

KG  
11366  
4.966

LXXXIX

4589

4619

4620











4589 stars-measures 1915 May 4.

|       | d      | x  | n     | d     | 8 | n     |
|-------|--------|----|-------|-------|---|-------|
| 1/5.9 | 15-005 | 04 | 13859 | 14370 |   | 14848 |
| 1.1   | 07     |    | 13207 | 13430 |   | 4940  |
|       | 14372  |    | 06    | 29    |   | 13918 |

|         |         |         |         |
|---------|---------|---------|---------|
| 15.9367 | .9350   | 9.0944  | .0928   |
| 2/202   | 17330   | 18994   | 17797   |
| 21.5    | 961002  | 1311107 | 1367169 |
| 6054    | 00      | 0607    | 6669    |
| 48      | 47      | 01      | 94      |
| 20.2280 | 2261    | 21.5880 | 5874    |
| 3/330   | 1024141 | 16748   | 18029   |
| 14.5    | 42      | 12527   | 12276   |
| 1345150 | 9465    | 2425    | 7127    |
| 59      |         | 50      | 34      |
| 33.0806 | .0726   | 14.4223 | .4239   |

moon-measures

|        |         |       |
|--------|---------|-------|
| 1/21.0 | 17222   | 19453 |
| 13.8   | 8351    | 18337 |
|        | 4741    | 3939  |
|        | 32      | 40    |
|        | 13.8885 | 8885  |
| 2/20.0 | 17037   | 19402 |
| 14.7   | 929699  | 17142 |
|        | 0299    | 5146  |
|        | 46      | 00    |
|        | 14.7745 | 7745  |

|         |         |
|---------|---------|
| 3/20213 | 19920   |
| 19.8    | 1890000 |
| 15.0    | 9500    |
| 6759    | 39      |
| 29      | .8976   |
| 19.8961 |         |
| 4/19.7  | 19894   |
| 15.6    | 1759091 |
| min     | 9191    |
| in      | 09      |
| 20      | 65      |
| 19.7659 | 7693    |



4589 stars-measures 1915 May 4

|     | d      | x  | n     | d     | x     |
|-----|--------|----|-------|-------|-------|
| 1/2 | 15.001 | 04 | 13859 | 14370 | 17848 |
| 1/4 | 07     |    | 13207 | 13430 | 4940  |
| 1/8 | 14372  |    | 06    | 2920  | 13918 |

|                |              |                |              |
|----------------|--------------|----------------|--------------|
| <u>15.9367</u> | <u>9.350</u> | <u>9.0944</u>  | <u>0.928</u> |
| 202 19036      | 17330        | 18994          | 17797        |
| 205 16755      | 9610         | 13111          | 13671        |
| 6054           | 0002         | 0627           | 6669         |
| 48             | 47           | 01             | 94           |
| <u>20.2280</u> | <u>2261</u>  | <u>21.5880</u> | <u>5877</u>  |
| 330 14261      | 10241        | 14748          | 18029        |
| 145 13451      | 42           | 12527          | 12276        |
| 5950           | 9465         | 2425           | 717          |
|                |              | 50             | 34           |
| <u>33.0806</u> | <u>0726</u>  | <u>14.4223</u> | <u>4239</u>  |

known measures

|      |                |             |
|------|----------------|-------------|
| 1/2  | 17222          | 19453       |
| 1/4  | 8351           | 18337       |
| 1/8  | 47+1           | 3739        |
|      | 32             | 49          |
|      | <u>13.8885</u> | <u>6885</u> |
| 2    | 17037          | 19402       |
| 100  | 9296           | 17142       |
| 14.7 | 0299           | 5146        |
|      | 46             | 00          |
|      | <u>14.7745</u> | <u>7745</u> |

|      |                |             |
|------|----------------|-------------|
| 2    | 20212          | 19920       |
| 178  | 11272          | 18902       |
| 110  | 6759           | 9500        |
|      | 29             | 39          |
|      | <u>198961</u>  | <u>8976</u> |
| 4    | 19255          | 19894       |
| 19.7 | 11591          | 17590       |
| 15.6 | 1407           | 9191        |
| min  | 14             | 09          |
| 20   | 65             |             |
|      | <u>19.7659</u> | <u>7693</u> |



4557 Quasar measures (cont.) 1915 May 4.

|      | $\alpha$      | $\delta$    | $\mu$ |
|------|---------------|-------------|-------|
| 5    | 18890         | 19888       |       |
| 198  | 11063         | 17711       | 10    |
| 16.0 | 7069          | 09          |       |
|      | 01            | 91          |       |
|      | <u>197832</u> | <u>7821</u> |       |

$$\begin{array}{r} 6 \\ 20.0 \\ 16.6 \end{array}$$

$$\begin{array}{r} 18503 \\ 12056 \\ 5460 \\ 90 \\ \hline 16.6438 \end{array}$$

$$\begin{array}{r} 14966 \\ 11440 \\ 3031 \\ 76 \\ \hline 6464 \end{array}$$

|      |                |             |
|------|----------------|-------------|
| 2    | 19021          | 15885       |
| 20.3 | 16593          | 83203       |
| 170  | 82             | 29          |
|      | 47             | 91          |
|      | <u>20.2442</u> | <u>2438</u> |

$$\begin{array}{r} 8 \\ 21.0 \\ 17.1 \end{array}$$

$$\begin{array}{r} 19390 \\ 14040 \\ 5050 \\ 00 \\ \hline 17.1348 \end{array}$$

$$\begin{array}{r} 17222 \\ 12595 \\ 9190 \\ 30 \\ \hline 5366 \end{array}$$

$$\begin{array}{r} 9 \\ 21.7 \\ 19.6 \\ \text{max} \\ \text{in} \\ \text{4} \end{array}$$

$$\begin{array}{r} 18323 \\ 14591 \\ 754 \\ 15 \\ \hline 17.6735 \end{array}$$

$$\begin{array}{r} 18285 \\ 14972 \\ 7580 \\ 88 \\ \hline 6689 \end{array}$$

$$\begin{array}{r} 16 \\ 22.0 \\ 17.5 \end{array}$$

$$\begin{array}{r} 18298 \\ 11788 \\ 8680 \\ 00 \\ \hline 17.6514 \end{array}$$

$$\begin{array}{r} 18289 \\ 14805 \\ 0096 \\ 84 \\ \hline 6515 \end{array}$$

Density 2



4559 Quon. Measles (cont.) 1915 May 4

|          |               |             |
|----------|---------------|-------------|
| $\Sigma$ | 18890         | 19888       |
| 178      | 11063         | 17711       |
| 160      | 7057          | 0910        |
|          | 01            | 97          |
|          | <u>197832</u> | <u>7821</u> |

~~200~~  
15.4

2

|     |    |    |    |    |      |      |
|-----|----|----|----|----|------|------|
| 10  | 19 | 02 | 1  | 15 | 88   | 5    |
| 170 | 16 | 59 | 37 | 9  | 83   | 2032 |
|     |    | 82 |    |    | 29   |      |
|     |    | 47 |    |    | 91   |      |
| 20  | 24 | 42 |    |    | 2428 |      |

25

~~9~~  
 17.6  
 17.6  
 17.6

$$\begin{array}{r} 4 \\ 22 \\ 17.5 \end{array}$$

18503  
 12056  
 5400  
 90  
 166435

$$\begin{array}{r} 14966 \\ 11440 \\ \hline 3031 \\ 76 \\ \hline 6464 \end{array}$$

$$\begin{array}{r} 19390 \\ 17040 \\ \hline 5050 \\ 00 \\ \hline 1715395 \end{array}$$

$$\begin{array}{r} 1723.2 \\ 12595 \\ 9190 \\ 30 \\ \hline 5366 \end{array}$$

$$\begin{array}{r} 18323 \\ 1459184 \\ \underline{75} \\ 15 \\ \hline 176735 \end{array}$$

$$\begin{array}{r} 18285 \\ 1497280 \\ 75 \\ 88 \\ \hline 6689 \end{array}$$

$$\begin{array}{r} 18298 \\ 1178980 \\ 86 \\ 00 \\ \hline 176514 \end{array}$$

$$\begin{array}{r} 18289 \\ 14805 \\ \hline 33094 \end{array}$$

Density 2



1  
8  
T

## Times Etc.

4589  
 App. to stars 1914 Jan 10 10<sup>h</sup> 07<sup>m</sup> - 10<sup>h</sup> 19<sup>m</sup>  
 " Moon 10 12 52.9 - 10 12 53.2  
 clock fast 0 017

H. Sid. T. 10 12 52.35  $\odot - \alpha = +3^h 33$   
 H. hor. 4 44 31.05  
 S. Sid. T. 14 57 22.40  
 Sid. T. in Moon 19 16 39.21  
 Interval 19 40 43.19  
 Red. 3 13.43  
 S. M. T. 19 37 29.76

From Kantaleu

Moon 19<sup>h</sup>position in 1<sup>m</sup> 2.5660

" 37.496

Tabular Place.

R. A. Dec.  
 6<sup>h</sup> 37<sup>m</sup> 52.85 +27° 53' 40.6  
 3.483  
 +1 36.21 - 2 08.7  
 6 39 29.06 +27 51 31.9

Moon's age 15 days (before full)

parallax 58' 02.57

semidiameter 15 50.5

R

950.5

Augmentation

+ 11.6

Irradiation (2)

- 0.1

R

962.0

R

2,062.2

AR

- 989

(1+AR)

1963.3

R2

3,854.6

934 = 11.2

950.5 = 11.6

a = -503.7

2x

479.7



45-89 Times etc.  
 1914 Jan 10 10 07<sup>m</sup> - 10<sup>m</sup> 19<sup>m</sup>  
 Moon 10 12 52.9 - 10 12 53.2  
 clock fast 0 017

H. Sid T. 10 12 52.35 @ - X: + 3<sup>m</sup> 33  
 H. long 4 44 31.05  
 S. Sid T. 14 57 22.40  
 Sid T. in Moon 14 16 39.21  
 Interval 19 40 43.19  
 Red. 3 13.43  
 S. in T. 19 37 29.76

From hand tables  
 Moon 19<sup>m</sup> 37.496  
 Moon in 1<sup>m</sup> 2.5660  
 Tabular Place. 6 39 29.06 + 27 51 31.9  
 R.A. 6 37 52.85 + 27 53 40.6  
 Red. 3.433  
 +1 36.21 - 2 08.7

lunar's age 14 days (before full)

938 = 11.2  
 9505 = 11.6

parallel 7.5 02.57  
 meridians 15 50.5  
 R 9.50.5  
 Augmentation 1 1.6  
 Irradiation 2 0.1  
 R 9 62.0  
 R 2.0622  
 al 9 89  
 (in al 1 9633  
 R2 3.8546

2 = -1037  
 61  
 7777



4589

## Plate Constants

4

|        |         |         |         |
|--------|---------|---------|---------|
| x      | 159358  | 20.2270 | 33.0791 |
| z      | 16.2169 | 20.7467 | 34.2334 |
| 2-z    | -2811   | -5197   | -1.1543 |
| y      | 90936   | 21.5877 | 14.4231 |
| $\eta$ | 8.7993  | 21.9181 | 14.3710 |
| y-z    | +2943   | -3304   | +521    |

$$\begin{array}{rcll}
 x-z & +500x & +17.9y & +3.7x & -5378 \\
 -2811 + 7968 & = +5157 & +152 & +5319 + 59 & +5378 & = 0 \\
 -5197 + 10114 & = +4917 & +386 & +5303 + 75 & +5378 & = 0 \\
 -11543 + 16540 & +4997 & +258 & +5255 + 123 & +5378 & = 0 \\
 217260 + 10863 & +281 & +80 & & & = 223106
 \end{array}$$

$$\begin{array}{rcll}
 y-\eta & +500y & -15.5x & +5.5y & -7288 \\
 +2943 + 4547 & = +7490 & -252 & +7238 + 50 & +7288 & = 0 \\
 -3304 + 10794 & = +7490 & -320 & +7170 + 118 & +7288 & = 0 \\
 +521 + 7212 & = +7733 & -523 & +7210 + 79 & +7289 & = -1 \\
 157099 + 7855 & -343 & +84 & & & = 157407
 \end{array}$$

$$\begin{array}{rcll}
 \text{Tables } a & = -2.0 & e & = -1.2 & a-b & +0.8 & f+d & = -2.8 \\
 \text{Abs.} & = -503.7 & & = -505.5 & & = +1.8 & & = -2.1 \\
 b-e & -501.7 & & -507.3 & & & & +0.7
 \end{array}$$



4589

Plate Constants

4

|   |        |        |        |
|---|--------|--------|--------|
| x | 159358 | 202270 | 330791 |
| y | 162169 | 207467 | 342334 |
| z | -2811  | -5197  | -11543 |

|   |       |        |        |
|---|-------|--------|--------|
| x | 90936 | 215877 | 144231 |
| y | 87993 | 219181 | 143710 |
| z | +2943 | -3304  | +521   |

|        |        |       |       |         |
|--------|--------|-------|-------|---------|
| x-3    | -2000  | +1794 | +571  | -5378   |
| -2811  | -7968  | +5157 | +162  | +5319   |
| -5197  | +12117 | +4917 | +384  | +5203   |
| -11543 | +16540 | +4972 | +2580 | +5255   |
| 217260 | +10863 | +641  | +80   | -233106 |

|       |        |       |       |         |
|-------|--------|-------|-------|---------|
| x-4   | +1004  | -1581 | +553  | -7228   |
| +2943 | +4542  | +7990 | -2527 | +7138   |
| -3304 | +10794 | +7790 | -3207 | +7170   |
| +1721 | +7212  | +7233 | -523  | +7210   |
| +7099 | +7855  | -343  | +84   | +157407 |

1  
2  
3  
4  
5  
6  
7  
8  
9  
10

1  
2  
3  
4  
5  
6  
7  
8  
9  
10

4589-

Moon's Center

5

|        | x        | $x - X_0$ | $\Delta x$ | $(x - X_0)^2$ | $(x - X_0) + (y - Y_0)^2$ | O-C                  |
|--------|----------|-----------|------------|---------------|---------------------------|----------------------|
| 1      | 21.00000 | -0.7300   | -5         | 0.5336        | 3.8544                    | -2                   |
| 2      | 20.00000 | -1.7300   | -3         | 2.9940        | 3.8709                    | +163                 |
| 3      | 19.8968  | -1.8332   | -2         | 3.3614        | 3.8656                    | +110                 |
| 4      | 19.7676  | -1.9624   | 0          | 3.8510        | 3.8510                    | -36 $\frac{1}{4}$ wt |
| 5      | 19.7827  | -1.9473   | +1         | 3.7916        | 3.8751                    | +205                 |
| 6      | 20.00000 | -1.7300   | +3         | 2.9918        | 3.8642                    | +96                  |
| 7      | 20.2440  | -1.4860   | +3         | 2.2073        | 3.8685                    | +139                 |
| 8      | 21.00000 | -0.7300   | +5         | 0.5322        | 3.8610                    | +64                  |
| 9      | 21.7300  | 0.0000    | +5         | 0.0000        | 3.8416                    | -130                 |
| 10     | 22.00000 | +0.2700   | +5         | 0.0732        | 3.8376                    | -170                 |
| 3.8546 |          |           |            |               |                           |                      |

|           | y       | $y - Y_0$ | $\Delta y$ | $(y - Y_0)^2$ |     |
|-----------|---------|-----------|------------|---------------|-----|
| 1         | 13.8885 | -1.8225   | +2         | 3.3208        | 202 |
| 2         | 14.7745 | -0.9365   | +1         | 0.8769        | 242 |
| 3         | 15.0000 | -0.7110   | +1         | 0.5042        | 259 |
| 4         | 15.7110 | 0.0000    | 0          | 0.0000        | 270 |
| 5         | 16.0000 | +0.2890   | -0         | 0.0835        | 278 |
| 6         | 16.6451 | +0.9341   | -1         | 0.8724        | 298 |
| 7         | 17.0000 | +1.2890   | -1         | 1.6612        | 311 |
| 8         | 17.5357 | +1.8247   | -2         | 3.3288        | 338 |
| 9         | 17.6712 | +1.9602   | -2         | 3.8416        | 360 |
| 10        | 17.6514 | +1.9404   | -2         | 3.7644        | 8   |
| Range 166 |         |           |            |               |     |

Approx Center

$$\begin{aligned}
 x &= 21.0 & y &= 13.8885 \\
 & & & \underline{17.5357} \\
 & & & 31.4242 \\
 Y_0 &= 15.7121 \\
 y - \text{max} &= 17.6712 \\
 R &= 1.9602 \\
 x - \text{min} &= 19.7676 \\
 X_0 &= 21.7278
 \end{aligned}$$

$$\begin{aligned}
 x - \text{min} &= 14.7745 \\
 & \underline{16.6451} \\
 & 31.4196 \\
 & 15.7098
 \end{aligned}$$

$$\text{Center} \begin{cases} X_0 = 21.7300 \\ Y_0 = 15.7110 \end{cases}$$



4589-

Unbiased Center

|    | $x$     | $x - X_0$ | $\Delta x$ | $(x - X_0)^2$ | $(x - X_0) + (y - Y_0)$ | $O - C$ |
|----|---------|-----------|------------|---------------|-------------------------|---------|
| 1  | 21.0000 | -0.7300   | -5         | 0.5336        | 3.8544                  | -2      |
| 2  | 20.0000 | -1.7300   | -3         | 2.9940        | 3.8709                  | +1.63   |
| 3  | 19.8968 | -1.8332   | -2         | 3.3614        | 3.8656                  | +1.10   |
| 4  | 19.7676 | -1.9624   | 0          | 3.8510        | 3.8510                  | -3.6    |
| 5  | 19.7827 | -1.9473   | +1         | 3.7916        | 3.8751                  | +2.05   |
| 6  | 20.0000 | -1.7300   | +3         | 2.9918        | 3.8642                  | +9.6    |
| 7  | 20.2440 | -1.4860   | +3         | 2.2073        | 3.8685                  | +1.39   |
| 8  | 22.0000 | -0.7300   | +5         | 0.5322        | 3.8610                  | +6.4    |
| 9  | 21.7300 | 0.0000    | +5         | 0.0000        | 3.8416                  | -1.30   |
| 10 | 22.0000 | +0.2700   | -5         | 0.0732        | 3.8376                  | -1.70   |

3.8546

|    | $y$     | $y - Y_0$ | $\Delta y$ | $(y - Y_0)^2$ |      |
|----|---------|-----------|------------|---------------|------|
| 1  | 13.8885 | -1.8225   | +2         | 3.3208        | 2.02 |
| 2  | 14.7745 | -0.9365   | +1         | 0.8769        | 2.42 |
| 3  | 15.0000 | -0.7110   | +1         | 0.5042        | 2.59 |
| 4  | 15.7110 | 0.0000    | 0          | 0.0000        | 2.70 |
| 5  | 16.0000 | +0.2890   | -0         | 0.0835        | 2.78 |
| 6  | 16.6451 | +0.9341   | -1         | 0.8724        | 2.98 |
| 7  | 17.0000 | +1.2890   | -1         | 1.6612        | 3.11 |
| 8  | 17.5357 | +1.8247   | -2         | 3.3288        | 3.38 |
| 9  | 17.6712 | +1.9602   | -2         | 3.8416        | 3.60 |
| 10 | 18.2514 | +2.5408   | -2         | 3.7644        | 8    |

Range 1.66

Approx. Center

$$x = 21.0 \quad y = 13.8885$$

$$\frac{17.5357}{31.4242}$$

$$Y_0 = 15.7121$$

$$y_{\text{max}} = 17.6712$$

$$R = 1.9602$$

$$x_{\text{min}} = 19.7676$$

$$X_0 = 21.7278$$

$$x = 20 \quad y = 14.7745$$

$$\frac{16.6451}{31.4196}$$

$$31.4196$$

$$15.7098$$

$$\text{Center} \left\{ \begin{array}{l} X_0 = 21.7300 \\ Y_0 = 15.7110 \end{array} \right.$$

## Formation of normals

|    |               |                 |                |
|----|---------------|-----------------|----------------|
| 1  | + 1.33        | + 1.5           | + 3.6          |
| 2  | + 1.63        | - 282.0         | - 153.1        |
| 3  | + 1.30        | - 201.5         | - 78.1         |
| 4  | - 0.00        | + 4.4           | - 0.0          |
| 5  | - 0.56        | - 399.5         | + 59.5         |
| 6  | - 1.61        | - 166.0         | + 89.3         |
| 7  | - 1.92        | - 207.3         | + 179.4        |
| 8  | - 1.33        | - 46.7          | + 116.5        |
| 9  | + 0.00        | - 0.0           | - 255.0        |
| 10 | + 0.52        | - 33.0          | - 320.0        |
|    | <u>- 0.64</u> | <u>- 1330.1</u> | <u>- 367.9</u> |

+ 45

| - a  | - b  | + ΔC              |
|------|------|-------------------|
| - 23 | + 20 | + 42 <sup>v</sup> |
| - 55 | + 10 | + 0 <sup>v</sup>  |
| - 58 | + 8  | - 5 <sup>v</sup>  |
| - 63 | - 0  | - 18 <sup>v</sup> |
| - 63 | - 3  | - 21 <sup>v</sup> |
| - 55 | - 10 | - 20 <sup>v</sup> |
| - 48 | - 14 | - 17 <sup>v</sup> |
| - 23 | - 20 | + 2 <sup>v</sup>  |
| + 0  | - 21 | + 24 <sup>v</sup> |
| + 9  | - 21 | + 33 <sup>v</sup> |

## 4589 Conditional Equations

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|    | a     | b     | c    | 0-c              | Corr           |
|----|-------|-------|------|------------------|----------------|
| 1  | -0.73 | -1.82 | -2   | +59 + 42 = +101  | -103 - 61      |
| 2  | -1.73 | -0.94 | +163 | +139 + 22 = +161 | +2 + 2         |
| 3  | -1.83 | -0.71 | +110 | +147 + 16 = +163 | -53 - 58       |
| 4  | -1.96 | +0.00 | -36  | +39 - 0 = +39    | -75 { -46 - 23 |
| 5  | -1.95 | +0.29 | +205 | +157 - 7 = +150  | +55 + 34       |
| 6  | -1.73 | +0.93 | +96  | +139 - 22 = +117 | -21 - 41       |
| 7  | -1.49 | +1.29 | +139 | +120 - 30 = +90  | +49 + 32       |
| 8  | -0.73 | +1.82 | +64  | +59 - 42 = +17   | +47 + 49       |
| 9  | +0.00 | +1.96 | -130 | -0 - 45 = -45    | -85 - 61       |
| 10 | +0.27 | +1.94 | -170 | -22 - 45 = -67   | -103 - 70      |
|    |       |       |      | +153 - 411       |                |

## Normal Equations

Average = 61

$$\begin{aligned}
 +1.673 - 0.64 &= -1330 & -11.88 \\
 -0.64 + 18.25 &= -368 & +4.76 \\
 +0.64 - 0.02 &= -51 & -45 \\
 +18.23 &= -419 & +4.31 \\
 +1.673 &= -1330 - 15 = -1345 & a = -804 - 0.70
 \end{aligned}$$

are measured 1660

$$\frac{A}{n} = .22$$

$$\frac{\Sigma V}{n} = -25.8$$

$$\begin{aligned}
 -2RC &= +2.25 + 45 \\
 &+ 11 \\
 \Delta b &= +0.54 & \Delta \delta &= +0.3 \\
 \Delta a &= -1.58 & \Delta \alpha &= -0.06 \\
 &- 32
 \end{aligned}$$

$$\begin{aligned}
 \Delta R &= -1.9 \\
 \text{Corr} &= -0.6 \\
 \Delta R &= -0.8
 \end{aligned}$$



# Conditional Equations

|    | 0                 | C             | 0-C       |
|----|-------------------|---------------|-----------|
| 1  | -0.73 -1.825 -2   | +59 +42 +101  | -109      |
| 2  | -1.73 -0.94 +1163 | +139 +22 +161 | +22       |
| 3  | -1.53 -0.71 +1110 | +147 +16 +163 | -53       |
| 4  | -1.96 +0.00 -36   | +39 -0 +39    | -46 (100) |
| 5  | -1.95 +0.29 +205  | +157 -7 +150  | +55       |
| 6  | -1.73 +0.93 +96   | +129 -22 +117 | -21       |
| 7  | -1.49 +1.29 +139  | +120 -30 +90  | +49       |
| 8  | -0.73 +1.82 +64   | +59 -42 +17   | -47       |
| 9  | +0.00 +1.96 -130  | -0 -45 -45    | -85       |
| 10 | +0.27 +1.94 -170  | -22 -45 -67   | -113      |

+153 -411

Average: 61

## Normal Equations

$$\begin{aligned}
 +1673 - 0.64 &= -1330 \\
 -0.64 + 1825 &= -368 \\
 +0.64 - 0.02 &= -51 \\
 +1823 &= +19
 \end{aligned}$$

$$b = -229$$

$$+1673 - 1330 + 15 = -1345$$

$$a = -804$$

are measured 166.0

$$\frac{P}{h} = .22$$

$$\frac{24}{h} = 25.8$$

$$\frac{-25.8}{.22} = -117 \quad \Delta R = -1.9$$



$$\begin{array}{r}
 4589 - \\
 X_0 = 21.7300 \\
 \hline
 1a = - \quad 40 \\
 21.7260
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 15.7110 \\
 \hline
 11 \\
 15.7099
 \end{array}$$

From plate constant  $X = 22.3106$   $Y = 15.7407$

$$\bar{z} = +0.3106$$

$$\eta = -2.2593$$

$$\log \bar{z} = 9.49220$$

$$\log \bar{z} = 9.94802$$

$$\log \bar{z} = 8.50724$$

$$(X-A) = 1.03694$$

$$X-A = +10.89$$

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

$$q_0 = 6 \quad 36 \quad 50.89$$

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

$$x' = 6 \quad 36 \quad 52.88$$

$$\log \tan \delta = 9.7072$$

$$\log \bar{z} = 8.9844$$

$$\begin{array}{r}
 70534 \\
 \hline
 5.7450
 \end{array}$$

$$\eta_0 = + \quad 1$$

$$\eta_0 = -2.2594$$

$$\begin{array}{r}
 \log \eta_0 = 0.35400 \\
 7.83115
 \end{array}$$

$$(D-D) = 3.02285$$

$$S-D = - \quad 17 \quad 34$$

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

$$S_0 = +27 \quad 28 \quad 36$$

$$\text{Red} = + \quad 70$$

$$S' = +27 \quad 28 \quad 43.0$$

0.5 1.5 2.5 3.5

1.0 1.5 2.0 2.5 3.0 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

1.0 1.5 2.0 2.5 3.0 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

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0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

0.5 1.5 2.5 3.5

4589-

$$X_0 = 217200$$

$$a = \frac{140}{217260}$$

$$Y_0 = 157110$$

$$b = \frac{11}{157099}$$

$$\text{Flamiglate transit } X = 223106 \quad Y = 157407$$

$$Z = +03106$$

$$Z = -22593$$

$$\log S = 9.49220$$

$$\log S = 9.9 + 802$$

$$8.50724$$

$$\log 1 \text{ au } S = 9.7072$$

$$S = 89844$$

$$\frac{70234}{57450}$$

$$(X-A) 103694$$

$$Z_1 = +1$$

$$Z = -22594$$

$$\lambda - A = +10.59$$

$$\log Z_1 = 0.35 + 002$$

$$7.33115$$

$$A \quad 6 \quad 26 \quad 40$$

$$q_0 \quad 6 \quad 26 \quad 50.89$$

$$(D-D) = 302285$$

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

$$D-D = -17.34$$

$$q' \quad 6 \quad 26 \quad 52.88$$

$$D = +27.46 \quad 10$$

$$S = +27.28 \quad 36$$

$$\text{Red} \quad + \quad 7.0$$

$$S' = +27.28 \quad 43.0$$











4589

Lunar Parallax

$$\begin{array}{r}
 \alpha' = 6 \quad 36 \quad 52 \quad 88 \\
 \ominus \quad 10 \quad 12 \quad 51 \quad 35 \\
 + 3 \quad 35 \quad 58 \quad 47 \\
 + \quad 53^\circ \quad 59' \quad 37'
 \end{array}$$

$$+ \quad \quad \quad 19 \quad 39$$

$$T \quad 53 \quad 40 \quad 00$$

$$\begin{array}{r}
 995727 \\
 000000 \\
 - 022732 \\
 \hline
 018459
 \end{array}$$

$$S = 56 \quad 49 \quad 32$$

$$27 \quad 28 \quad 42$$

$$29 \quad 20 \quad 49$$

$$\begin{array}{r}
 982640 \\
 822745 \\
 969028 \\
 \hline
 007727 \\
 782140
 \end{array}$$

$$S - S' = \quad + 22 \quad 47.2$$

$$S = +27 \quad 51 \quad 30.2$$

$$\text{ann Eph } S \quad +27 \quad 51 \quad 31.9$$

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

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

$$\text{Inv.} \quad + 0.3$$

$$S - \quad +27 \quad 51 \quad 30.5$$

$$O - C \quad \quad \quad - 1.4$$

$$S' = +27 \quad 28 \quad 43.0$$

$$\pi \quad 58' \quad 02''.57$$

$$\begin{array}{r}
 9.86913 \\
 822745 \\
 9.90792 \\
 \hline
 005350 \\
 8.05800
 \end{array}$$

$$\alpha - \alpha' = +39 \quad 17.42$$

$$= + \quad 2^{\text{h}} \quad 37^{\text{m}} \quad 16^{\text{s}}$$

$$\alpha \quad 6 \quad 39 \quad 30.04$$

$$\alpha \quad 6 \quad 39 \quad 29.06$$

$$+ 0.98$$

$$\text{curr.} \quad - 0.01$$

$$\text{Inv.} \quad - 0.06$$

$$\alpha: \quad 6 \quad 39 \quad 29.98$$

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



4589

Lunar Parallax

$\alpha$  6 36 52.55  
 $\delta$  10 12 51.35  
 $+3$  35 58.47  
 $\tau$  53° 59' 37"

 $S = +27$   $W = 43.0$  $\pi$  58' 02.57 $\tau$  19 39 $\tau$  53 40 00

995727

000000

022732

018459

986913

822745

990792

005352

8.05800

 $\alpha - \delta = +39$  17.42 $\tau + 2$  37.16 $S = 56$  49 32

27 28 42

29 30 49

982640

822745

969028

007727

782140

 $S - S' = +27$  17.2 $S + 27$  51 30.2Ampl.  $S + 27$  51 31.9 $O - C = -1.7$ Curv.  $+0.6$ Inv.  $+0.3$  $\tau = +27$  51 30.8 $O - C = -1.4$  $\alpha$  6 39 30.04 $\alpha$  6 39 29.06 $+0.98$ Curv.  $-0.01$ Inv.  $-0.16$  $\alpha$  6 39 29.98 $O - C = +0.92$









4  
1  
11  
10  
2  
27  
53  
3  
28  
24  
1  
21  
13  
10  
2  
2  
13  
3  
2  
1

4619

d

x

Star-measures

1915 May 5.

11

1 18537  
 11.8 10441.51  
 10.6 50  
 58  
118107

20457  
 1854559  
 60  
 46 ✓  
.8401

18859  
 11868  
 65-65  
 80  
15.7008

20185  
 17180  
 9288  
 71  
.7006

2 12431  
 55 1175240  
 45  
27.0685

1385750  
 49  
 13170  
.0682

17189  
 12989  
 7584  
 41  
5.4160

20416  
 14568  
 6161  
 12  
4149

3 10337  
 245 9998  
 9389  
 20  
28.0344

14550  
 5052  
 14228  
.0323

16928  
 1097073  
 71  
 30  
24.5958

20040  
 15989  
 8586  
 20  
15.951

Moon-measures.

1 216  
 13.4  
 min  
 in  
 7  
2  
 22.0  
 13.5

16829  
 12940  
 3140  
 45  
13.3898

15699  
 9605  
 9099  
 99  
.3900

15818  
 11441  
 3638  
 30  
13.4385

14994  
 938571  
 71  
 99  
4299

14.0000  
 +

3  
 23.0  
 1405



7619.

Star - measures

1915 May 5.

11

$$\begin{array}{r} 18537 \\ 1181044151 \\ 10650 \\ 58 \\ \hline 118107 \end{array}$$

$$\begin{array}{r} 20457 \\ 1854559 \\ 6059 \\ 46 \\ \hline 8401 \end{array}$$

$$\begin{array}{r} 18859 \\ 11868 \\ 65-65 \\ 50 \\ \hline 157008 \end{array}$$

$$\begin{array}{r} 20185 \\ 17180 \\ 9288 \\ 71 \\ \hline 7006 \end{array}$$

$$\begin{array}{r} 12431 \\ 1175240 \\ 45 \\ \hline 270685 \end{array}$$

$$\begin{array}{r} 1385750 \\ 4950 \\ 13170 \\ \hline 0682 \end{array}$$

$$\begin{array}{r} 17189 \\ 12779 \\ 7984 \\ 41 \\ \hline 59160 \end{array}$$

$$\begin{array}{r} 20416 \\ 14548 \\ 6161 \\ 12 \\ \hline 4149 \end{array}$$

$$\begin{array}{r} 10337 \\ 9998 \\ 9387 \\ \hline 280344 \end{array}$$

$$\begin{array}{r} 14550 \\ 505 \\ 14228 \\ \hline 0323 \end{array}$$

$$\begin{array}{r} 16928 \\ 1097073 \\ 71 \\ 30 \\ \hline 245958 \end{array}$$

$$\begin{array}{r} 20040 \\ 15988 \\ 53 \\ 20 \\ \hline 15951 \end{array}$$

Moon - measures

$$\begin{array}{r} 16 \\ 14 \\ \hline 2 \\ 20 \\ 135 \end{array}$$

$$\begin{array}{r} 16829 \\ 12940 \\ 3170 \\ 15 \\ \hline 133898 \end{array}$$

$$\begin{array}{r} 15699 \\ 960 \\ 9099 \\ 99 \\ \hline 13900 \end{array}$$

$$\begin{array}{r} 15818 \\ 11441 \\ 3638 \\ 30 \\ \hline 134385 \end{array}$$

$$\begin{array}{r} 14974 \\ 938571 \\ 71 \\ 99 \\ \hline 4399 \end{array}$$

140000

+

$$\begin{array}{r} 230 \\ 1405 \end{array}$$

2  
2  
1  
  
5  
23  
14  
m  
v  
3  
  
6  
m  
16  
  
7  
23  
16  
  
8  
27  
17

4619 Moon - measures (cont) 1911 May 5. 12

$$\begin{array}{r}
 4 \quad 19149 \\
 23.5 \quad 13965 \\
 15.0 \quad 6871 \\
 \quad 69 \\
 \hline
 23.5 - 191
 \end{array}$$

$$\begin{array}{r}
 16150 \\
 11330 \\
 \quad 30 \\
 \quad 30 \\
 \quad 54 \\
 \hline
 .5178
 \end{array}$$

$$\begin{array}{r}
 5 \quad 19164 \\
 23.6 \quad 13631 \\
 15.4 \quad 3826 \\
 \text{max} \quad 84 \\
 \text{in} \quad 84 \\
 \text{2L} \\
 \hline
 23.55 - 43
 \end{array}$$

$$\begin{array}{r}
 16129 \\
 1168176 \\
 \quad 82 \\
 \quad 39 \\
 \hline
 .5547
 \end{array}$$

$$\begin{array}{r}
 6 \quad 18202 \\
 23.5 \quad 13652 \\
 16.0 \quad 4950 \\
 \quad 25 \\
 \hline
 23.45 - 63
 \end{array}$$

$$\begin{array}{r}
 16100 \\
 1067162 \\
 \quad 69 \\
 \quad 11 \\
 \hline
 .4561
 \end{array}$$

$$\begin{array}{r}
 2 \\
 23.0 \\
 16.7
 \end{array}$$

$$\begin{array}{r}
 18655 \\
 1098990 \\
 \quad 80 \\
 \quad 61 \\
 \hline
 16.7674
 \end{array}$$

$$\begin{array}{r}
 16795 \\
 1444128 \\
 \quad 22 \\
 \quad 99 \\
 \hline
 .7634
 \end{array}$$

$$\begin{array}{r}
 8 \quad 18166 \\
 22.6 \quad 1084960 \\
 17.0 \quad 59 \\
 \quad 86 \\
 \hline
 22.7324
 \end{array}$$

$$\begin{array}{r}
 16521 \\
 1382321 \\
 \quad 28 \\
 \quad 18 \\
 \hline
 .7304
 \end{array}$$

Density 4



4619 *Trices etc* 13 55<sup>m</sup> - 14<sup>m</sup> 07<sup>m</sup> 13  
 Exh to stars 1914 Jan 17, 13<sup>h</sup> 55<sup>m</sup> - 14<sup>m</sup> 07<sup>m</sup>  
 " " moon 14 00 52.1 - 14 00 52.3  
 clock fast 0 02.8

H. sid. T. 14 00 49.4  $\Theta - \alpha = +0^m 51^m$   
 H. long 4 44 31.05  
 Sid. T. 14 45 20.45  
 Sid. T. in hour 19 44 15.12  
 Interval 23 01 05.33  
 Red. 3 46.26  
 S.M.T. 22 57 19.07

Moon 23<sup>h</sup> 13<sup>h</sup> 10<sup>m</sup> 07<sup>s</sup> 05<sup>s</sup> Decl. - 10° 34' 18.7  
 Motion in 1<sup>h</sup> 2.1432 15.824  
 " " -2.682 -5.75 + 42.4  
 Tabular place 13 10 01.30 - 10 33 36.3

Moon's age 22 days

parallel 59 13.17

" semidiam 16 09.7

R = 969.7

Augmentation + 9.9

Irradiation (4) - 0.6

R 979.0

R 20986

AK 1006

(a+1)R 19980

R<sup>2</sup> 39920

934 = 9.2  
 970 = 9.9

a = -503.4

24

479.4



4619 *Thirces & To* 1919 Jan 17 13<sup>h</sup> 55<sup>m</sup> - 14<sup>h</sup> 07<sup>m</sup> 18  
 exp. station  
 moon 14 00 52.1 - 14 00 52.5  
 clock fast 0 02.8

H. high T. 14 00 49.4 0 - 10<sup>m</sup> 51<sup>m</sup>  
 H. low 4 44 31.05  
 S. high T. 18 45 20.45  
 S. low T. 19 44 15.12  
 Interval 23 01 05.33  
 S. high 3 46.26  
 S. low T. 22 57 19.07

*R.A.* *Decl.*  
 Moon 23<sup>h</sup> 13<sup>h</sup> 10<sup>m</sup> 07<sup>s</sup> 05<sup>s</sup> - 10° 34' 18.7  
 Moon 21.532 15.526  
 -2.582 -5.75 T 42.4  
 Tabular place 13 10 01 30 -10 33 36.3

*Moon's age 22 days*

*parallax* 59 13.17  
*sun's* 16 09.7  
*R =* 96.97  
*Augmentation* + 9.9  
*Irregularity (4)* - 0.6  
*R* 979.0  
*R* 2.0986  
*AK* 1006  
*(a+1)R* 19980  
*R<sup>2</sup>* 3.9920

934.92  
 970.99

a - -503.4  
 24  
 479.4

## Curvature

|             |        |                  |            |            |      |
|-------------|--------|------------------|------------|------------|------|
| $S$         | $\eta$ | $\Delta S$       | $-2.9S$    | $+9\eta$   | $-2$ |
| $-1.08 -$   | $2.22$ | $-0 + 3 = +3$    | $-2 = +1$  | $-2 = +1$  |      |
| $+5.20 -$   | $3.05$ | $+28 - 15 = +13$ | $-11 = +2$ | $-11 = +2$ |      |
| $+6.23 +$   | $7.10$ | $+14 - 18 = -4$  | $+6 = +2$  | $+6 = +2$  |      |
| $M -0.58 -$ | $1.59$ | $+2$             | $-2 = -2$  | $-2 = -2$  |      |

|                  |            |         |      |
|------------------|------------|---------|------|
| $\Delta\eta$     | $-4.7\eta$ | $+2.9S$ | $-6$ |
| $-0 + 9 = +9$    | $-3 = +6$  |         |      |
| $-60 + 52 = -8$  | $+15 = +7$ |         |      |
| $+16 - 28 = -12$ | $+18 = +6$ |         |      |
| $+10$            | $-2 = +2$  |         |      |

$\alpha = -0.01$   
 Curve  $\delta = +0.1$

| Reference Stars - Standard Coordinates                                          |     |         |         |     |          |         |     |         |         | 14 |
|---------------------------------------------------------------------------------|-----|---------|---------|-----|----------|---------|-----|---------|---------|----|
| 4619 Capellio. 1781 mag 7.4    Capellio. 1798 mag 7.7    Capellio. 1799 mag 7.2 |     |         |         |     |          |         |     |         |         |    |
| L                                                                               | 13  | 03      | 13.05   | 13  | 11       | 41.63   | 13  | 12      | 12.74   |    |
| L                                                                               |     |         | 07      |     |          | 68      |     |         | 12.83   |    |
| L                                                                               |     |         | 02      |     |          | 60      |     |         | 72      |    |
| mean                                                                            | 13  | 03      | 13.05   | 13  | 11       | 41.64   | 13  | 12      | 12.76   |    |
| Prece                                                                           |     |         | +44.03  |     |          | +44.32  |     |         | +43.94  |    |
| $\alpha$                                                                        | 13  | 03      | 57.08   | 13  | 12       | 25.96   | 13  | 12      | 56.70   |    |
| A                                                                               | 13  | 09      | 40      | 13  | 09       | 40      | 13  | 09      | 40      |    |
| $\alpha-A$                                                                      |     | -5      | 42.92   |     | +2       | 45.96   |     | +3      | 16.20   |    |
| $\sin(\alpha-A)$                                                                |     | -       | 342.88  |     | +1       | 65.96   |     | +1      | 96.69   |    |
| $\log i$                                                                        |     |         | 2.53514 |     |          | 2.22001 |     |         | 2.29378 |    |
| $\log S$                                                                        |     |         | 9.99150 |     |          | 9.98923 |     |         | 9.99323 |    |
| $\log \rho$                                                                     |     |         | 1.03388 |     |          | 0.71648 |     |         | 0.79425 |    |
| $\Sigma$                                                                        |     | -1      | 0.8112  |     | +5       | 2.0558  |     | +6      | 2.266   |    |
| $\Sigma$                                                                        |     | -       | 33      |     | +26      |         |     | +13     |         |    |
| $\Sigma$                                                                        |     |         | 11.1855 |     |          | 27.2084 |     |         | 28.2279 |    |
| $\Sigma$                                                                        |     |         | 11.8104 |     |          | 27.0684 |     |         | 28.0334 |    |
| $2-\Sigma$                                                                      |     |         | +6249   |     |          | -1400   |     |         | -1945   |    |
| $\alpha$                                                                        | -11 | 13      | 35.4    | -12 | 37       | 50.7    | -10 | 01      | 09.3    |    |
| $\Sigma$                                                                        |     |         | 36.0    |     |          | 50.7    |     |         | 09.4    |    |
| $\Sigma$                                                                        |     |         | 35.6    |     |          | 51.0    |     |         | 09.6    |    |
| mean                                                                            | -11 | 13      | 35.7    | -12 | 37       | 50.8    | -10 | 01      | 09.4    |    |
| Prece                                                                           |     | -4      | 29.9    |     | -4       | 26.9    |     | -4      | 26.2    |    |
| $\delta$                                                                        | -11 | 18      | 05.6    | -12 | 42       | 17.7    | -10 | 05      | 35.6    |    |
| D                                                                               | -11 | 00      | 50      | -11 | 00       | 50      | -11 | 00      | 50      |    |
| $\delta-D$                                                                      |     | -17     | 15.6    |     | -1       | 41      |     | +55     | 14.4    |    |
| $\sin(\delta-D)$                                                                |     | -10     | 35.6    |     | -60      | 89.5    |     | +33     | 14.7    |    |
| $\log i$                                                                        |     | 3.01519 |         |     | 3.78458  |         |     | 3.52044 |         |    |
| $\log \rho$                                                                     |     | 0.34634 |         |     | 1.11573  |         |     | 0.85159 |         |    |
| $\log S$                                                                        |     | 9.3007  |         |     | 9.3530   |         |     | 9.2504  |         |    |
| $\Sigma$                                                                        |     | 20678   |         |     | 14330    |         |     | 15885   |         |    |
| $\Sigma$                                                                        |     | 84219   |         |     | 7.8394   |         |     | 7.8923  |         |    |
| $\eta_0$                                                                        |     | -2.2199 |         |     | -13.0536 |         |     | +7.1054 |         |    |
| $\eta_1$                                                                        |     | -264    |         |     | -69      |         |     | -78     |         |    |
| $\eta$                                                                          |     | 15.7537 |         |     | 9.395    |         |     | 25.0976 |         |    |
| $\eta$                                                                          |     | 15.7007 |         |     | 54.154   |         |     | 24.5954 |         |    |
| $\eta-\eta$                                                                     |     | -530    |         |     | +4759    |         |     | -5022   |         |    |



## 4619 Reference Stars - Standard Coordinates

14

Capella 1781 mag. 74 Capella 1794 mag. 77 Capella 1799 mag. 77

|        |    |    |       |      |    |    |       |      |    |    |      |         |
|--------|----|----|-------|------|----|----|-------|------|----|----|------|---------|
| C      | 13 | 03 | 13    | 05   | 13 | 11 | 41    | 63   | 13 | 12 | 12   | 74      |
| L      |    |    | 07    |      |    |    |       | 68   |    |    |      | 12.83   |
| E      |    |    | 02    |      |    |    |       | 60   |    |    |      | 72      |
| Mean   | 13 | 03 | 13    | 05   | 13 | 11 | 41    | 64   | 13 | 12 | 12   | 76      |
| Pro    |    |    | +44   | 03   |    |    | +44   | 32   |    |    |      | 43.94   |
| S      | 13 | 03 | 57    | 08   | 13 | 12 | 25    | 96   | 13 | 12 | 56   | 70      |
| A      | 13 | 09 | 40    |      | 13 | 09 | 40    |      | 13 | 09 | 40   |         |
| S-A    |    | -5 | 97    | 92   |    | +2 | 45    | 96   |    | +3 | 16   | 70      |
| W(4-1) |    |    | 34    | 2.88 |    | +1 | 65    | 96   |    |    | +1   | 96.69   |
| W(4-1) |    |    | 2.5   | 2514 |    |    | 2.2   | 2001 |    |    | 2.2  | 29378   |
| W(4-1) |    |    | 9.99  | 150  |    |    | 9.98  | 923  |    |    | 9.99 | 323     |
| W(4-1) |    |    | 103   | 388  |    |    | 071   | 648  |    |    | 079  | 425     |
| S      |    | -1 | 0.81  | 12   |    | +5 | 20    | 58   |    |    | +6   | 2266    |
| S      |    |    | 33    |      |    | +2 | 26    |      |    |    | +1   | 13      |
| S      |    |    | 11.18 | 55   |    |    | 27.20 | 84   |    |    |      | 24.2279 |
| X      |    |    | 11.81 | 07   |    |    | 270   | 684  |    |    |      | 280334  |
| S-X    |    |    | +6    | 249  |    |    | -1    | 400  |    |    |      | -1945   |

|        |    |    |      |    |    |    |   |    |      |    |    |   |      |    |     |
|--------|----|----|------|----|----|----|---|----|------|----|----|---|------|----|-----|
| Q      | -1 | 10 | 13   | 35 | 4  | -1 | 2 | 37 | 50   | 7  | -1 | 0 | 01   | 09 | 3   |
| L      |    |    |      | 26 | 0  |    |   |    | 50   | 7  |    |   |      |    | 094 |
| S      |    |    |      | 35 | 6  |    |   |    | 51   | 0  |    |   |      |    | 096 |
| Mean   | -1 | 1  | 13   | 35 | 7  | -1 | 2 | 37 | 50   | 8  | -1 | 0 | 01   | 09 | 4   |
| Pro    |    |    | -4   | 25 | 9  |    |   | -4 | 26   | 9  |    |   | -4   | 26 | 2   |
| S      | -1 | 1  | 18   | 04 | 6  | -1 | 2 | 42 | 17   | 7  | -1 | 0 | 05   | 35 | 6   |
| D      | -1 | 1  | 00   | 50 |    | -1 | 1 | 00 | 50   |    | -1 | 1 | 00   | 50 |     |
| S-D    |    |    | -17  | 14 | 6  |    |   | -1 | 41   | 27 |    |   | +55  | 14 | 4   |
| W(4-1) |    |    | -10  | 37 | 6  |    |   |    | -60  | 89 |    |   | +33  | 14 | 7   |
| W(4-1) |    |    | 3.0  | 14 | 77 |    |   |    | 3.7  | 84 |    |   | 3.5  | 20 | 44  |
| W(4-1) |    |    | 0.3  | 45 | 92 |    |   |    | 1.1  | 15 |    |   | 0.8  | 51 | 59  |
| W(4-1) |    |    | 9.30 | 07 |    |    |   |    | 9.35 | 30 |    |   | 9.25 | 04 |     |
| S      |    |    | 20   | 67 | 8  |    |   |    | 14   | 33 |    |   | 15   | 88 | 5   |
| W(4-1) |    |    | 84   | 21 | 9  |    |   |    | 7.8  | 39 |    |   | 7.8  | 92 | 3   |
| S      |    |    | -2.2 | 17 | 8  |    |   |    | -13  | 05 |    |   | +7   | 10 | 54  |
| S      |    |    |      | 26 | 4  |    |   |    |      | 69 |    |   |      | 78 |     |
| S      |    |    | 15.7 | 53 | 8  |    |   |    | 15.9 | 38 |    |   | 25.0 | 97 | 6   |
| S      |    |    | 15   | 70 | 07 |    |   |    | 54   | 15 |    |   | 24   | 59 | 54  |
| S-S    |    |    | -5   | 30 |    |    |   |    | +4   | 75 |    |   | -5   | 02 | 22  |

Plate 4620

3

4619

## Plate Constants

15

| x               | y       | R.A      | Decl.     |
|-----------------|---------|----------|-----------|
| 11.8104         | 15.7007 | 13 03 57 | -11 18 05 |
| 27.0684         | 5.4154  | 12 26    | -12 42 18 |
| 28.0334         | 24.5954 | 12 57    | -10 05 36 |
| 66.91           | 45.71   | 27 14 0  | 65 59     |
| 66.99           | 45.99   | 13 09 47 | -11 22 00 |
| 3   66.95       | 45.85   | -10      | 21 10     |
| 22.32           | 15.28   | 13 09 40 | -11 00 50 |
| -22             | -18     |          |           |
| .32             | 272     |          |           |
| 31              | 4665    |          |           |
| 10 <sup>5</sup> | 1270"   |          |           |
|                 | 21' 10" |          |           |

Center  $\begin{cases} A = 13^h 09^m 40^s \\ D = -11^\circ 00' 50'' \end{cases}$

$$\begin{aligned} x - \bar{x} + 100x & \quad + 34 & \quad + 8.4x & \quad - 12241 \\ + 6249 + 5905 & = + 12154 + 47 & = + 12201 + 40 & = + 12241 & = 0 \\ - 1400 + 13534 & = + 12134 + 16 & = + 12150 + 92 & = + 12242 & = + 1 \\ - 1945 + 14017 & = + 12072 + 74 & = + 12146 + 95 & = + 12241 & = 0 \\ 21.5569 + 10778 & & + 46 & + 73 & = 21.4225 \end{aligned}$$

$$\begin{aligned} y - \bar{y} + 100y & \quad - 2.94 & \quad + 10.14 & \quad + .14 & \quad - 7446 \\ - 530 + 7850 & = + 7320 - 34 & = + 7286 + 159 & = + 7445 + 1 & = + 7446 & = 0 \\ + 4759 + 2708 & = + 7467 - 78 & = + 7389 + 55 & = + 7444 + 3 & = + 7447 & = + 1 \\ - 5022 + 12298 & = + 7276 - 81 & = + 7195 + 248 & = + 7443 + 3 & = + 7446 & = 0 \\ 15.3852 + 7693 & & - 63 & + 155 & + 2 & = 15.4193 \end{aligned}$$

Tabular  $a: -1.0 \quad e: -6.4 \quad a-e: +5.4 \quad b+a: -2.2$   
 Obs  $a: -34 \quad e: +10.1 \quad a-e: +6.7 \quad b+a: -0.2$

899.9

$$b-e \quad -502.7^{\circ} \quad -503.7^{\circ} \quad +2.0^{\circ}$$



4619

## Plate Constants

15

| $x$     | $y$     | R.A.     | Decl.     |
|---------|---------|----------|-----------|
| 11.8104 | 15.7007 | 13 03 57 | -11 18 05 |
| 27.0684 | 54.154  | 12 26    | -12 42 18 |
| 28.0334 | 24.5954 | 12 57    | -10 05 36 |
| 66.91   | 45.71   | 27 14.0  | 65 59     |
| 66.99   | 45.99   | 13 09 47 | -11 22 00 |
| 51.6695 | 45.85   | -10      | 21 10     |
| 22.32   | 15.718  | 13 09 40 | -11 00 50 |
| 1.32    | 2.72    |          |           |
| 31      | 26.61   |          |           |
| 10      | 270     |          |           |
|         | 21° 10" |          |           |

Center  $\left\{ \begin{array}{l} A = 13^{\circ} 09' 40'' \\ D = -11^{\circ} 00' 50'' \end{array} \right.$

$$\begin{array}{rclcl}
 2-3 + 1700x & + 32 & + 3.4x & - 12241 & \\
 + 6249 + 5905x + 12154 + 47 & + 12201 + 40 & + 12241 & = & 0 \\
 - 1400 + 13534 = + 12134 + 16 & + 12150 + 92 & + 12242 & = & + 1 \\
 - 1945 + 14017 = + 12072 + 74 & + 12146 + 95 & + 12241 & = & 0 \\
 21.5569110778 & + 46 & + 73 & = & 21.4225
 \end{array}$$

$$\begin{array}{rclcl}
 4-4 + 100y & - 2.9 & + 10.1x & + 17 & - 7446 \\
 - 530 + 7850 = + 7320 - 34 & + 7286 + 159 & + 7445 + 1 & + 7446 & = 0 \\
 + 4755 + 2708 = + 7467 - 78 & + 7389 + 55 & + 7444 + 3 & + 7447 & = + 1 \\
 - 5022 + 12298 = + 7276 - 81 & + 7195 + 248 & + 7443 + 3 & + 7446 & = 0 \\
 15.3852 + 7693 & - 63 & + 153 & + 2 & = 15.4193
 \end{array}$$

$$\begin{array}{lclcl}
 \text{Tabular: } -1.0 & e = -6.4 & a - a = +5.4 & b + a = +2.2 \\
 \text{Obs } a = -34 & e = +0.1 & a - e = +6.7 & b + a = -0.2
 \end{array}$$

1  
2  
3  
4  
5  
6  
7  
8

4619

## Moon's Center

16

|   | x       | $x - X_0$ | $\Delta x$ | $(x - X_0)^2$ | $(x - X_0)^2 + (y - Y_0)^2$ | $O - C$ |
|---|---------|-----------|------------|---------------|-----------------------------|---------|
| 1 | 21.5620 | 0.0000    | -4         | 0.0000        | 3.9764                      | -1.56   |
| 2 | 22.0000 | +0.4380   | -4         | 0.1915        | 3.9737                      | -1.83   |
| 3 | 23.0000 | +1.4380   | -3         | 2.0670        | 3.9817                      | -1.03   |
| 4 | 23.5184 | +1.9564   | -1         | 3.8271        | 3.9740                      | -1.80   |
| 5 | 23.5545 | +1.9924   | 0          | 3.9697        | 3.9697                      | -2.23   |
| 6 | 23.4562 | +1.8942   | +1         | 3.5887        | 3.9698                      | -2.22   |
| 7 | 23.0000 | +1.4380   | +3         | 2.0687        | 3.9817                      | -1.03   |
| 8 | 22.7314 | +1.1694   | +3         | 1.3682        | 3.9855                      | -1.65   |

$$R^2 = 3.9920$$

|   | y       | $y - Y_0$ | $\Delta y$ | $(y - Y_0)^2$ |        |
|---|---------|-----------|------------|---------------|--------|
| 1 | 13.3899 | -1.9931   | -10        | 3.9764        | 1.80 ✓ |
| 2 | 13.4392 | -1.9438   | -10        | 3.7822        | 1.67 ✓ |
| 3 | 14.0000 | -1.3830   | -7         | 1.9147        | 1.34 ✓ |
| 4 | 15.0000 | -0.3830   | -2         | 0.1469        | 1.01 ✓ |
| 5 | 15.3830 | 0.0000    | 0          | 0.0000        | .90 ✓  |
| 6 | 16.0000 | +0.6170   | +3         | 0.3811        | .72 ✓  |
| 7 | 16.7654 | +1.3824   | +7         | 1.9130        | .46 ✓  |
| 8 | 17.0000 | +1.6170   | +8         | 2.6173        | .36 ✓  |

Range 1.44

## Approx. Center

$$x = 23.0 \quad y = 14.0000$$

$$16.7654$$

$$\hline 30.7654$$

$$Y_0 = 15.3827$$

$$y = \text{min } 13.3899$$

$$R = 1.9928$$

$$x = \text{max } 23.5545$$

$$X_0 = 21.5617$$

$$\text{Center } \begin{cases} X_0 = 21.5620 \\ Y_0 = 15.3830 \end{cases}$$



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Minimum Center

15

|   | x      | $x - X_0$ | $\Delta x$ | $(x - X_0)^2$ | $(x - X_0)(y - Y_0)$ | $y - Y_0$ |
|---|--------|-----------|------------|---------------|----------------------|-----------|
| 1 | 215620 | 00000     | -4         | 00000         | 39764                | -156      |
| 2 | 220000 | +04380    | -4         | 01915         | 39737                | -183      |
| 3 | 230000 | +14380    | -3         | 20670         | 39817                | -103      |
| 4 | 235184 | +19564    | -1         | 38271         | 39740                | -180      |
| 5 | 235545 | +19927    | 0          | 39697         | 39697                | -223      |
| 6 | 234562 | +18942    | +1         | 35887         | 39698                | -222      |
| 7 | 230000 | +14380    | +3         | 20687         | 39817                | -103      |
| 8 | 227317 | +11697    | +3         | 13682         | 39855                | -165      |

R: 3.9920

|   | y      | $y - Y_0$ | $\Delta y$ | $(y - Y_0)^2$ |     |
|---|--------|-----------|------------|---------------|-----|
| 1 | 133899 | -19931    | -10        | 39764         | 180 |
| 2 | 134392 | -19438    | -10        | 37822         | 167 |
| 3 | 140000 | -13830    | -7         | 19147         | 134 |
| 4 | 150000 | -03830    | -2         | 01469         | 101 |
| 5 | 153830 | 00000     | 0          | 00000         | 90  |
| 6 | 160000 | +06170    | +3         | 03811         | 72  |
| 7 | 167654 | +13824    | +7         | 19130         | 46  |
| 8 | 170000 | +16170    | +8         | 26173         | 36  |

Range: 144

Off-axis Center

x = 230000

y = 140000

167654

207654

Y<sub>0</sub> = 153827

y = 133899

R = 1.9928

x = 235545

X<sub>0</sub> = 215617Center } X<sub>0</sub> = 215620  
              Y<sub>0</sub> = 153830

## Formation of normals

|   |               |   |                 |                |
|---|---------------|---|-----------------|----------------|
| 1 | - 000         | - | 0.0             | + 310.5        |
| 2 | - 0.85        | - | 80.5            | + 354.6        |
| 3 | - 1.99        | - | 148.2           | + 142.1        |
| 4 | - 0.75        | - | 352.5           | + 68.5         |
| 5 | + 0.00        | - | 444.0           | - 0.0          |
| 6 | + 1.17        | - | 420.0           | - 137.8        |
| 7 | + 1.99        | - | 148.2           | - 142.1        |
| 8 | + 1.90        | - | 76.0            | - 105.3        |
|   | <u>+ 1.47</u> |   | <u>- 1669.4</u> | <u>+ 490.5</u> |

$\begin{matrix} & 2 \\ +3 & 6 \\ & 39 \\ -5 & \end{matrix}$

| -a   | -b  | + ΔC              |
|------|-----|-------------------|
| + 0  | + 6 | - 10 <sup>v</sup> |
| + 4  | + 6 | - 6 <sup>v</sup>  |
| + 14 | + 4 | + 2 <sup>v</sup>  |
| + 20 | + 1 | + 5 <sup>v</sup>  |
| + 20 | - 0 | + 4 <sup>v</sup>  |
| + 19 | - 2 | + 1 <sup>v</sup>  |
| + 14 | - 4 | - 6 <sup>v</sup>  |
| + 12 | - 5 | - 9 <sup>v</sup>  |

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## Moon's Center (Conditional Equations)

17

|   | $\alpha$ | $\delta$ | $\alpha - \delta$ | Corr. |
|---|----------|----------|-------------------|-------|
| 1 | +0.00    | -1.99    | = -1.99           | -0.86 |
| 2 | +0.44    | -1.94    | = -1.50           | -0.54 |
| 3 | +1.44    | -1.38    | = -0.94           | +1.03 |
| 4 | +1.96    | -0.38    | = -1.58           | +0.35 |
| 5 | +1.99    | +0.00    | = +0.00           | -0.21 |
| 6 | +1.89    | +0.62    | = +0.73           | -0.57 |
| 7 | +1.44    | +1.38    | = +0.94           | -0.17 |
| 8 | +1.47    | +1.62    | = +0.15           | -0.25 |

+1.38 - 2.35  
Average = 47

## Normal Equations

$$+17.08 + 1.47 = -1669 + 10.33$$

$$+ 1.47 + 1.473 = + 490 - 1.77$$

$$- 1.47 - 0.13 = + 144 - 0.89$$

$$+ 14.60 = + 634 - 2.664 = + 43.4 - 0.18$$

$$+ 17.08 = -1669 - 64 = -1733$$

$$1 = -1015 + 0.62$$

Arc measured =  $144^\circ$  Average  $(\alpha - \delta) = -12$

$$\frac{RC}{n} = 12$$

$$\frac{-12}{12} = -1.00 \quad \Delta \alpha = -1.2$$

$$-2 RC = -0.80 - 16$$

+3.

$$\Delta \delta = +0.14 \quad \Delta \delta = +0.1$$

$$\Delta \alpha = -0.50 \quad \Delta \alpha = -0.02$$

-10.

$$\text{Corr} + 0.2$$

$$\Delta R = -1.4$$



4619

## Moon's Center (Orbital) Equations

17

|   |                      | $C$    |     | $C$               | $O-C$  |
|---|----------------------|--------|-----|-------------------|--------|
| 1 | $+0.00 - 199 = -199$ | $-156$ | $-$ | $0 - 86 = -86$    | $-70$  |
| 2 | $+0.44 - 194 = -189$ | $-183$ | $-$ | $41 - 84 = -43$   | $-54$  |
| 3 | $+1.44 - 138 = -103$ | $-103$ | $-$ | $146 - 60 = -206$ | $+102$ |
| 4 | $+1.96 - 038 = -180$ | $-180$ | $-$ | $199 - 16 = -215$ | $+35$  |
| 5 | $+1.99 - 000 = -223$ | $-223$ | $-$ | $202 + 0 = -202$  | $-21$  |
| 6 | $+1.59 - 062 = -222$ | $-222$ | $-$ | $192 + 27 = -165$ | $-57$  |
| 7 | $+1.44 - 138 = -103$ | $-103$ | $-$ | $146 + 60 = -86$  | $-17$  |
| 8 | $+1.47 + 162 = -65$  | $-65$  | $-$ | $119 + 70 = -49$  | $-16$  |

$+138 = 135$   
Average =  $+7$

## Moon's Equation

$$+17.08 + 147 = -1669$$

$$+147 + 1473 = +490$$

$$-147 - 0.13 = +144$$

$$+1460 = +634$$

$$b = +434$$

$$+17.08 = -1669 - 64 = -1732$$

$$a = -1615$$

Arc measured =  $144^\circ$  Average  $(O-C) = +12$

$$\frac{O-C}{n} = 12$$

$$\frac{-12}{12} = -1.00 \quad \Delta n = -1.2$$



4619 Orion's Mean Position (1914.0)

$$\begin{array}{r} X_0 = 21.5620 \\ \frac{1}{2}a = -51 \\ \hline X = 21.5569 \end{array} \quad \begin{array}{r} Y_0 = 15.3830 \\ \frac{1}{2}b = +22 \\ \hline Y = 15.3852 \end{array}$$

From plate constants  $X = 21.4225$   $Y = 15.4193$

$$\begin{aligned} \bar{z} &= -0.5775 \\ \log \bar{z} &= 9.76155m \\ \log S &= 9.99142 \\ &8.50724 \end{aligned}$$

$$\log(A-A) = 1.26289m$$

$$A-A = 18.32$$

$$A = 13 \ 09 \ 40$$

$$X_0 = 13 \ 09 \ 21.68$$

$$\text{Red} = + \ 0.53$$

$$X' = 13 \ 09 \ 22.21$$

$$\eta = -2.5807$$

$$\begin{aligned} \log \tan S &= 9.3020m \\ &9.5231 \\ &7.0534 \\ \hline &5.8785m \end{aligned}$$

$$\eta_1 = -1$$

$$\eta_0 = -2.5806$$

$$\log \eta_0 = 0.41172m$$

$$7.33115$$

$$3.08057m$$

$$S-D = -20 \ 03.8$$

$$D = -11 \ 00 \ 50$$

$$S'_0 = -11 \ 20 \ 53.8$$

$$\text{Red} = -5.0$$

$$S' = -11 \ 20 \ 58.8$$



4619 *Thomsonian Position (1914.0)* 18  
 $X_0 = 21.5620$   $Y_0 = 15.3830$   
 $\Delta X = -0.0051$   $\Delta Y = +0.0022$   
 $X = 21.5569$   $Y = 15.3852$

From plate constants  $X = 21.4225$   $Y = 15.4193$

$\bar{S} = -0.5775$   
 $\log \bar{S} = 9.76155$   
 $\log \tan \delta = 9.99142$   
 $8.50724$

$(\alpha - A) = 1.26289$

$\alpha - A = 18.32$

$A = 13.0940$

$\alpha_0 = 13.092168$

$\text{Red} = +0.53$

$\alpha' = 13.092221$

$\eta = -2.5807$

$\log \tan \delta = 9.3020$   
 $9.5231$   
 $7.2532$   
 $5.8785$

$\eta_1 = -1$

$\eta_0 = -2.5806$

$\log \eta_0 = 0.41172$   
 $7.33115$

$3.08057$

$S - D = -20.038$

$D = -11.0050$

$S_0 = -11.20538$

$\text{Red} = -50$

$S = -11.20588$

$$\begin{array}{r}
 13 \quad 05 \quad 30.33 \\
 \underline{29.73} \\
 +0.60
 \end{array}$$

$$\begin{array}{r}
 -5 \quad 04 \quad 55.6 \\
 \underline{48.5} \\
 -7.1
 \end{array}$$

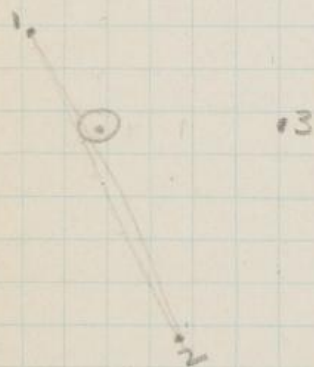
$$\begin{array}{r}
 13 \quad 14 \quad 14.98 \\
 \underline{.57} \\
 +0.41
 \end{array}$$

$$\begin{array}{r}
 -22 \quad 43 \quad 06.2 \\
 \underline{05.0} \\
 +01.2
 \end{array}$$

$$\begin{array}{r}
 13 \quad 20 \quad 40.09 \\
 \underline{39.62} \\
 +0.47
 \end{array}$$

$$\begin{array}{r}
 -10 \quad 42 \quad 51.3 \\
 \underline{45.6} \\
 -5.7
 \end{array}$$

5 10 15 20



0

-5

-10

-15

-20

-25

4619

Red. ad locum aph.

S

 $-11^{\circ} 20' 53.8''$ 

19

$$\begin{array}{rcl}
 H + \alpha & 1.1 & 27.1 = 171^{\circ} 46'' \\
 H & 22 & 17.7 \\
 \alpha & 13 & 09.4 \\
 g & 19 & 11.1 \\
 g + \alpha & 8 & 20.5 = 125^{\circ} 8''
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(H + \alpha) & & 9.96000 \\
 8 & & 0.9593 \\
 \sin & & 9.9527 \\
 \tan S & & 9.3026 \\
 \pm & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 8' & & 0.7193 \\
 8 & & 8.9985
 \end{array}$$

$$\begin{array}{rcl}
 f & +0.43 \\
 g & -0.10 \\
 h & +0.20 \\
 \hline
 & +0.53
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos S & & 9.9914 \\
 2 & & 0.5757 \\
 \hline
 & & 0.5671 \\
 \log \sin S & & 9.2940 \\
 \cos(H + \alpha) & & 9.9955 \\
 h & & 1.3036 \\
 \sin & & 9.1560 \\
 \sec S & & 0.0086 \\
 & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 h' & & 0.5931 \\
 h & & 9.2921
 \end{array}$$

$$\begin{array}{rcl}
 g' & & -5.24 \\
 h' & & +3.92 \\
 l & & -3.69 \\
 \hline
 & & -5.01
 \end{array}$$

S =  $-11^{\circ} 20' 53.8''$ 

$$\begin{array}{rcl}
 H + \alpha & & \\
 H & 22 & 17.7 \\
 \alpha & 13 & 09.4 \\
 g & & \\
 g + \alpha & &
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(H + \alpha) & & \\
 8 & & \\
 \sin & & \\
 \tan S & & 9.3026 \\
 & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 8' & & \\
 8 & &
 \end{array}$$

$$\begin{array}{rcl}
 f & & \\
 g & & \\
 h & &
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos S & & 9.9914 \\
 & & \\
 \log \sin S & & 9.2940 \\
 \cos(H + \alpha) & & \\
 h & & \\
 \sin & & \\
 \sec S & & 0.0086 \\
 & & 8.8239
 \end{array}$$

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

$$\begin{array}{rcl}
 g' & & \\
 h' & & \\
 l' & &
 \end{array}$$



4619

Red and brown sph.

S - 11° 20' 53" 8

H+α 18 27.1 = 171° 46"  
 H 22 17.7  
 α 13 09.4  
 β 19 11.1  
 g+α 8 20.5 = 125° 8'

log cos(β+α) 9.76000  
 8 0.7593  
 sum 99.127  
 1000 930.26  
 88239

8' 0.7193  
 8 8.99.85

f +0.43  
 8 -0.10  
 h +0.20

+0.53

log cos S 9.9914  
 2 0.5757  
 0.5671  
 log cos S 9.2940  
 cos(H+α) 9.9955  
 2 1.3036  
 sum 91.560  
 1000 0.0086  
 88239

h' 0.5931  
 h 9.2921

-524  
 +392  
 -369  
 -501

S = -11° 20' 53" 8

H+α

H 22 17.7  
 α 13 09.4  
 β

g+α

log cos(β+α)  
 8  
 sum  
 1000 930.26  
 88239

8  
 8

f  
 8  
 h

log cos S 9.9914  
 2  
 log cos S 9.2940  
 cos(H+α)  
 h  
 sum  
 1000 0.0086  
 88239

h'  
 h

8'  
 h  
 h



## Lunar Parallax

$$\begin{array}{r}
 4619 \\
 \alpha' = 13^h 09^m 22.21 \\
 \Theta = 14 \quad 00 \quad 49.4 \\
 \Theta - \alpha' = +51 \quad 27.2 \\
 = +12^\circ 51' 48''
 \end{array}$$

$$+ \quad \quad \quad 4 \quad 58$$

$$+ 12 \quad 46 \quad 50$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 \hline
 0.01089 \\
 9.96816
 \end{array}$$

$$\gamma = +42^\circ 54' 05''$$

$$- 11 \quad 20 \quad 59$$

$$54 \quad 15 \quad 04$$

$$\begin{array}{r}
 9.82640 \\
 8.23617 \\
 9.90934 \\
 \hline
 0.16702 \\
 8.13893
 \end{array}$$

$$\delta - \delta' = +47 \quad 20.3$$

$$\delta = -10 \quad 33 \quad 38.5$$

$$\text{Amplitude } \delta = -10 \quad 33 \quad 36.3$$

$$O-C \quad \quad \quad - 2.2$$

$$\begin{array}{rcl}
 \text{curr.} & + & 0.1 \\
 \text{2nd ord. ref.} & + & 0.1 \\
 \text{Inv} & + & 0.1 \\
 \delta = & -10 & 33 \quad 38.3 \\
 O-C & - & 2.0
 \end{array}$$

$$\delta' = -11^\circ 20' 58.8''$$

$$\Pi = 59' 13.17$$

$$\begin{array}{r}
 9.86913 \\
 8.23617 \\
 9.34758 \\
 \hline
 0.00742 \\
 7.46030
 \end{array}$$

$$\alpha - \alpha' = +9' 55.29$$

$$+ 39.69$$

$$a \quad 13 \quad 10 \quad 01.90$$

$$a = 13 \quad 10 \quad 01.30$$

$$+ 0.60$$

$$\begin{array}{rcl}
 \text{curr.} & - & 0.01 \\
 \text{Inv} & - & 0.02 \\
 a = & 13 & 10 \quad 01.88
 \end{array}$$

$$O-C \quad \quad \quad + 0.58$$



4619

Lunar Parallax

20

$$\alpha' = 18^h 09^m 22.21$$

$$\delta = 14^{\circ} 00' 49.4''$$

$$O-\alpha = +51' 27.2''$$

$$= +12^{\circ} 51' 48''$$

$$+ \quad + 58''$$

$$+ 12' 4'' = 50''$$

$$995727$$

$$000000$$

$$001029$$

$$996816$$

$$\gamma = 742^{\circ} 54' 0.5''$$

$$- 11' 20' 59''$$

$$54' 15' 0.4''$$

$$982640$$

$$823617$$

$$990934$$

$$016702$$

$$813893$$

$$\delta - \delta' = +47' 20.3''$$

$$\delta = -10' 33' 38.5''$$

$$\text{Am. Eph. } \delta = -10' 33' 36.3''$$

$$O-C$$

$$- 2.2$$

$$+ 0.1$$

2nd Pro Ref:

$$+ 0.1$$

2nd

$$+ 0.1$$

$$T = -10' 33' 38.3''$$

$$O-C$$

$$- 2.0$$

$$\delta = -11^{\circ} 20' 58.8''$$

$$\Pi = 59' 13.17''$$

$$986913$$

$$823617$$

$$934758$$

$$000742$$

$$796030$$

$$\alpha - \alpha' = +9' 55.29''$$

$$+ 39.69''$$

$$a = 13' 10' 01.90''$$

$$a = 13' 10' 01.30''$$

$$+ 0.60$$

$$\text{Carr.} = 0.01$$

$$\text{2nd} = 0.12$$

$$a = 13' 11' 01.88''$$

$$O-C = +0.58$$



4620 x Stars-Measures

$$\begin{array}{r}
 d \\
 19360 \\
 11.8 \quad 10750 \\
 5.5 \quad 4948 \\
 \quad 40 \\
 \hline
 15.8594
 \end{array}
 \quad
 \begin{array}{r}
 n \\
 19638 \\
 18220 \\
 1010 \\
 30 \\
 \hline
 .8576
 \end{array}$$

$$\begin{array}{r}
 2 \\
 27.0 \quad 13489 \\
 5.5 \quad 13150 \\
 \quad 4947 \\
 \hline
 27.0340
 \end{array}
 \quad
 \begin{array}{r}
 1357480 \\
 76 \\
 13240 \\
 \hline
 0337
 \end{array}$$

$$\begin{array}{r}
 2 \\
 28.1 \quad 10439 \\
 24.6 \quad 930097 \\
 \quad 9197 \\
 \hline
 28.1143
 \end{array}
 \quad
 \begin{array}{r}
 1259159 \\
 9999 \\
 11474 \\
 \hline
 1124
 \end{array}$$

4 1915 May 6.

$$\begin{array}{r}
 d \\
 18289 \\
 989589 \\
 8689 \\
 \hline
 11.8390
 \end{array}
 \quad
 \begin{array}{r}
 n \\
 18600 \\
 1697172 \\
 7872 \\
 80 \\
 \hline
 .8377
 \end{array}$$

$$\begin{array}{r}
 16741 \\
 11897 \\
 7888 \\
 16 \\
 \hline
 5.4834
 \end{array}
 \quad
 \begin{array}{r}
 19372 \\
 1419703 \\
 90 \\
 71 \\
 \hline
 .4826
 \end{array}$$

$$\begin{array}{r}
 17161 \\
 1059299 \\
 0099 \\
 49 \\
 \hline
 24.6556
 \end{array}
 \quad
 \begin{array}{r}
 18576 \\
 15095 \\
 0702 \\
 7.3 \\
 \hline
 .6528
 \end{array}$$

Moon-Measures.

$$\begin{array}{r}
 1 \\
 22.0 \\
 13.0+ \\
 \hline
 10744 \\
 1060589 \\
 947 \\
 \hline
 13.0148
 \end{array}
 \quad
 \begin{array}{r}
 14820 \\
 1909 \\
 14692 \\
 \hline
 .0124
 \end{array}$$

$$\begin{array}{r}
 2 \\
 22.2 \\
 13.0- \\
 \hline
 975549 \\
 50 \\
 9718 \\
 \hline
 12.9967
 \end{array}
 \quad
 \begin{array}{r}
 15721 \\
 15683 \\
 8180 \\
 \hline
 .9960
 \end{array}$$

$$\begin{array}{r}
 3 \\
 23.0 \\
 13.2 \\
 \hline
 15361 \\
 1381520 \\
 30 \\
 50 \\
 \hline
 131537
 \end{array}
 \quad
 \begin{array}{r}
 19980 \\
 1147061 \\
 59 \\
 75 \\
 \hline
 .1487
 \end{array}$$



4620

Stars Measures

1915 May 6.

21

$\frac{1}{2}$  19360  
 $\frac{1}{18}$  10750  
 $\frac{1}{15}$  4948  
 $\frac{1}{40}$  40  
 $\frac{1}{2}$  158594  
8576

$\frac{1}{2}$  13489  
 $\frac{1}{27}$  13153  
 $\frac{1}{11}$  4947  
470340  
0337

$\frac{1}{2}$  10439  
 $\frac{1}{216}$  930097  
 $\frac{1}{91}$  91  
28,1143  
1124

$\frac{1}{2}$  18280  
 $\frac{1}{98}$  98959  
 $\frac{1}{86}$  869  
 $\frac{1}{80}$  80  
 $\frac{1}{2}$  118390  
8377  
 $\frac{1}{2}$  16741  
 $\frac{1}{118}$  11897  
 $\frac{1}{98}$  9888  
 $\frac{1}{16}$  16  
54834  
4826

$\frac{1}{2}$  17161  
 $\frac{1}{105}$  1059299  
 $\frac{1}{00}$  0099  
 $\frac{1}{49}$  49  
24,6556  
6528

Moon - measures.

$\frac{1}{300}$  1  
 $\frac{1}{1501}$

$\frac{1}{2}$  10774  
 $\frac{1}{1000}$  100059  
 $\frac{1}{94}$  947  
13,0145  
0124

$\frac{1}{2}$  122  
 $\frac{1}{130}$   
 $\frac{1}{122}$

$\frac{1}{2}$  97559  
 $\frac{1}{50}$  50  
 $\frac{1}{97}$  9718  
12,9967  
9960  
 $\frac{1}{2}$  15361  
 $\frac{1}{138}$  1381520  
 $\frac{1}{30}$  30  
 $\frac{1}{50}$  50  
13,1537  
1487



4620

x moon measures (cont) 1915 May 6

4 870909 10245  
 23.9 06 990092  
 14.0 8348 8492

23.96409647

10150

1085850

9561

50

7970

10221

14.05800632

6

24.2 19870  
 15.0 1756872  
 max 70  
 in 58  
 24.2298

16330  
 8621  
 2979  
 26  
 2300

2

240  
159

1562240

13372

28

1269010

14997

00

15.93619328

8

23.9 1256849 12675  
 16.0 61 1230001  
 12170 10

23.96119629

scratch

9 194900  
 23.2 171000  
 16.7 0098  
 79  
 232382

19578  
 1196772  
 7072  
 78  
 2392

19030  
 1181518  
 19  
 20

167206

17480  
 1468989  
 80  
 82

7203

Density 3



4620

Moon measures (cont) 1911 May 6

|     |         |        |
|-----|---------|--------|
| 4   | 8709.09 | 10245  |
| 239 | 06      | 990092 |
| 140 | 8348    | 8492   |

2396409647

Σ

239

140

10150

10858

9561

5050

7970

10221

1405800632

Σ

|     |         |
|-----|---------|
| 242 | 19870   |
| 150 | 1756872 |
| max | 70      |
| Σ   | 58      |

|       |
|-------|
| 16320 |
| 8621  |
| 2929  |
| 26    |

2422982300

Σ

240

159

1562240

13372

28

1269010

14997

00

1593619328

Σ

|     |         |         |
|-----|---------|---------|
| 239 | 1256849 | 12675   |
| 160 | 61      | 1230001 |
|     | 12170   | 10      |

2396119629

Σ scratch

|     |        |
|-----|--------|
| 232 | 194900 |
| 167 | 171000 |
|     | 0098   |
|     | 79     |

232382

|         |
|---------|
| 19578   |
| 1196772 |
| 7072    |
| 78      |

2392

|         |
|---------|
| 19030   |
| 1181518 |
| 1918    |
| 20      |

167206

|         |
|---------|
| 17488   |
| 1468989 |
| 52      |

7203

Density 3.



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Times etc.

Expt. station 1914 Jan 17

14<sup>h</sup> 10<sup>m</sup>-14<sup>h</sup> 22<sup>m</sup>Moon  
clock fast

14

16

21.8

-14

16

220

0 02.8

H. Sid T.

14

16

19.1

 $\theta - \alpha = +1^h 6^m$ 

H. long

4

44

31.05

S. Sid T.

19

00

50.15

Sid T. M. noon

19

44

15.12

Interval

23

16

35.03

Red

3

48.80

S. M. T.

23

12

46.23

Town hall clock

R. A.

Decl.

Moon 23<sup>h</sup>

13

10

07.05

-10

34

187

Moon 23<sup>h</sup> 2.1436

15.814

" 12.7705

+

27.37

+

3

22.0

Tabular place

13

10

3442

-10

37

40.7

Moon's age 22 days.

Parallax

59

1298

Semidiameter

16

097

934 = 89.5

970:

R

969.7

Circumference

+9.7

Inradius (3)

-0.3

R

979.1

R

20988

ak

-1007

(1+a)/R

19981

R<sup>2</sup>

39924

a = -5038

+ 24

4798



4620

Thurs etc.

Exp. T. Jan 17 14<sup>m</sup> 10<sup>m</sup> - 14<sup>m</sup> 22<sup>m</sup>  
 known 14 16 218 - 14 16 220  
 clock fast 0 02.8

H. Sid. T. 14 16 191 0-2-11<sup>m</sup> 6<sup>m</sup>  
 H. Sid. T. 4 44 310.5  
 Sid. T. 19 00 501.5  
 Sid. T. 19 44 101.2  
 Internal 20 16 350.3  
 Read 5 48.80  
 Sid. T. 23 12 46.23

Thurs. hand. Allen R. A. Week.  
 known 23<sup>m</sup> 13 10 07.05 - 10 34 18.7  
 known 1<sup>m</sup> 2.1436 15.814  
 12.7705<sup>m</sup> + 27.37 T 3 22.0  
 Tabular place 13 10 344.2 - 10 37 40.7

Thurs. and 22 days.

934-88.5<sup>m</sup>  
 970.

- parallax 59 129.8  
 semidiam 16 09.7  
 R 969.7  
 Augmentation +9.7  
 Irradiation (3) -0.2  
 R 979.1  
 R 209.88  
 CR -100.7  
 U+AIR 199.81  
 R<sup>2</sup> 299.24

2 - 503.8  
 + 24  
 479.8



4620

Plate constant

|     |         |         |         |
|-----|---------|---------|---------|
| x   | 11.8384 | 27.0338 | 28.1134 |
| y   | 11.1855 | 27.2084 | 28.2279 |
| x-z | +6.529  | -1746   | -1145   |
| y   | 15.8585 | 5.4830  | 246542  |
| y   | 15.7538 | 4.9395  | 25.0976 |
| y-y | +1048   | +5435   | -7434   |

$$\begin{array}{rclcl}
 x-z & +500x & -59.7y & +3.8x & -11547 \\
 +6529 & +5919 & = +12448 & -947 & = +11501 + 45 = +11546 & = -1 \\
 -1746 & +13517 & = +11771 & -327 & = +11444 + 103 = +11547 & = 0 \\
 -1145 & +14057 & +12912 & -1472 & = +11440 + 107 = +11547 & = 0 \\
 222334 & +11117 & -895 & +84 & & = 221093
 \end{array}$$

$$\begin{array}{rclcl}
 y-y & +500y & +60.4y & +11.4y & -9872 \\
 +1048 & +7929 & = +8977 & +715 & = +9692 + 181 = +9873 & = +1 \\
 +5435 & +2742 & = +8177 & +1633 & = +9810 + 62 = +9872 & = 0 \\
 -4434 & +12327 & +7893 & +1698 & +9591 + 289 & = +9872 & = 0 \\
 149965 & +7498 & +1343 & +171 & & = 149105
 \end{array}$$

$$\begin{array}{lcl}
 \text{Tables } a = -1.5 & e = -7.0 & a-e = +5.5 & b+a = -3.2 \\
 \text{Obs } a = -503.8 & e = -501.4 & a-e = +76 & b+a = -0.7 \\
 & & & +2.0
 \end{array}$$



4020

Plate Transmittance

|     |         |        |         |
|-----|---------|--------|---------|
| x   | 118384  | 270338 | 28.1134 |
| z   | 11.1855 | 272084 | 28.2279 |
| -z  | +6.529  | -1746  | -1145   |
| y   | 158585  | 54830  | 246572  |
| -y  | 157538  | 49295  | 250970  |
| y-z | +1048   | 15435  | -7437   |

$$\begin{array}{rcll}
 x-z & +520x & -59.7y & +3.8x & -11.547 \\
 +6.529 & +5919 & +12448 & -947 & +1501 & +4.5 & +11546 & = -1 \\
 -1746 & +13517 & +11771 & -327 & +11444 & +102 & +11543 & = 0 \\
 -1145 & +14057 & +12912 & -1472 & +11440 & +107 & +11547 & = 0 \\
 222334 & +11117 & & -895 & & +86 & & = 221093
 \end{array}$$

$$\begin{array}{rcll}
 y-z & +500y & +60.4y & +11.4y & -9872 \\
 +1048 & +7929 & +8977 & +715 & +9692 & +134 & +9873 & = +1 \\
 +5433 & +2742 & +8177 & -1633 & +9810 & +62 & -9872 & = 0 \\
 -4434 & +12327 & +7893 & +1698 & +9591 & +289 & -9872 & = 0 \\
 149965 & +7498 & & +1343 & & +171 & & = 149105
 \end{array}$$

$$\begin{array}{rcll}
 \text{Tables } a & = -15 & b & = -70 & a-b & = +55 & b+a & = -32 \\
 \text{Obs } a & = -5038 & c & = -5014 & a-c & = +76 & b+c & = -07
 \end{array}$$

1  
2  
3  
4  
5  
6  
7  
8  
9  
  
1  
2  
3  
4  
5  
6  
7  
8  
9

46 20

Moon's Center

|   | $x$     | $x - x_0$ | $\Delta x$ | $(x - x_0)^2$ | $(x - x_0)^2 \cdot (y - y_0)^2$ | $o - c$ |
|---|---------|-----------|------------|---------------|---------------------------------|---------|
| 1 | 22.0000 | -0.2290   | -6         | 0.0527        | 3.9906                          | -18     |
| 2 | 22.2290 | 0.0000    | -6         | 0.0000        | 3.9984                          | +60     |
| 3 | 23.0000 | +0.7710   | -5         | 0.5936        | 4.0039                          | +115    |
| 4 | 23.9644 | +1.7354   | -3         | 3.0105        | 4.0055                          | +131    |
| 5 | 24.0000 | +1.7710   | -3         | 3.1355        | 4.0133                          | +209    |
| 6 | 24.2299 | +2.0009   | -0         | 4.0036        | 4.0036                          | +112    |
| 7 | 24.0000 | +1.7710   | +3         | 3.1375        | 4.0178                          | +247    |
| 8 | 23.9620 | +1.7330   | +3         | 3.0044        | 4.0114                          | +190    |
| 9 | 23.2387 | +1.0097   | +5         | 1.0205        | 3.9937                          | +13     |

3.9924

|   | $y$     | $y - y_0$ | $\Delta y$ | $(y - y_0)^2$ |          |
|---|---------|-----------|------------|---------------|----------|
| 1 | 13.0136 | -1.9834   | -10        | 3.9379        | 187 ✓    |
| 2 | 12.9964 | -2.0006   | -10        | 3.9984        | 180 ✓    |
| 3 | 13.1512 | -1.8458   | -9         | 3.4103        | 157 ✓    |
| 4 | 14.0000 | -0.9970   | -5         | 0.9950        | 120 ✓    |
| 5 | 14.0606 | -0.9364   | -5         | 0.8778        | 118 ✓    |
| 6 | 15.0000 | -0.0030   | 0          | 0.0000        | 90 ✓     |
| 7 | 15.9344 | +0.9374   | +5         | 0.8796        | 62 ✓     |
| 8 | 16.0000 | +1.0030   | +5         | 1.0070        | 60 ✓     |
| 9 | 16.7204 | +1.7234   | +9         | 2.9732        | 30 ✓ 157 |

Range

Approx. Center

$$x = 24.0 \quad y = 14.0666$$

$$\frac{15.9344}{29.9950}$$

$$y_0 = 14.9975$$

$$y_{\text{min}} = 12.9964$$

$$R = 2.0011$$

$$x_{\text{max}} = 24.2299$$

$$x_0 = 22.2288$$

$$\text{Center } \left\{ \begin{array}{l} x_0 = 22.2290 \\ y_0 = 14.9970 \end{array} \right.$$



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Arrows Center

|   | $x$     | $x - x_0$ | $\Delta x$ | $(x - x_0)^2$ | $(x - x_0)^2 \cdot f_y - y_0^2$ | $0 - 0$ |
|---|---------|-----------|------------|---------------|---------------------------------|---------|
| 1 | 22.0000 | -0.2290   | -6         | 0.0527        | 3.9906                          | -18     |
| 2 | 22.2290 | 0.0000    | -6         | 0.0000        | 3.9954                          | 760     |
| 3 | 23.0000 | +0.7710   | -5         | 0.5936        | 4.0039                          | +115    |
| 4 | 23.9649 | +1.7359   | -3         | 3.0105        | 4.0055                          | +131    |
| 5 | 24.0000 | +1.7710   | -3         | 3.1355        | 4.0133                          | +209    |
| 6 | 24.2299 | +2.0009   | -0         | 4.0036        | 4.0036                          | +112    |
| 7 | 24.0000 | +1.7710   | +3         | 3.1375        | 4.0178                          | +247    |
| 8 | 23.9620 | +1.7330   | +3         | 3.0044        | 4.0114                          | +190    |
| 9 | 23.2357 | +1.0097   | +5         | 1.0205        | 3.9937                          | +113    |

39924

|   | $y$     | $y - y_0$ | $\Delta y$ | $(y - y_0)^2$ |     |
|---|---------|-----------|------------|---------------|-----|
| 1 | 13.0136 | -1.9834   | -10        | 3.9379        | 188 |
| 2 | 12.9964 | -2.0006   | -10        | 3.9984        | 180 |
| 3 | 13.1512 | -1.8458   | -9         | 3.4103        | 157 |
| 4 | 14.0000 | -0.9970   | -5         | 0.9950        | 120 |
| 5 | 14.0606 | -0.9367   | -5         | 0.8778        | 118 |
| 6 | 15.0000 | 0.0030    | 0          | 0.0000        | 90  |
| 7 | 15.4344 | +0.9374   | +5         | 0.8796        | 62  |
| 8 | 16.0000 | +1.0030   | +5         | 1.0070        | 60  |
| 9 | 16.7204 | +1.7234   | +9         | 2.9732        | 30  |

157  
Range

Approx. Center

$$x = 24.0 \quad y = 14.9966$$

$$1 - 5.24.2$$

$$29.9910$$

$$y = 14.9975$$

$$y - \text{mean} = 12.9964$$

$$R = 2.0011$$

$$x - \text{mean} = 24.2299$$

$$x_0 = 22.2288$$

$$\text{Center} \left\{ \begin{array}{l} x = 22.2290 \\ y = 14.9970 \end{array} \right.$$

## Formation of hours.

|   |        |          |         |
|---|--------|----------|---------|
| 1 | + 0.46 | + 4.1    | + 35.6  |
| 2 | - 0.00 | + 0.0    | - 120.0 |
| 3 | - 1.42 | + 88.5   | - 212.5 |
| 4 | - 1.74 | + 228.0  | - 131.0 |
| 5 | - 1.66 | + 370.0  | - 196.5 |
| 6 | + 0.00 | + 224.0  | + 0.0   |
| 7 | + 1.66 | + 437.5  | + 232.3 |
| 8 | + 1.73 | + 228.5  | + 190.0 |
| 9 | + 1.74 | + 13.1   | + 22.4  |
|   | - 0.15 | + 1593.7 | - 1797  |

| - a  | - b | + 16 | + ΔC   |   |
|------|-----|------|--------|---|
| + 2  | -   | 6    | + 12 ✓ | - |
| - 0  | -   | 6    | + 10 ✓ |   |
| - 7  | -   | 5    | + 4 ✓  |   |
| - 16 | -   | 3    | - 3 ✓  |   |
| - 16 | -   | 3    | - 3 ✓  |   |
| - 18 | +   | 0    | - 2 ✓  |   |
| - 16 | +   | 3    | + 3 ✓  |   |
| - 16 | +   | 3    | + 3 ✓  |   |
| - 9  | +   | 5    | + 12 ✓ |   |

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## Moon's Center - Conditional Equations

|   | O                    | C                   | O-C | Corr. |
|---|----------------------|---------------------|-----|-------|
| 1 | -0.23 - 1.98 = -1.8  | - 20 + 18 = -2      | -16 | -4    |
| 2 | +0.00 - 2.00 = -1.60 | + 0 + 18 = +18      | +42 | +52   |
| 3 | +0.77 - 1.85 = +1.15 | + 68 + 17 = +85     | +30 | +34   |
| 4 | +1.74 - 1.00 = +1.31 | + 15 + 4 + 9 = +163 | -32 | -35   |
| 5 | +1.77 - 0.94 = +2.09 | + 15 + 7 + 9 = +166 | +43 | +40   |
| 6 | +2.00 + 0.00 = +1.12 | + 17 + 7 - 0 = +177 | -65 | -67   |
| 7 | +1.77 + 0.94 = +2.47 | + 15 + 7 - 9 = +148 | +99 | +102  |
| 8 | +1.73 + 1.00 = +1.90 | + 15 + 4 - 9 = +145 | +45 | +48   |
| 9 | +1.01 + 1.72 = +1.3  | + 90 - 16 = +74     | -61 | -49   |

## Normal Equations

$$\begin{aligned}
 +17.96 - 0.15 &= +15.94 & +10.56 \\
 -0.15 + 18.08 &= -1.80 & -4.11 \\
 +0.15 - 0.00 &= +1.3 & +0.09 \\
 +18.08 &= -1.67 & -4.02 \\
 +17.96 &= +15.94 - 1 = +15.93 & a = +88.8 + 0.59
 \end{aligned}$$

Arc measured = 157 Average (O-C) +9.4

$$\frac{RC}{n} = 19$$

$$\frac{+9.4}{18} = +0.49 \quad \Delta n = +0.6$$

$$-2.RC = +0.80 +16$$

$$Corr = 0.2$$

$$\Delta R = +0.8$$

$$\Delta b = -0.17 \quad \Delta \delta = -0.1$$

$$\Delta a = +0.47 \quad \Delta \alpha = +0.02$$

+9



4620

## Consistent Conditional Equations

|   | O                      | C                   | O-C    |
|---|------------------------|---------------------|--------|
| 1 | $-0.23 - 1.98 = -1.8$  | $-20 + 18 = -2$     | $-1.6$ |
| 2 | $+0.00 - 2.00 = -1.60$ | $0 - 18 = -18$      | $+42$  |
| 3 | $+0.77 - 1.85 = +1.15$ | $+68 + 17 = +85$    | $+30$  |
| 4 | $+1.24 - 1.02 = +1.31$ | $+12.4 + 9 = +16.3$ | $-32$  |
| 5 | $+1.77 - 0.94 = +2.09$ | $+15.7 + 9 = +16.6$ | $+43$  |
| 6 | $+2.00 + 0.00 = +2.00$ | $+17.7 - 0 = +17.7$ | $-65$  |
| 7 | $+1.77 + 0.94 = +2.47$ | $+12.3 - 9 = +14.2$ | $+99$  |
| 8 | $+1.73 + 1.00 = +1.90$ | $+12.4 - 9 = +14.5$ | $+45$  |
| 9 | $+1.01 + 1.72 = +1.3$  | $+90 - 16 = +74$    | $-61$  |
|   |                        | $+259 - 174$        | $+85$  |
|   |                        | $+85$               | $+85$  |

Consistent Equations

$$+1.796 - 0.15 = +1.594$$

$$-0.15 + 1.808 = -1.80$$

$$-0.15 - 0.00 = -1.3$$

$$+1.808 = -1.67$$

$$b = -92$$

$$+1.796 = +1.594 - 1 = +1.73$$

$$a = +888$$

Archived with: 156° Averaged (0-2) + 9.4

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

$$\frac{+9.4}{18} = +0.52 \quad 22 = +0.6$$



4620 Moon's Mean Position (1914.0)

$$\begin{array}{r}
 X_0 = 22.2290 \quad Y_0 = 14.9970 \\
 \frac{1}{2}a = \quad + \quad 44 \quad 26 = \quad - \quad 5 \\
 \hline
 22.2334 \quad 14.9965
 \end{array}$$

From Plate Constants  $X = 22.1093$   $Y = 14.9105$ 

$$\bar{z} = +0.1093$$

$$\eta = -3.0895$$

$$\begin{array}{r}
 \log \bar{z} = 9.03862 \\
 -\cos \bar{z} = 9.99132 \\
 \hline
 8.50724
 \end{array}$$

$$\begin{array}{r}
 \log \tan S = 9.3020 \text{ m} \\
 8.0772 \\
 \hline
 7.0534 \\
 4.4326 \text{ m}
 \end{array}$$

$$(1-A) = 0.54006$$

$$\alpha - A \quad + \quad 3.47$$

$$\begin{array}{r}
 \log \eta_0 = 0.48989 \text{ m} \\
 7.33115
 \end{array}$$

$$A \quad 13 \quad 09 \quad 40$$

$$(1-D) = 3.15874 \text{ m}$$

$$\alpha_0 = 13 \quad 09 \quad 43.47$$

$$S-D = 24 \quad 013$$

$$\text{Red} \quad + \quad 0.53$$

$$D = -11 \quad 00 \quad 50$$

$$\alpha' = 13 \quad 09 \quad 44.00$$

$$S = -11 \quad 24 \quad 513$$

$$\text{Red} \quad - \quad 5.0$$

$$S' = -11 \quad 24 \quad 56.3$$



4620 Observed Mean Position (1914.0)

$$X_0 = 22.2290 \quad Y_0 = 14.9970$$

$$\begin{array}{r} 22.2290 \\ 22.2337 \\ \hline \end{array} \quad \begin{array}{r} 14.9970 \\ 14.9965 \\ \hline \end{array}$$

From Plate Centroids  $X = 22.1093 \quad Y = 14.9105$ 

$$B = 20.1093$$

$$A = -50.895$$

$$\log B = 9.03862$$

$$\log A = 9.99132$$

$$8.50724$$

$$(B-A) 0.54006$$

$$A-A + 3.47$$

$$A 13.09.40$$

$$\alpha_0 13.09.43.47$$

$$\text{Red} + 0.53$$

$$\alpha' 13.09.44.00$$

$$\log \text{Total} = 9.3020$$

$$5.0772$$

$$7.4524$$

$$44.326$$

$$\log A = 0.48989$$

$$73.311$$

$$(A-D) = 3.15874$$

$$A-D = 24.013$$

$$D = 11.00.50$$

$$S = 11.24.51.3$$

$$\text{Red} = 50$$

$$S = 11.24.56.3$$



4620

## Lunar Parallax

$$\begin{array}{rcl}
 \alpha & 13^h & 09^m 44^s.00 \\
 \ominus & 14 & 16.19.1 \\
 \alpha - \alpha' & = + & 06 \quad 35.1 \\
 & = + & 16^{\circ} \quad 38' \quad 46'' \\
 & + & 6 \quad 23
 \end{array}$$

$$16 \quad 32 \quad 23$$

$$\begin{array}{r}
 9.95727 \\
 \hline
 0.00000 \\
 0.01836 \\
 \hline
 9.97563
 \end{array}$$

$$\begin{array}{r}
 \delta = +43 \quad 23 \quad 36 \\
 -11 \quad 24 \quad 56 \\
 \hline
 54 \quad 48 \quad 32
 \end{array}$$

$$\begin{array}{r}
 9.82640 \\
 8.23613 \\
 9.91235 \\
 \hline
 0.16277 \\
 \hline
 8.13765
 \end{array}$$

$$\delta - \delta' = +47 \quad 12.0$$

$$\delta = -10 \quad 37 \quad 44.3$$

$$\text{Am. Eph. } \delta = -10 \quad 37 \quad 40.7$$

$$o - c \quad - \quad 3.6$$

$$\begin{array}{rcl}
 \text{curr} & + & 0.1 \\
 \text{good old ref.} & + & 0.1 \\
 \text{Dur} & - & 0.1 \\
 \delta & -10 \quad 37 \quad 44.3 \\
 o - c & - & 3.6
 \end{array}$$

$$\delta' = -11^{\circ} \quad 24' \quad 56''.3$$

$$\pi = 59' \quad 12''.98$$

$$\begin{array}{r}
 9.86913 \\
 8.23613 \\
 9.45706 \\
 \hline
 0.00751 \\
 \hline
 7.56983
 \end{array}$$

$$\begin{array}{r}
 \alpha - \alpha' = +12' \quad 46''.05 \\
 - \quad + \quad 51''.07
 \end{array}$$

$$\alpha \quad 13 \quad 10 \quad 35.07$$

$$\alpha = 13 \quad 10 \quad 34.42$$

$$+0.65$$

$$\begin{array}{rcl}
 \text{curr} & - & 0.01 \\
 \text{Dur} & + & 0.02 \\
 \alpha = 13 \quad 10 \quad 35.09
 \end{array}$$

$$o - c = +0.67$$



4620

Lunar Parallax

$$\begin{array}{r}
 \alpha \quad 13^h \quad 09^m \quad 44.00 \\
 \omega \quad 14 \quad 16 \quad 19.1 \\
 \delta - \alpha = 51 \quad 06 \quad 35.1 \\
 \quad \quad \quad 16^{\circ} \quad 38' \quad 46'' \\
 + \quad \quad \quad 6 \quad 23 \\
 \hline
 \quad \quad \quad 16 \quad 32 \quad 23
 \end{array}$$

$$\begin{array}{r}
 995727 \\
 000000 \\
 \hline
 001836 \\
 997563
 \end{array}$$

$$\begin{array}{r}
 \delta = -43 \quad 23 \quad 36 \\
 - \quad 11 \quad 24 \quad 56 \\
 \hline
 54 \quad 48 \quad 32
 \end{array}$$

$$\begin{array}{r}
 9.82640 \\
 8.23613 \\
 99.1235 \\
 \hline
 0167.72 \\
 813765
 \end{array}$$

$$S - S' = +47 \quad 12 \quad 0$$

$$S = -10 \quad 37 \quad 44.2$$

$$\text{Equinox } S = -10 \quad 37 \quad 40.7$$

$$O - C = -3.6$$

$$\begin{array}{r}
 \text{curr} \quad + \quad 0.1 \\
 \text{2nd ord. ref} \quad + \quad 0.1 \\
 \text{2nd} \quad - \quad 0.1 \\
 \delta \quad -11 \quad 37 \quad 44.3 \\
 O - C \quad - \quad 3.6
 \end{array}$$

$$S = -11^{\circ} \quad 24' \quad 56.3''$$

$$\Pi = 59' \quad 12.98''$$

$$\begin{array}{r}
 9.86913 \\
 8.23613 \\
 9.45706 \\
 \hline
 000751 \\
 7.56983
 \end{array}$$

$$X - X' = +12' \quad 46.05''$$

$$+ 51.07$$

$$X = 13 \quad 10 \quad 35.07$$

$$X = 13 \quad 10 \quad 34.42$$

$$+ 0.65$$

$$\text{curr} \quad - 0.01$$

$$\text{2nd} \quad + 0.02$$

$$X = 13 \quad 11 \quad 35.09$$

$$O - C = +0.67$$





