5	+ 1	32	25.8	-	33	07.7		
teady D)	-	4	02.60	+	5	547.2	-	1	987.8		
eq			3.60487m			3.74408			3.29838m		
q			0.93602m			1.07523			0.62953m		
1m5			9.5680			9.6269			9.5811		
T			22.116			12.509			20.325		
h			88.330			79.312			86.670		
h ₀	-	8	630.2	+	1	1.8914	-	4	261.2		
h	+		681	+		85	+		465		
h			134379			338999			17.7853		
q			13.5476			338140			17.6340		
1-q			1.1097			859			1.513		

	p	$p-c$	$\lambda \sin(p-c)$	$\beta \cos(p-c)$	ϑ	Hayn's Wor.	Hayn	Resid.
1	215	200	+1.4	+5.1	-6.2	-0.2	-1.8	+0
2	227	212	+2.1	+4.6	-6.4	0.0	0	+9
3	234	219	+2.5	+4.2	-6.4	+0.3	+2.8	+1.4
4	263	248	+3.7	+2.0	-5.3	0.0	0	-9
5	270	255	+3.9	+1.4	-5.0	+1.6	+1.47	+3.1
6	290	275	+4.0	-0.5	-3.2	-0.5	-4.6	-1.4
7	312	297	+3.6	-2.5	-0.8	+0.9	+8.3	+5.2
8	324	309	+3.1	-3.4	+0.6	+0.8	+7.4	+1.4
9	344	329	+2.1	-4.6	+2.8	-2.0	-18.4	-1.4
10	0	345	+1.0	-5.2	+4.5	+0.4	+3.7	+4.2
11	11	356	+0.8	-5.3	+5.3	+0.4	+3.7	+6.5

$$\begin{aligned}\lambda &= -4.0 \\ \beta &= -5.4 \\ c &= 1.5\end{aligned}$$

$0-c$	$p-c$	ϑ	$0-c$
+2.7	200	-3.4	-4.6
+9	212	-2.2	+9
+11.3	219	-1.4	+13.2
-9.9	248	+2.0	-1.7
-11.6	255	+2.8	+3
-10.1	275	+4.8	-15.6
-3.0	297	+6.4	+5.3
+7.4	309	+6.8	+2.9
+3.7	329	+7.0	-2.8
+5	345	+6.5	+5
+2.3	356	+5.9	+2.3

	$0-c$	Hayn	new $0-c$
+2.88			
-3.46			
Average - 5.82			
1	+1.9	+5.5	-3.6
2	+9	0	+9
3	+13.5	+9	+12.6
4	-12.5	+1.8	-14.3
5	0	+2.8	-2.8
6	-18.8	+9	-19.7
7	+9	0	+9
8	+10.3	+11.9	-1.6
9	-16.7	-11.9	-4.8
10	+9	+3.7	-2.8
11	+3.4	+3.7	-3

3008

Moon's Center

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 (y - y_0)^2$	$0 - c$
1	183528	-12282	15085	46287	+19
2	180000	-15810	24996	46277	+9
3	178367	-17443	30426	46403	+135
4	174492	-21318	45446	46143	-125
5	174300	-21510	46268	46268	0
6	175645	-20165	40663	46080	-188
7	180000	-15810	24996	46277	+9
8	183069	-12741	16234	46371	+103
9	190000	05810	03376	46101	-167
10	195810	00000	00000	46277	+9
11	200000	04190	01756	46302	+34

Comp R^2 4.6268

	y	$y - y_0$	$(y - y_0)^2$
1	184976	-17664	31202
2	188052	-14588	21281
3	190000	-12640	15977
4	200000	02640	00697
5	202640	00000	00000
6	210000	07360	05417
7	217228	14588	21281
8	220000	17360	30137
9	223310	20670	42725
10	224152	21512	46277
11	223746	21106	44546

Approx Center $x = 18.0$ $y = 18.8052$ $y = \frac{217228}{10} = 21.7228$ 40.5280 mean $y = 20.2640$ $y - \text{mean} = 22.4152$ $R = 2.1512$ $2 - \text{min} = 17.4300$ $X = 19.5812$ Center $\left\{ \begin{array}{l} x_0 = 19.5810 \\ y_0 = 20.2640 \end{array} \right.$

3008 Linear Center

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	18.3528	-1.2282	1.5085	4.6287	+1.9
2	18.0000	-1.5810	2.4996	4.6277	-1.9
3	17.8367	-1.7443	3.0426	4.6403	+1.35
4	17.4492	-2.1318	4.5446	4.6143	-1.25
5	17.4300	-2.1510	4.6268	4.6268	0
6	18.5645	-2.0165	4.0663	4.6080	-1.88
7	18.0000	-1.5810	2.4996	4.6277	+1.9
8	18.3069	-1.2741	1.6234	4.6371	+1.03
9	19.0000	-0.5810	0.3376	4.6101	-1.67
10	19.8100	0.0000	0.0000	4.6277	+1.9
11	20.0000	0.4190	0.1756	4.6302	+3.4

Comp $R^2 = 4.6268$

	y	$y - y_0$	$(y - y_0)^2$
1	18.4976	-1.7664	3.1202
2	18.8052	-1.4588	2.1281
3	19.0000	-1.2640	1.5947
4	20.0000	-0.2640	0.0697
5	20.2640	0.0000	0.0000
6	21.0000	0.7360	0.5417
7	21.7228	1.4588	2.1281
8	22.0000	1.7360	3.0137
9	22.3310	2.0670	4.2725
10	22.4152	2.1512	4.6277
11	22.3746	2.1106	4.4546

Approx Center $x = 18.0$ $y = 18.8052$

$$y = \frac{21.7228}{4} = 5.4307$$

$$\text{mean } y = 20.2640$$

$$y_{\text{max}} = 22.4152$$

$$y_{\text{min}} = 17.4300$$

$$x = 19.5812$$

$$\text{Center } \begin{cases} x_0 = 19.5810 \\ y_0 = 20.2640 \end{cases}$$

Formation of Novae

With Hayn's Correction

	ab	dm				
1	+ 2.18	- 23.4	- 33.6	+ 44.3	+ 63.8	
2	+ 2.31	- 14.2	- 13.1	- 14.2	- 13.1	
3	+ 2.19	- 235.0	- 170.0	- 219.5	- 159.0	
4	+ 0.55	+ 266.0	+ 32.6	+ 304.5	+ 37.2	
5	- 0.00	- 0.0	+ 0.0	+ 60.3	- 0.0	
6	- 1.49	+ 380.0	- 139.0	+ 398.0	- 145.8	
7	- 2.31	- 14.2	+ 13.1	- 14.2	+ 13.1	
8	- 2.21	- 131.0	+ 179.2	+ 20.3	- 27.8	
9	- 1.20	+ 96.9	- 345.5	+ 27.8	- 99.5	
10	+ 0.00	+ 0.0	+ 19.3	- 6.0	- 60.3	
11	+ 0.89	+ 14.3	+ 71.8	- 1.3	- 6.3	
	+ 0.91	+ 339.4	- 385.2	+ 606.0	- 397.7	

With Hayn's Correction

	O		C	O - C
1	- 36	- 31 + 29 =	- 2	- 34
2	+ 9	- 39 + 24 =	- 15	+ 24
3	+ 126	- 43 + 20 =	- 23	+ 149
4	- 143	- 53 + 4 =	- 49	- 94
5	- 28	- 54 - 0 =	- 54	+ 26
6	- 197	- 50 - 12 =	- 62	- 135
7	+ 9	- 39 - 24 =	- 63	+ 72
8	- 16	- 32 - 28 =	- 60	+ 44
9	- 48	- 14 - 34 =	- 48	0
10	- 28	+ 0 - 35 =	- 35	+ 7
11	- 3	+ 10 - 34 =	- 24	+ 21

+ 343 - 263
Average = 55

3008

Moon's Center

Conditional Equations

	a	b	0	c	0-c
1	-1.23	-1.77	+19	-17 + 27 = +10	+9
2	-1.58	-1.46	+9	-22 + 22 = 0	+9
3	-1.74	-1.26	+135	-25 + 19 = -6	+141
4	-2.13	-0.26	-125	-30 + 4 = -26	-99
5	-2.15	+0.00	0	-31 - 0 = -31	+31
6	-2.02	+0.74	-188	-29 - 12 = -41	-147
7	-1.58	-1.46	+9	-22 - 22 = -44	+53
8	-1.27	+1.74	+103	-18 - 27 = -45	+148
9	-0.58	+2.07	-167	-8 - 32 = -40	-147
10	+0.00	+2.15	+9	+0 - 33 = -33	+42
11	+0.42	+2.11	+39	+6 - 32 = -26	+60

+493 - 393

Average 81

Normal Equations

$$+24.92 + 0.91 = +339 \quad (+606)$$

$$+0.91 + 25.95 = -385 \quad (-398)$$

$$-0.91 - 0.03 = -12 \quad (-22)$$

$$+25.92 = -397 \quad (-420)$$

$$b = -15.3 \quad (-16.2)$$

$$+24.92 = +339 + 14 = +353$$

$$(+606 + 15 = +621)$$

$$a = +14.2 \quad (+24.9)$$

$$\text{Arc measured} = 156^\circ \quad \text{Average } (0-c) = +9$$

$$\frac{pc}{m} = 0.18$$

$$+\frac{9}{18} = +0.50$$

$$\Delta n = +0.6$$

3008

Proxima Centauri

Conditional Equations

	a	b	0	c	0-c
1	-1.23	-1.77	+19	-17 + 27 = +10	+9
2	-1.58	-1.46	+9	-22 + 22 = 0	+9
3	-1.79	-1.26	+135	-25 + 19 = -6	+141
4	-2.13	-0.26	-125	-30 + 4 = -26	-99
5	-2.15	+0.00	0	-31 - 0 = -31	+31
6	-2.02	+0.74	-188	-29 - 12 = -41	-147
7	-1.58	-1.46	+9	-22 - 22 = -44	+53
8	-1.27	+1.79	+103	-18 - 27 = -45	+148
9	-0.58	+2.07	-167	-8 - 32 = -40	+147
10	+0.00	+2.15	+9	+0 - 33 = -33	+42
11	+0.42	+2.11	+34	+6 - 32 = -26	+60
				-493 = -393	
				Average = 1	

Normal Equations

$$+2492 + 091 = +339$$

$$+ 091 + 2595 = -385$$

$$- 091 - 003 = -12$$

$$+ 2592 = -397$$

$$+ 2492 + 339 + 14 = +353$$

$$b = -1.53$$

$$a = +14.2$$

$$\text{Arc measured} = 1.56^\circ \quad \text{Average } (0-c) = +9$$

$$\frac{pc}{m} = 0.18$$

$$\frac{+9}{18} = -0.50$$

$$Dv = +0.6$$

3005

Red. ad locum aph

 $S_0 + 21 \quad 12$

$$\begin{array}{rcl}
 H + \alpha & 3 & 06 = 46^\circ 30' \\
 W & 18 & 09 \\
 \alpha & 8 & 57 \\
 G & 19 & 30 \\
 G + \alpha & 4 & 27 = 66^\circ 45'
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos S & 9.9696 \\
 L & 0.9107 \\
 (L) & 0.8803
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos (G + \alpha) & 9.5963 \\
 q & 1.0185 \\
 \sin & 9.9632 \\
 \tan S & 9.5887 \\
 \frac{1}{15} & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 (S') & 0.6148 \\
 (S) & 9.3943
 \end{array}$$

$$\begin{array}{rcl}
 & +0.60 \\
 & +0.25 \\
 & +0.97 \\
 \hline
 & +1.82
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin S & 9.5583 \\
 \log (H + \alpha) & 9.8378 \\
 \log & 1.2737 \\
 \sin & 9.8606 \\
 \sec S & 0.0304 \\
 \frac{1}{15} & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 (L') & 0.6698 \\
 (L) & 9.9886
 \end{array}$$

$$\begin{array}{rcl}
 & +4.12 \\
 & +4.68 \\
 & -7.59 \\
 \hline
 & +1.21
 \end{array}$$

2008 Morris Mean Position (1913.0)

$$\begin{array}{r} X_0 = 19.5810 \\ + 7 \\ \hline 19.5817 \end{array} \quad \begin{array}{r} Y_0 = 20.2640 \\ - 8 \\ \hline 20.2632 \end{array}$$

Hagen (19.5822)

From Plate Constants $X = 19.4976$ $Y = 20.3151$
(19.4981)

$$Z = +1.4976 \quad (1.4981) \quad \eta = -1.6849$$

$$\begin{array}{r} \log 3 = 0.17539 \\ \cos 5 = 9.96958 \\ 8.50724 \end{array} \quad \begin{array}{r} (17554) \log \tan 5 = 9.5898 \\ 0.3508 \\ 7.0534 \\ 6.9940 \end{array}$$

$$(X-A) \quad 1.69857 \quad (1.69872)$$

$$A-A \quad +4995 \quad (4997)$$

$$A \quad 8 \quad 56 \quad 00$$

$$X_0 = 8 \quad 56 \quad 49.95 \quad (49.97)$$

$$\text{Red} = +1.82$$

$$X' = 8 \quad 56 \quad 51.77 \quad (51.79) \quad (+-0.1) = -13 \quad 064$$

$$D = +21 \quad 24 \quad 54$$

$$S_0 = +21 \quad 11 \quad 47.6$$

$$\text{Red} = +1.2$$

$$S_1 = +21 \quad 11 \quad 48.8$$

3008 known mean position (1913.0)

$$X_0 = 195810$$

$$Y_0 = 202640$$

$$\Delta X = +7$$

$$\Delta Y = -8$$

$$195817$$

$$202632$$

From Plate Constants $X = 19.4976$ $Y = 20.3151$

$$z = +1.4976$$

$$\eta = -1.6849$$

$$\log z = 0.17539$$

$$\log \eta = 9.5898$$

$$\dots 5 \quad 9.96958$$

$$0.3508$$

$$8.50724$$

$$7.0534$$

$$6.9940$$

$$\mu - A \quad 1.69857$$

$$\eta_1 = +9$$

$$\mu - A \quad +4.995$$

$$\eta_0 = -1.6858$$

$$A \quad 8.5600$$

$$\log \eta_0 = 0.22681$$

$$\alpha \quad 8.564995$$

$$7.33115$$

$$\text{Red} = +1.82$$

$$2.89566$$

$$\alpha' = 8.565179$$

$$(\mu - D) = -1.3064$$

$$D = +21.2454$$

$$S_0 = +21.11476$$

$$\text{Red} = +1.2$$

$$S_1 = +21.11488$$

3008 Lunar Parallax.

$$x' = 8'' 56''' 51.77'' (51.79)''$$

$$\theta = 10 \quad 09 \quad 29.05''$$

$$\theta - x' = +1 \quad 12 \quad 37.28''$$

$$= +18^\circ 09' 19''$$

$$+ \quad \quad \quad 7 \quad 29$$

$$+ 18 \quad 01 \quad 5.0''$$

$$9.95727''$$

$$0.00000$$

$$002187''$$

$$997914''$$

$$f = 43 \quad 37 \quad 30''$$

$$21 \quad 11 \quad 49''$$

$$22 \quad 25 \quad 41''$$

$$9.52640''$$

$$8.24438''$$

$$9.58152''$$

$$0.16170''$$

$$781350''$$

$$s - s' = +22 \quad 22.5''$$

$$\delta = +21 \quad 34 \quad 11.3''$$

$$\text{Hawkins } \delta = +21 \quad 34 \quad 16.1''$$

$$o - c$$

$$\text{with Henry's correction } (-4.8'')$$

$$-4.8''$$

$$(-4.8'')$$

$$\delta = +21^\circ 11' 48.8''^{30}$$

$$\pi = 60' 21.0''$$

$$9.86913''$$

$$8.24438''$$

$$949359''$$

$$003153''$$

$$763863''$$

$$\alpha - \alpha' = +14' 57.54''$$

$$+ 59.84''$$

$$(51.63)''$$

$$\alpha = 8 \quad 57 \quad 51.61''$$

$$\alpha = 8 \quad 57 \quad 50.65''$$

$$+0.96''$$

$$(+0.98'')$$

3008 *Lunar Parallax*

$$\begin{array}{r}
 \alpha' = 8^h 56^m 51.77 \\
 \delta = 10 \quad 09 \quad 29.05 \\
 \alpha - \alpha' = -1 \quad 12 \quad 37.25 \\
 = +18^m 09^s 19''
 \end{array}$$

$$= 7 \quad 29$$

$$+ 18 \quad 09 \quad 50$$

$$\begin{array}{r}
 9.95727 \\
 000000 \\
 002189 \\
 \hline
 997444
 \end{array}$$

$$\delta = 43 \quad 37 \quad 30.4$$

$$21 \quad 11 \quad 49.9$$

$$22 \quad 25 \quad 4.1$$

$$\begin{array}{r}
 9.82640 \\
 824438 \\
 958152 \\
 016120 \\
 \hline
 781350
 \end{array}$$

$$\delta - \delta' = +22 \quad 22.5$$

$$\delta = +21 \quad 34 \quad 11.3$$

$$\text{Hankle's } \delta = +21 \quad 34 \quad 16.1$$

$$O - C$$

$$- 4.8$$

30

$$\delta = +21^{\circ} \quad 11' \quad 49.8''$$

$$\pi = 60' \quad 21.0''$$

$$\begin{array}{r}
 986913 \\
 824438 \\
 949359 \\
 003153 \\
 \hline
 763863
 \end{array}$$

$$\alpha - \alpha' = +14' \quad 57.54$$

$$+ 59.84$$

$$\alpha = 8 \quad 57 \quad 51.61$$

$$\alpha = 8 \quad 57 \quad 50.65$$

$$+ 0.96$$

