

KG

11366

168

KG 11366, 168

GS

II

Arcquipa Station

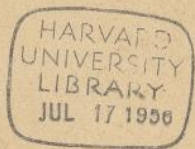
Observations and Calculations

relating to

Geographical Position,

by Winslow Epton.

KG 11366.168



5.1 0.25

1

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1897phae.proj.1170U

Reduction for Latitude

Mr. 30 + Dec. 2/96

Equations of condition.

$$\pm C \Delta c - A \Delta a - \Delta \varphi + f = 0 \text{ in which } C = \sec z, A = \tan z, f = \varphi_1 + b \mp \varphi_0 - a_0 \tan z + (c_0 + i_0) \sec z$$

Mr. 30

| | ϵ Aq. | μ Aq. | τ Or. | β Or. | γ Erid. | κ Or. | θ Aq. | λ Aq. | θ Can. | i Ceti | α Hy. | γ Can. | γ Erid. |
|-----------------|-------------------|----------------------|------------|--------------------|----------------|--------------|---------------------|----------------------|----------------------|----------------------|----------------------|---------------------|----------------------|
| $f + \varphi_0$ | 30.1 ⁸ | 45.7 ^{28.9} | 46.3 | 42.6 ⁵ | 34.2 | 39.4 | 33.7 | 38.7 ^{33.0} | 23.9 ^{24.8} | 27.2 ^{25.6} | 29.8 ^{29.2} | 29.9 ⁷ | 22.8 ^{23.3} |
| φ_0 | 28.0 | | | | | | | | | | | | |
| $-f$ | +2.1 ⁸ | +17.7 ^{0.9} | +18.3 | +14.6 ⁵ | +6.2 | +11.4 | +5.7 ^{5.0} | -4.1 ^{3.2} | -0.8 ^{2.4} | +1.8 ^{11.2} | +1.9 ⁷ | -5.2 ^{4.7} | |

log sec z + log tan z from p. 204 former book

Equations

| | | | | | | | |
|--------------------|---------------------------|------------|-------------|------------|--------------------|--------|-----|
| ϵ Aquarii | + [0.21830] | Δc | - [0.11936] | Δa | - $\Delta \varphi$ | + 2.1 | = 0 |
| μ Aquarii | + [0.23843] | | - [0.15032] | | | + 17.7 | |
| τ Orionis | + [0.37503] | | + [0.32252] | | | + 18.3 | |
| β Orionis | + [0.28 ⁹ 49] | | + [0.22305] | | | + 14.6 | |
| γ Eridani | + [0.2 ⁰ 7236] | | + [9.79857] | | | + 6.2 | |
| κ Orionis | + [0.22316] | | + [0.12699] | | | + 11.4 | |
| θ Aquarii | + [0.29911] | | - [0.23600] | | | + 5.7 | |
| λ Aquarii | + [0.30701] | | - [0.24650] | | | + 10.7 | |
| θ Can. Maj. | - [0.12640] | | + [9.94876] | | | - 4.1 | |
| i Ceti | - [0.24982] | | - [0.16718] | | | - 0.8 | |
| α Hydrae | - [0.29584] | | + [0.23162] | | | + 1.8 | |
| γ Can. Maj. | - [0.02350] | | + [9.52893] | | | + 1.9 | |
| γ Eridani | - [0.07316] | | - [9.80135] | | | - 5.2 | |

Dec. 2/96

| | | | | | | | | | | | | | | |
|-----------|------|----------------------|------|------|--------------------|------|-------|---------------------|------|----------------------|----------------------|-------|---------------------|----------------------|
| $f + q_0$ | 32.3 | ^{30.0} 29.7 | 31.4 | 19.8 | ^{.7} 18.5 | 24.8 | 15.8 | ^{.6} 42.3 | 35.7 | ^{20.4} 19.5 | ^{34.6} 39.7 | 17.0 | ^{.0} 26.2 | ^{32.0} 31.4 |
| q_0 | 28.0 | | | | | | | | | | | | | |
| $-f$ | +4.3 | ^{2.0} +1.7 | +3.4 | -8.2 | ³ -9.5 | -3.2 | -12.2 | ^{.6} +14.3 | +7.7 | ^{7.6} -8.5 | ^{6.6} +11.7 | -11.0 | ^{2.0} -1.8 | ^{4.0} +3.4 |

log sec z and log tan z from p. 220 former book.

Equations

| | | | | | |
|--------------------|-------------|------------|-------------|------------|-------------------------|
| κ Aquilæ | -[0.34991] | Δc | -[0.30156] | Δa | $-\Delta q + 4.3'' = 0$ |
| ϵ Aquarii | -[0.21595] | | -[0.11565] | | +1.7 |
| μ Aquarii | -[0.23847] | | -[0.15036] | | +3.4 |
| τ Orionis | -[0.36697] | | + [0.32268] | | -8.2 |
| β Orionis | -[0.28961] | | + [0.22319] | | -9.5 |
| γ Eridani | -[0.07245] | | + [9.79887] | | -3.2 |
| κ Orionis | -[0.21642] | | + [0.11639] | | -12.2 |
| θ Aquarii | -[0.29917] | | - [0.23608] | | +14.3 |
| ϕ Aquarii | + [0.39671] | | - [0.35861] | | +7.7 |
| θ Cam. Maj. | + [0.13292] | | + [9.96326] | | -8.5 |
| ζ Beti | + [0.17560] | | - [0.04757] | | +11.7 |
| α Hydrae | + [0.29675] | | + [0.23055] | | -11.0 |
| γ Cam. Maj. | + [0.02338] | | + [9.52780] | | -1.8 |
| γ Eridani | + [0.07304] | | - [9.80094] | | +3.4 |

Preliminary Reduction.

Mr. 30

| | | | | $\Delta a = -1.30$ | $\Delta c = -3.80$ | Σ | $\Delta \phi$ |
|-----------------|--|--------------|--|--------------------|--------------------|----------|---------------|
| 1 | $0 = +1.65 \Delta c - 1.32 \Delta a - \Delta \phi + 2.1$ | | | +1.72 | -6.27 | -4.6 | -2.5 |
| 2 | +1.73 - 1.41 | +0.9 +177 | | +1.83 | -6.57 | -4.7 | -3.8 |
| 3 | +2.37 + 2.10 | +18.3 | | -2.73 | -9.01 | -11.7 | 6.6 |
| 4 | +1.95 + 1.67 | +14.6 | | -2.17 | -7.41 | -9.6 | 5.0 |
| 5 | +1.18 + 0.63 | +6.2 | | -0.82 | -4.48 | -5.3 | 0.9 |
| 6 | +1.67 + 1.34 | +11.4 | | -1.74 | -6.35 | -8.1 | 3.3 |
| 7 | +1.99 - 1.72 | +5.7 | | +2.24 | -7.56 | -5.3 | 0.4 |
| 8 | +2.03 - 1.76 | +10.7 | | +2.29 | -7.71 | -5.4 | 5.3 |
| 9 [*] | -1.34 + 0.89 | -4.1 | | -1.16 | +5.09 | +3.9 | -0.2 |
| 10 ^p | -1.78 - 1.47 | -0.8 | | +1.91 | +6.76 | +8.7 | 7.9 |
| 11 | -1.98 + 1.70 | +1.8 | | -2.21 | +7.52 | +5.3 | 7.1 |
| 12 | -1.06 + 0.34 | +1.9 | | -0.44 | +4.03 | +3.6 | 5.5 |
| 13 | -1.18 - 0.63 | -5.2 | | +0.82 | +4.48 | +5.3 | 0.1 |
| | | | | | | +55.1 | -2.7 |

^{*} Poor on account of few wires shown.

$$13 \mid +52.4 \\ 4.0$$

1, 2, 7, 8. $0 = +1.85 \Delta c - 1.55 \Delta a - \Delta \phi + 9.05$

3, 4, 5, 6. $0 = +1.79 \Delta c + 1.44 \Delta a - \Delta \phi + 12.62$

10, 13. $0 = -1.48 \Delta c - 1.05 \Delta a - \Delta \phi - 3.00$

9, 11, 12. $0 = -1.50 \Delta c + 0.98 \Delta a - \Delta \phi - 0.13$

or
2, 10, 12. $0 = -1.18 \Delta c - 0.63 \Delta a - \Delta \phi - 5.20$

6, 10. $0 = -1.52 \Delta c + 1.02 \Delta a - \Delta \phi + 1.85$

$$0 = +0.06 \Delta c - 2.99 \Delta a - 3.57 \quad \text{negl. } \Delta c \quad \Delta c = -3.80 \\ \Delta a = -1.20 \quad -1.26$$

$$0 = -0.02 \Delta c - 2.03 \Delta a - 2.87 \quad \Delta a = -1.41 \quad 1.37$$

$$0 = -0.34 \Delta c + 1.65 \Delta a + 7.05 \quad \text{Adpt } -1.30$$

$$0 = +1.87 \Delta c - 0.06 \Delta a - \Delta \phi + 10.84 \\ = -1.47 \Delta c - 0.04 \Delta a - \Delta \phi - 1.56 \\ = -1.35 \Delta c + 0.20 \Delta a - \Delta \phi - 1.68$$

$$0 = +3.29 \Delta c - 0.02 \Delta a + 12.40 \quad \Delta c = -3.76 \\ 0 = +3.17 \Delta c - 0.26 \Delta a + 12.52 \quad \Delta c = -3.84 \\ -3.80$$

Final Reduction.

In this, the star positions of Berliner Jahrbuch were used (the red ink figures) which were not accessible for the preliminary reduction.

As previous reductions have retained - signs for south latitudes and south declinations, the signs of the f terms on pp. 10 + 14 should be changed, then Δq will be the algebraic correction.

Weights. The mean error of a single observation of β Orionis on Jan. 8, 21, + 22 is $\pm .35$ and of γ Can. May. is ± 1.12 p. 67

Since the uncertainty due to the difficulty of observation increases within the limits of δ used in this work from 1 to 4. This is more than offset by the increase in accuracy varying with δ p. 28. Taking the two together the accuracy increases as the zenith is approached within the limits of δ employed in the ratio 4 to 5 or 1 to 1.25. The resulting equations of condition might therefore be weighted by the $\sqrt{\delta}$ of weights interpolated between these limits i.e. 1.0 to 1.1 for range. This seems too small to be taken into account.

Stars δ Aq. λ Aq. θ Can. May. i Ceti Nov. 30 and κ Orionis θ Aq. Dec. 2 should be used with less weight on account of small number of wires used; as follows:—

| | Nov. 30 | | | |
|---------------|----------|-----|----------|--------------|
| | Wires | wt. | Rel. wt. | $\sqrt{wt.}$ |
| δ Aq. | 8 wires | 2.8 | 0.70 | .8 |
| λ " | 9 | 3.0 | .75 | .8 |
| θ Can. | 3 | 1.7 | .42 | .6 |
| ι Ceti | 2 | 1.4 | .35 | .6 |
| other stars | 16 wires | 3.9 | 1.0 | 1.0 |

Dec. 2

| | | | | |
|--------------|---|-----|------|----|
| κ Or. | 8 | 2.8 | 0.70 | .8 |
| θ Aq. | 8 | 2.8 | .70 | .8 |

Eqs. of cond. are multiplied by $\sqrt{wt.}$ for these stars

Preliminary Reduction.

Dec. 2

| | | | | $C \Delta c$ | $A \Delta a$ | Σ | $\Delta \phi$ |
|----|--|-------|--|--------------|--------------|----------|---------------|
| 1 | $0 = -2.24 \Delta c - 2.00 \Delta a - \Delta \phi + 4.3$ | | | +0.78 | -8.40 | -7.6 | -3.3 |
| 2 | -1.64 - 1.31 | +1.7 | | + .57 | -6.16 | -6.6 | -4.9 |
| 3 | -1.73 - 1.41 | +3.4 | | + .61 | -6.63 | -6.0 | -2.6 |
| 4 | -2.33 + 2.10 | -8.2 | | + .82 | +9.87 | +10.7 | +2.5 |
| 5 | -1.95 + 1.67 | -9.5 | | + .68 | +7.85 | +7.5 | -2.0 |
| 6 | - ^{1.18} 1.65 + 0.63 | -3.2 | | + .41 | +2.96 | +3.4 | +0.2 |
| 7 | - ^{1.65} 1.99 + 1.31 | -12.2 | | + .58 | +6.16 | +6.7 | -5.5 |
| 8 | -1.99 - 1.72 | +14.3 | | + .70 | -8.08 | -7.4 | +6.9 |
| 9 | +2.49 - 2.28 | +7.7 | | - .87 | -14.36 | -15.2 | -7.5 |
| 10 | +1.36 + 0.92 | -8.5 | | - .48 | +5.80 | +5.3 | -3.2 |
| 11 | +1.50 - 1.12 | +11.7 | | - .62 | -7.06 | -7.6 | +4.1 |
| 12 | +1.97 + 1.70 | -11.0 | | - .69 | +11.91 | +11.2 | +0.2 |
| 13 | +1.06 + ^{0.34} 3.57 | -1.8 | | - .37 | +2.14 | +1.8 | 0.0 |
| 14 | +1.18 - 0.63 | +3.4 | | - .41 | -3.97 | -4.4 | -1.0 |
| | | | | | | +13.9 | -30.0 |

$$1,2,3,8 \quad 0 = -1.90 \Delta c - 1.61 \Delta a - \Delta \phi + 5.92$$

-16.1

$$4,5,6,7 \quad 0 = -1.78 \Delta c + 1.43 \Delta a - \Delta \phi - 8.28$$

-1.2

$$9,11,14 \quad 0 = +1.72 \Delta c - 1.34 \Delta a - \Delta \phi + 7.60$$

$$10,12,13 \quad 0 = +1.46 \Delta c + 0.99 \Delta a - \Delta \phi - 7.10$$

$$\text{Keyl. } \Delta c \quad \Delta c = -.35$$

$$0 = -0.12 \Delta c - 3.04 \Delta a + 14.20 \quad \Delta a = +4.67 \quad +4.68 \quad \text{Adopt} \quad +4.7$$

$$0 = +0.26 \Delta c + 2.33 \Delta a' + 14.70 \quad \Delta a' = +6.31 \quad +6.27 \quad +6.3$$

$$+5.5$$

$$0 = -1.84 \Delta c - .09 \Delta a - \Delta \phi - 1.18$$

$$= +1.59 \Delta c - .18 \Delta a - \Delta \phi + 0.25$$

$$0 = -3.43 \Delta c + 0.4 \Delta a - 1.43$$

$$3.43 \Delta c = -1.21$$

$$\Delta c = -.35$$

Final Equations for Least Square Reduction

Nov. 30

| Δc | Δa | $-\Delta \phi$ | $-\Delta \rho$ | Δp | a | b | c | n | s |
|------------|------------|----------------|----------------|------------|-----------------|-------------|-------|--------|-----|
| 0 = +1.65 | -1.32 | -2.8 | 1.00 | +1.65 | -1.32 | $-\sqrt{p}$ | -2.8 | -3.47 | |
| +1.73 | -1.41 | -0.9 | " | +1.73 | -1.41 | all - | -0.9 | -1.58 | |
| +2.37 | +2.10 | -18.3 | " | +2.37 | +2.10 | | -18.3 | -14.83 | |
| +1.95 | +1.67 | -14.5 | " | +1.95 | +1.67 | | -14.5 | -11.88 | |
| +1.18 | +1.63 | -6.2 | " | +1.18 | +1.63 | | -6.2 | -5.39 | |
| +1.67 | +1.34 | -11.4 | " | +1.67 | +1.34 | | -11.4 | -9.39 | |
| +1.99 | -1.72 | -5.7 | .80 | +1.59 | -1.38 | | -4.6 | -5.19 | |
| +2.03 | -1.76 | -5.0 | .80 | +1.62 | -1.41 | | -4.0 | -4.59 | |
| -1.34 | +1.89 | +3.2 | .60 | -.80 | +1.53 | | +1.9 | +1.03 | |
| -1.78 | -1.47 | +2.4 | .60 | -1.07 | 1.88 | | +1.4 | -1.15 | |
| -1.98 | +1.70 | -11.2 | 1.00 | -1.98 | +1.70 | | -11.2 | -12.48 | |
| -1.06 | +1.34 | -1.7 | 1.00 | -1.06 | +1.34 | | -1.7 | -3.42 | |
| -1.18 | -.63 | +4.7 | 1.00 | -1.18 | -.63 | | +4.7 | +1.89 | |

Dec. 2

| Δc | Δa | $-\Delta \phi$ | $-\Delta \rho$ | Δp | a | b | c | n | s |
|----------------|------------|----------------|----------------|------------|--------|-------|-----|-----|-----|
| 0 = prec. page | -4.3 | -1.00 | -2.24 | -2.00 | -4.3 | -9.54 | | | |
| -2.0 | " | -1.64 | -1.31 | -2.0 | -5.95 | | | | |
| -3.4 | " | -1.73 | -1.41 | -3.4 | -7.54 | | | | |
| +8.2 | " | -2.33 | +2.10 | +8.2 | +6.87 | | | | |
| +9.3 | " | -1.95 | +1.67 | +9.3 | +8.02 | | | | |
| +3.2 | " | -1.18 | +0.63 | +3.2 | +1.65 | | | | |
| +12.2 | .80 | -1.32 | +1.05 | +9.8 | +8.73 | | | | |
| -14.6 | .80 | -1.59 | -1.38 | -11.7 | -15.87 | | | | |
| -7.7 | 1.00 | +2.49 | -2.28 | -7.7 | -8.49 | | | | |
| +7.6 | " | +1.36 | +1.92 | +7.6 | +8.88 | | | | |
| -6.6 | " | +1.50 | -1.12 | -6.6 | -7.22 | | | | |
| +11.0 | " | +1.97 | +1.70 | +11.0 | +13.67 | | | | |
| +2.0 | " | +1.06 | +1.34 | +2.0 | +2.40 | | | | |
| -4.0 | " | +1.18 | -.63 | -4.0 | -4.45 | | | | |
| -13.60 | -4.42 | -1.92 | +11.40 | -8.34 | | | | | |

+52.3
+105.9
-53.6
-13.4
-1.23
-0.98

-106.8
+55.2
-51.6
-12.9
-1.19
-0.94

-105.5 -101.2
+51.2 +52.8
-54.3 -48.4
-13.6 -12.1
-1.25 -1.11
-1.00 -0.86

+51.0
-103.5
-52.5
-13.1
-1.21
-0.96

Dec 28/96

7.5 36.0

40.5 11.8

35.7 67.2

38.8 68.0 38.0 67.5 35.2 66.0

42.2 13.0 40.5 10.7 41.8 11.0

41.2 9.8

36.0 67.5

M 2290

Y 2510

Y 2757

Y 2488 *

7 58 57.5

10.6

10.9

58 14.5

28.2 28.8

29.0 29.6

23 27.5

59 38

10.4

10.6

59 1.5

28.2 28.6

29.7 30.1

24 16.5

8 0 19

10.4

10.6

59 49

28.4 28.7

29.5 29.8

25 6.5

1 0.5

10.8

10.9

0 37

28.8 29.0

39 46 30.1

30.3

25 57.5

3 4.5

10.4

10.5

3 0.5

27.8 27.8

42 6 29.3 29.3

26 46.5

4 7.5

10.7

10.7

4 15

29.0 29.0

43 18 30.0 30.0

28 0.5

8 5 10.5

10.5

10.5

9

5 28.5

28.5 28.5

44 29.5 29.5

30

29 14

6 14

10.4

10.4

6 43.5

28.8 28.8

45 42.5 29.9 29.9

30 28.5

7 18

10.5

10.5

7 56.5

28.5 28.5

46 55.5 29.7 29.7

31 43.5

9 28

11.4

11.3

10 32

29.3 29.1

49 24.5 30.5 30.3

34 14

10 11

11.0

10.8

11 23

28.8 28.5

50 14 30.0 29.7

35 7.5

10 55

11.4

11.2

12 16.5

30.5 29.9

51 5 30.7 30.3

36 1

11 38.5

11.2

10.9

13 8.5

30.4 29.6

51 55.5 30.7 30.1

36 56

12 22

10.7

10.4

14 0.5

29.9 28.9

52 46.5 30.9 30.0

37 50.5

I 1/2 I

10.74 | 10.73 |

28.94 | 28.84 |

29.96 | 29.90 |

+6 13.0 +3 6.5

5 32.5 2 46.2

4 51.8 2 25.8

4 10.0 2 5

2 6.0 1 3

+ 1 3.0 + 0 31.5

- 1 3.5 - 0 31.8

2 7.5 1 3.8

4 17.5 2 8.8

5 0.5 2 30.2

5 44.5 2 52.2

6 28.0 3 14

- 7 11.5 - 3 35.8

+7 14.0 +3 37

6 27.0 3 13.5

5 39.5 2 49.8

4 51.5 2 25.8

2 28.0 1 14

+ 1 13.5 + 0 36.8

- 1 15.0 - 0 37.5

2 30.0 1 15

5 3.5 2 31.8

5 54.5 2 57.2

6 48.0 3 24

7 40.0 3 50

- 8 32.0 - 4 16

+7 3.0 +3 31.5

6 16.5 3 8.2

5 30.5 2 45.2

4 43.5 2 21.8

2 23.5 1 11.8

+ 1 11.5 + 0 35.8

- 1 13.0 - 0 36.5

2 26.0 1 13

4 58.0 2 27.5

5 44.5 2 52.2

6 35.5 3 17.8

7 26.0 3 43

- 8 17.0 - 4 8.5

+6 32.5 +3 16.2

5 43.5 2 51.8

4 53.5 2 26.8

+ 4 2.5 + 2 1.2

- 4 14.0 - 2 7.0

5 7.5 2 33.8

6 1.0 3 0.5

6 56.0 3 28.0

- 7 50.5 3 55.2

AT -5 15 43.28

-38.58

- .20

-5 16 22.06

-5 15 43.28

-28.67

- .15

16 12.10

-5 15 43.28

-22.26

- .11

16 5.65

-5 15 43.28

-14.78

- .07

15 58.13

* A+C group faint star in right position
B " brighter " preceding with
setting 60 20 at middle thread

-100.2
+49.3
-50.9
-12.7
-1.17
-0.92

34.3 65.9
40.5 8.8

y Can May

$$D = \frac{1}{2} [T' + \Delta T' - (T + \Delta T)]$$

| 10 45 19 | 0.4 8.7 | y 2290 | y 2510 | y 2757 |
|-----------|-----------|---------------------------|------------|-----------|
| 46 26 | 2.5 9.0 | T' + ΔT' 7 41 3.6 | 7 54 21.3 | 8 40 56.4 |
| 47 33.5 | 4.1 8.6 | T - ΔT 2 48 48.4 | 3 49 16.4 | 4 28 23.8 |
| 48 42.5 | 6.1 9.1 | Δ 4 52 15.2 | 4 5 4.9 | 4 12 32.6 |
| 49 53 | 8.3 10.2 | D 2 26 7.6 | 2 2 32.45 | 2 6 16.3 |
| 53 26.5 | 9.5 9.8 | y 2988 | y Can May | |
| 55 17.5 | 10.3 10.4 | T' + ΔT' 9 5 58.0 34.7 | 8 17 9.5 | |
| 10 57 9.5 | 9.5 9.5 | T - ΔT 5 14 1.9 | 5 41 15.8 | |
| 59 7 | 11.5 11.4 | Δ 3 51 56.1 | 2 35 53.7 | |
| 1 5 | 11.3 11.0 | D 1 55 58.05 | 1 17 56.85 | |
| 5 12 | 13.7 11.4 | | | |
| 6 37.5 | 15.2 11.5 | | | |

D - 1/2 I See p. 45 for revised calculation

| 8 7 | 19.5 13.8 | y 2290 | y 2510 | y 2757 |
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| 9 36 | 22.2 13.6 | -2 23 1.1 | -1 58 55.4 | -2 2 44.8 |
| 11 5.5 | 24.0 12.3 | 23 21.4 | 59 18.9 | 3 8.1 |
| | 11.2 10.67 | 23 41.8 | 1 59 42.4 | 3 31.1 |
| | | 24 2.6 | 2 0 6.6 | 3 54.5 |
| | | 25 4.6 | 1 18.4 | 5 4.5 |
| | | 25 36.1 | 1 55.6 | 5 40.5 |
| | | 26 7.6 | 2 32.4 | 6 16.3 |
| | | 26 39.4 | 3 9.9 | 6 52.8 |
| | | 27 11.4 | 3 47.4 | 7 29.3 |
| | | 28 16.4 | 5 4.2 | 8 43.8 |
| | | 28 37.8 | 5 29.6 | 9 8.5 |
| | | 28 59.8 | 5 56.4 | 9 34.1 |
| | | 29 21.6 | 6 22.4 | 9 59.3 |
| | | 29 43.4 | 6 48.4 | 10 24.8 |
| | | y 2988 | y Can May | |
| -1 57.5 | -0 58.8 | 1 52 26.5 | 52 41.8 | 1 12 1.6 |
| 3 55.5 | 1 57.8 | 52 49.8 | 53 6.2 | 12 35.0 |
| 8 2.5 | 4 1.2 | 53 12.8 | 53 31.2 | 13 8.8 |
| 9 28.0 | 4 44 | 53 36.2 | 53 56.8 | 13 43.3 |
| 10 57.5 | 5 28.8 | 54 46.7 | | 14 18.6 |
| 12 26.5 | 6 13.2 | 55 22.2 | | 16 5.3 |
| -13 56.0 | 6 58 | 55 58.0 | 55 58.0 | 17 0.8 |
| | | 56 24.5 | | 17 56.8 |
| | | 57 11.0 | | 18 55.6 |
| | | 58 24.5 | 58 5.0 | 19 54.6 |
| | | 58 50.2 | 58 31.8 | 21 58.0 |
| | | 59 15.8 | 58 58.5 | 22 40.8 |
| | | 59 41.0 | 59 26.0 | 23 25.6 |
| | | 2 0 6.5 | 59 53.2 | 24 10.0 |
| | | | | 24 54.8 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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29 44.97

37 20.36

43 48.64

48 43.93

58 2.36

4 37.11

14 0.66

21 36.10

28 4.34

45.71

44.15

44.32

44.31

44.26

44.30

- 2.06

- .65

- .56

- .65

- .71

- .60

2.68

.85

.73
~~.86~~

.84

.92

.78
q Muna

5 - 80 42.2

q - 16 22.5

p.8 - 64 19.7

$$0 = 43.12 + \Delta T + .66a - 1.08c$$

$$43.63 + .74a + 1.13c$$

$$0 = 2.24 + 12.4c \quad c = -.18$$

$$0 = 1.71 + 6.24a + 5.11c \quad a = -.13$$

$$0 = 0.02 - 6.32a' + 5.06c \quad a' = -.14$$

$$0 = 1.69 + 12.56a \quad a = -.13$$

log sin(u) 9.95486 ~

.. sec 0.79170 ~

.. cos(u) 9.63670

.. A 0.746564

.. B 0.42840

A - 5.58

B 2.68

C 6.19

12 0 0

14 38 28

B

2.68

- 5 15 43.28

11 40.73

6 44 16.72

14 50 8.73

18 30 35.79

2 26.23

12 13 40.93

18 30 35.79

2 0.20

9 23 10.75

11 40.73

22 40

30.75 slow

Rate 1.2 per day

+67.0
-71.6
-4.6
-1.2
-1.1
-.36

49.5 17.5
19.8 51.8

2290

2510

+68.0
-72.0
-4.0
-1.0
-.09
-.34

50.0 18.0
20.0 52.0

y Can May

+68.0
-72.0
-4.0
-1.0
-.09
-.34

50.0 18.0
20.0 52.0

2757

+64.7
-72.0
-7.3
-1.9
-.17
-.42

48.2 16.5
20.0 52.0

50 11.5 ? A

38.8 39.1

50 54.5 38.1 38.3

51 38 38.0 38.2

52 21.5 38.1 38.2

54 30 37.5 37.5 7 23 B

53.0 53.0

55 34 37.6 37.6 8 39 53.7 53.7

12 56 37.5 37.5 37.5 9 53 53.0 53.0

57 40.5 37.3 37.3 11 7.5 53.5 53.5

58 43.5 37.6 37.5 12 20.5 53.2 53.2

0 48.5 38.2 38.1 14 45.5 53.7 53.5

1 29.5 38.1 37.9 15 33.5 54.1 53.8

2 11 38.6 38.4 16 22 55.3 54.9

2 51.5 38.4 38.1 17 8.5 54.8 54.2

3 32 38.3 37.9 17 55 54.6 53.8

I $\frac{1}{2}$ I 38.01 | 37.97

54.89 | 53.66

37.97 | 37.32

20.72 | 20.66

+ 6 26.0 + 3 13.
5 43.0 2 51.5
4 59.5 2 89.8
4 16.0 2 8.
2 7.5 1 3.8
+ 1 3.5 + 0 31.8

+ 2 30 + 1 15.
+ 1 14 + 0 37.

+ 10 57.5 + 5 28.8
9 28.0 4 44.
8 0.0 4 0
3 55.5 1 57.8
+ 1 55.5 + 0 57.8

+ 5 45.0 + 2 52.5
4 54.0 2 27.
2 26.0 1 13.
+ 1 12.5 + 0 36.2

- 1 3.0 - 0 31.5
2 6.0 1 3.
4 11.0 2 5.5
4 52.0 2 26.
5 33.5 2 46.8
6 14.0 3 7
- 6 54.5 - 3 27.2

- 1 14.5 - 0 37.2
2 27.5 1 13.8
4 52.5 2 26.2
5 50.5 2 50.2
6 29.0 3 14.5
7 15.5 3 37.8
- 8 2.0 - 4 1.0

- 1 53.0 - 0 56.5
3 42.5 1 51.2
7 18.0 3 39.
8 26.5 4 13.2
9 36.0 4 48.
10 43.0 5 21.5
- 11 49.5 - 5 54.8

- 1 12.0 - 0 36
2 23.5 1 11.8
4 45.0 2 22.5
5 31.0 2 45.5
6 18.0 3 9.
7 3.5 3 31.8
- 7 49.0 - 3 54.5

ΔT - 5 15 43.28
+ 9.30
+ .05
15 33.93

- 5 15 43.28
+ 11.48
+ .06
15 31.74

- 5 15 43.28
+ 15.22
+ .08
15 27.98

- 5 15 43.28
+ 19.11
+ .10
15 24.07

+68.0
-72.0
-4.0
-1.0
-0.09
-0.34
50.0 18.0
20.0 52.0

9 2988 *

9- $\frac{1}{2}$ I For review, see p. 45

| 12 | 12.5 | 2290 | 2510 | y Cam. | 2757 | 2988 |
|-----------|------|------------|-----------|-----------|---------|-----------|
| 13 | 9 | +2 29 20.6 | | | | 2 0 30.8 |
| | | 28 59.1 | | 1 23 25.6 | | 0 2.5 |
| 14 | 4 | 28 37.4 | | 22 40.8 | 2 9 8.8 | 1 59 35.0 |
| | | 28 15.6 | | 21 56.8 | 8 43.3 | 59 7.0 |
| 15 | 0 | 27 11.4 | 2 3 47.4 | 19 54.6 | 7 29.3 | 58 38.5 |
| | | 26 39.4 | 3 9.4 | 18 54.6 | 6 52.5 | |
| 15 | 57 | 26 7.6 | 2 32.4 | 17 56.8 | 6 16.3 | 55 58.0 |
| | | 25 36.1 | 1 55.2 | 17 0.3 | 5 40.3 | 55 19.5 |
| | | 25 4.6 | 1 18.6 | 16 5.6 | 5 4.5 | 54 40.8 |
| | | 24 2.1 | 0 6.2 | 14 17.8 | 3 53.8 | 53 24.2 |
| | | 23 41.6 | 1 59 42.2 | 13 43.6 | 3 30.8 | 52 59.2 |
| | | 23 20.8 | 59 17.9 | 13 8.8 | 3 7.3 | 52 33.8 |
| [2 21 18] | | 23 0.6 | 58 54.6 | 12 35.3 | 2 44.5 | 52 9.5 |
| | | 22 40.4 | 58 31.4 | 12 2.0 | 2 21.8 | 51 45.0 |

22 35

23 52.5

26 25.5

**

2290

2510

27 15.5

31 4

 δ

-13 16.9

-14 11.2

28 6.5

31 54.5 $\log \cos \delta$

9.98822

9.98655

28 55

32 43.5 " $\sin \phi$

9.45014

9.45014

29 44

33 30 Σ

9.43836

9.43669

+9 5.5 +4 32.8

8 9.0 4 4.5

7 14.0 3 37.0

6 18.0 3 9.0

+5 21.0 +2 40.5

y Cam

2757

 δ

-15 28.7

-13 59.6

 $\log \cos \delta$

9.98396

9.98692

" $\sin \phi$

9.45014

9.45014

 Σ

9.43410

9.43706

-1 17.0 -0 38.5

2 34.5 1 17.2

5 7.5 2 33.8

5 57.5 2 58.8

6 48.5 3 24.2

7 37 3 48.5

-8 26 -4 13.0

*

Faint star in right position.

**

Star following, setting at C_s 59 30; it may be same star as that observed over B group at E transit. There are other faint stars in vicinity.

-5 15 43.28

+23.21

+ 12

15 19.95

1897ebhae.proj.11700

22

$\frac{1}{2}I(\text{mean})$

$\gamma 2290 = \lambda \text{ Leporis}$

| | | | | $\log a(\frac{1}{2}I)$ | $\log d_{\text{mean}}$ | $\log I$ | I | |
|----|--------------|----------|--------------|------------------------|------------------------|----------------|--------------|-------|
| 29 | 43.4 34.8 | 37 | 25.8 23.7 | 9.78376 41 | 9.22212 | 2.61673 708 | 413.7 4.1 | 40.6 |
| 29 | 21.1 14.4 | 37 | 20.3 18.6 | 9.78285 56 | 9.22121 | 2.57188 217 | 373.1 .4 | 40.7 |
| 28 | 59.4 54.1 | 37 | 14.8 13.5 | 9.78194 72 | 9.22030 | 2.52164 186 | 332.4 .6 | 41.0 |
| 28 | 37.6 33.5 | 37 | 9.4 8.4 | 9.78103 087 | 9.21939 | 2.46456 472 | 291.4 .6 | 41.1 |
| 28 | 16.0 12.8 | 37 | 4.0 3.2 | 9.78013 00 | 9.21849 | 2.39851 864 | 250.3 .4 | 124.4 |
| 27 | 11.4 10.6 | 36 | 47.8 .6 | 9.77741 38 | 9.21577 | 2.10018 21 | 125.9 6.6 | 62.7 |
| 26 | 39.4 | 36 | 39.8 | 9.77606 | 9.21442 | 1.80082 | 63.2 | |
| 26 | 7.6 | 36 | 31.9 | 9.77471 | 9.21307 | | | |
| 25 | 36.1 35.8 | 36 | 24.0 | 9.77336 | 9.21172 | 1.80322 | 63.6 | 63.9 |
| 25 | 4.6 3.8 | 36 | 16.2 .0 | 9.77202 199 | 9.21038 | 2.10557 560 | 127.5 | |
| 24 | 2.4 2.3 | 36 35 | 0.6 59.8 | 9.76932 18 | 9.2076* | 2.40932 46 | 256.6 .7 | 43.4 |
| 23 | 41.7 37.6 | 35 | 55.4 54.4 | 9.76842 24 | 9.20678 | 2.47717 35 | 300.0 .2 | 43.6 |
| 23 | 21.1 15.8 | 35 | 50.3 49.0 | 9.76752 30 | 9.20588 | 2.53606 28 | 343.6 .8 | 43.7 |
| 23 | 0.8 22 | 35 | 45.2 42.5 | 9.76663 34 | 9.20499 | 2.58810 39 | 387.3 .6 | 44.0 |
| 22 | 40.4 31.8 | 35 | 40.1 38.0 | 9.76574 37 | 9.20410 | 2.63475 512 | 431.3 .6 | |

$\gamma 2510 = \eta \text{ Leporis}$

| | | | | | | | | | |
|---|----|--------------|----|--------------|-----------------|---------|----------------|---------------|------|
| 2 | 6 | 48.4 33.4 | 31 | 42.1 38.4 | 9.72057 1981 | 9.15726 | 2.68159 235 | 480.4 1.2 | 46.7 |
| | 6 | 22.4 9.8 | 31 | 35.5 32.4 | 9.71922 858 | 9.15591 | 2.63718 782 | 433.7 4.3 | 47.0 |
| | 5 | 56.4 46.4 | 31 | 29.1 26.6 | 9.71790 39 | 9.15459 | 2.58735 786 | 386.7 7.1 | 47.3 |
| | 5 | 29.6 22.4 | 31 | 22.4 20.6 | 9.71651 14 | 9.15320 | 2.53075 112 | 339.4 1.7 | 47.6 |
| | 5 | 4.2 4 | 31 | 16.0 14.6 | 9.71519 496 | 9.15188 | 2.46512 41 | 291.8 2.0 | |
| | 3 | 47.4 46.3 | 30 | 56.8 56.6 | 9.71117 3 | 9.14786 | 2.16809 813 | 147.3 | 73.3 |
| | 3 | 9.6 9.4 | 30 | 47.4 | 9.70918 | 9.14587 | 1.86907 | 74.0 | |
| | 2 | 32.4 | 30 | 38.1 | 9.70720 | 9.14389 | | | |
| | 1 | 55.4 55.2 | 30 | 28.8 | 9.70521 | 9.14190 | 1.87304 | 74.7 | 75.3 |
| | 1 | 18.5 17.4 | 30 | 19.6 19.4 | 9.70323 19 | 9.13992 | 2.17603 07 | 150.0 | |
| | 0 | 6.4 0.6 | 30 | 1.6 0.2 | 9.69932 01 | 9.13601 | 2.48099 136 | 302.7 1.9 | 51.5 |
| | 59 | 42.4 35.2 | 29 | 55.6 53.8 | 9.69800 761 | 9.13469 | 2.54926 65 | 354.2 1.5 | 51.8 |
| | 59 | 18.4 8.4 | 29 | 49.6 47.1 | 9.69668 13 | 9.13337 | 2.60857 912 | 406.9 52.1 | 52.1 |
| | 58 | 55.0 42.4 | 29 | 43.8 40.6 | 9.69541 410 | 9.13210 | 2.66099 176 | 458.1 52.5 | 52.5 |
| | 58 | 31.4 16.4 | 29 | 37.8 34.1 | 9.69408 325 | 9.13077 | 2.70808 891 | 510.6 1.6 | |

y can May: See Note p. 25

23

| $\delta - \frac{1}{2}I(\text{Mean})$ | $\log i(\delta - \frac{1}{2}I)$ | $\log \text{denom.}$ | $\log I$ | I |
|--------------------------------------|---------------------------------|----------------------|----------|----------------|
| 24 54.8 = 21 13.7 | 9.55881 | 8.99291 | 2.84594 | 701.4 |
| 23 51.8 20 58.0 | 367 | | 5108 | 9.7 64.9 66.7 |
| 24 10.0 21 2.5 | 9.55516 | 8.98926 | 2.80383 | 636.5 |
| 23 18.34 20 49.6 | 089 | | 820 | 43.0 65.9 67.9 |
| 23 26.6 20 51.4 | 9.55149 | 8.98559 | 2.75635 | 570.6 |
| 22 44.8 41.2 | 4809 | | 975 | 5.1 67.0 68.5 |
| 22 40.8 20 40.2 | 9.54776 | 8.98186 | 2.70209 | 503.6 |
| 10.2 32.6 | 520 | | 466 | 6.6 68.3 69.4 |
| 21 57.4 25 29.4 | 9.54413 | 8.97823 | 2.63877 | 435.3 |
| 35.4 19 23.8 | 222 | | 4068 | 7.2 |
| 19 54.6 24 58.6 | 9.53356 | 8.96766 | 2.34829 | 223.0 |
| 48.2 19 57.0 | 01 | | 884 | .3 110.2 |
| 18 55.1 24 43.8 | 9.52839 | 8.96249 | 2.05245 | 112.8 |
| 53.0 19 43.2 | 18 | | 266 | .9 |
| 17 56.8 24 29.2 | 9.52321 | 8.95731 | | |
| 17 0.6 19 15.2 | 9.51818 | 8.95228 | 2.06266 | 115.5 |
| 16 58.5 24 14.6 | 796 | | 288 | .6 118.2 |
| 16 5.4 19 1.4 | 9.51316 | 8.94726 | 2.36869 | 233.7 |
| 15 59.0 18 59.8 | 257 | | 928 | 4.0 |
| 14 18.2 18 34.6 | 9.50321 | 8.93731 | 2.67969 | 478.3 |
| 13 56.2 29.0 | 110 | | 5180 | 80.6 84.0 85.4 |
| 13 43.4 18 25.8 | 9.49988 | 8.93398 | 2.74997 | 562.3 |
| 12.8 18.2 | 700 | | 5285 | 6.0 85.2 87.4 |
| 13 8.8 18 17.2 | 9.49662 | 8.93072 | 2.81122 | 647.5 |
| 12 28.0 7.0 | 269 | | 515 | 53.4 86.3 89.0 |
| 12 35.2 18 8.8 | 9.49339 | 8.92749 | 2.86560 | 733.8 |
| 11 43.6 17 55.9 | 838 | | 7061 | 42.4 87.7 90.8 |
| 12 1.8 18 0.4 | 9.49014 | 8.92424 | 2.91461 | 821.5 |
| 10 55.8 17 44.7 | 8399 | | 2076 | 33.2 |
| | 9 2757 | | | |
| 2 10 24.8 32 36.2 | 9.73144 | 9.16850 | 2.67035 | 468.1 |
| 10.8 32.7 | 075 | | 104 | .9 45.6 |
| 9 59.8 32 29.8 | 9.73018 | 9.16724 | 2.62585 | 422.5 |
| 48.0 27.0 | 2962 | | 641 | 3.1 45.8 |
| 9 34.1 32 23.5 | 9.72892 | 9.16598 | 2.57596 | 376.7 |
| 24.9 21.2 | 47 | | 641 | 7.1 46.2 |
| 9 8.6 32 17.2 | 9.72767 | 9.16473 | 2.51922 | 330.5 |
| 1.6 15.4 | 31 | | 758 | .8 46.4 |
| 8 43.6 32 10.9 | 9.72641 | 9.16347 | 2.45353 | 284.1 |
| 38.4 9.6 | 14 | | 380 | .3 |
| 7 29.3 31 52.3 | 9.72265 | 9.15971 | 2.15624 | 143.3 |
| 28.1 52.0 | 59 | | 630 | 72.0 71.3 |
| 6 52.6 31 43.2 | 9.72079 | 9.15785 | 1.85709 | 90.6 |
| 52.2 43.0 | 5 | | 713 | |
| 6 16.3 31 34.2 | 9.71895 | 9.15601 | | |
| | | | | 72.6 |
| 5 40.4 31 25.1 | 9.71707 | 9.15413 | 1.86081 | 91.4 73.2 |
| 40.0 25.0 | 15 | | 83 | |
| 5 4.5 31 16.1 | 9.71521 | 9.15227 | 2.16368 | 145.8 |
| 3.3 15.8 | 15 | | 74 | |
| 3 54.2 30 58.6 | 9.71155 | 9.14861 | 2.46839 | 294.0 |
| 49.0 57.2 | 25 | | 69 | .2 50.0 |
| 3 31.0 30 52.8 | 9.71034 | 9.14740 | 2.53655 | 344.0 |
| 24.0 51.0 | 0994 | | 98 | .3 50.3 |
| 3 7.7 30 46.9 | 9.70907 | 9.14613 | 2.59581 | 394.3 |
| 58.5 44.6 | 859 | | 629 | 47.8 50.5 |
| 2 44.6 30 41.2 | 9.70786 | 9.14495 | 2.64817 | 444.8 |
| 38.3 38.3 | 24 | | 519 | 50.8 |
| 2 21.8 30 35.4 | 9.70662 | 9.14368 | 2.69517 | 495.6 |
| 7.8 32.0 | 590 | | 589 | 6.5 |

~~42988~~

Reduction to 1896.0

From Frisby's Yarnell -

| No. | α 1860 | Pre. | δ 1860 | Pre. |
|------------------------|-----------------------|-------|---------------|-------|
| 2290 λ Leporis | 5 13 7.50 78 16.4 | 2.762 | -13 19 26.3 | +4.07 |
| 2510 η " | 5 50 1.74 87 30.4 | 2.735 | -14 11 47.8 | +0.87 |
| 2757 | 6 32 52.84 98 13.2 | 2.741 | -14 1 23.0 | -2.87 |

From Engl. Naut. Alman. 1891 for 1891.0

| | | | | |
|--------------------|-------------------------|--------|--------------|--------|
| γ Can. Maj. | 6 58 49.616 104 42.4 | 2.7129 | -15 28 22.34 | -5.097 |
|--------------------|-------------------------|--------|--------------|--------|

Precession formulas: γ . p x x 111

$$m = 3.07177 + 0.0000, 19 (\gamma - 1850)$$

$$n = 20.0564 - 0.0000, 86 (\gamma - 1850)$$

$$\frac{da}{dt} = m + n \sin \alpha \tan \delta$$

$$\frac{d\delta}{dt} = n \cos \alpha$$

$$\text{for } 1878 \quad m = 3.0723, \quad n = 20.0540 = 1.33693$$

$$\text{" } 1893.5 \quad 3.0726 \quad 20.0527 = 1.33685$$

| | γ 2290 | γ 2510 | γ 2757 | γ Can. Maj. |
|-------------------------------|-----------------|------------------|------------------|--------------------|
| $\log \alpha$ | 0.12611 | 0.12611 | 0.12611 | 0.12608 |
| " $\sin \alpha$ (approx 1878) | 118 9.99486 | 66 9.99959 | 29 9.99582 | 49 9.98583 |
| " $\tan \delta$ " | 374 9.37442 | 292 9.40308 | 801 9.39753 | 74 9.44226 |
| Σ | 03 9.49139 | 69 9.52878 | 41 9.51976 | 80 9.55383 |
| No | -3098 | -3379 | -3305 | -3579 |
| m | 3.0723 | 3.0723 | 3.0723 | 3.0726 |
| $\frac{da}{dt}$ | 2.7613 | 2.7345 | 2.7418 | 2.7146 |
| " n | 1.30220 | 1.30220 | 1.30220 | 1.30217 |
| " $\cos \alpha$ " | 009 9.30771 | 60096 8.63852 | 16597 9.15526 | 528 9.40461 |
| Σ | 229 0.60941 | 0316 9.94072 | 6817 0.45746 | 745 0.70678 |
| $\frac{d\delta}{dt}$ | +4.073 4.002 | +0.872 800 | -2.867 2.939 | -5.099 |

| 1896.0 | | | | | | | | | |
|---------------|--|------------------------------------|-----------------|---------------|-------------------------------------|-----------------|---------------|--|------------------------------------|
| Apr. α | δ | 1860-96 $\Delta\alpha$ | α 1896.0 | Apr. δ | 1860-96 $\Delta\delta$ | δ 1896.0 | Apr. α | δ | 1860-96 $\Delta\alpha$ |
| 2290 | 5 13 57. ² _{78 29.3} | +99.4 ⁵ ₇₈ | 5 14 46.95 | -13 19 16.3 | +144.1 | 17 2.2 | 2290 | 5 13 57. ² _{78 29.3} | +99.4 ⁵ ₇₈ |
| 2510 | 5 50 51. ⁰ _{87 42.8} | +98.44 | 5 51 40.18 | -14 11 47.8 | +28.8 | 19.0 | 2510 | 5 50 51. ⁰ _{87 42.8} | +98.44 |
| 2757 | 6 33 52. ² _{98 25.6} | +98.70 | 6 34 31.54 | -14 11 23.0 | +105.8 | 8.8 | 2757 | 6 33 52. ² _{98 25.6} | +98.70 |
| α 1893 | | | | | δ 1893 | | | | |
| γ Can | 6 58 49. ^{55.0} _{104 43.8} | +13.57 ³ ₁₀₄ | 6 59 3.19 | -15 28 22.34 | -25.46 ⁵⁰ ₁₀₄ | -15 28 47.8 | γ Can | 6 58 49. ^{55.0} _{104 43.8} | +13.57 ³ ₁₀₄ |

See p. 83 for values from
Argentine General Catalogue -
Calculation of ℓ

| | γ 2290 | γ 2510 | γ 2757 | γ Can. |
|-------|-------------------------|------------------------|------------------------|------------------------|
| Cl. N | - ³ .98 | -.97 | -.93 | -.94 |
| Cl. S | -.36 | -.35 | -.38 | -.34 |
| Mean | -.67 _{3 35} | -.66 _{3 3} | -.66 _{3 3} | -.64 _{3 2} |
| | -10.05 | 9.9 | 9.9 | 9.6 |

Note to Reduction of Thread Intervals.

The formula used has been that of Chauvenet II, 248 (172^{*}) This is sufficiently accurate unless the star is too near the zenith, when the more rigid formula (172) should be used. A calculation of the interval of the extreme threads for γ Can. Maj., the star nearest the zenith of those observed, by the rigid formula showed a discrepancy of 0.3 only, which is far within the uncertainty of the observations. Hence the approximate formula is used for all cases.

Reduction to App. Place.

Dec. 28/96

| | $\gamma 2290$ | $\gamma 2510$ | $\gamma 2757$ | γ Can. |
|----------------------|---------------------------------|---------------|---------------|---------------|
| q | 345 42 | 345 42 | 345 42 | 345 42 |
| α_0 | 78 42 | 87 55 | 98 38 | 104 46 |
| H | 352 39 | 352 38 | 352 36 | 352 35 |
| $q+\alpha_0$ | 64 24 | 73 37 | 84 20 | 90 28 |
| $H+\alpha_0$ | 71 21 | 80 33 | 91 14 | 97 21 |
| δ_0 | -13 17.0 | -14 11.3 | -14 3.1 | -15 28.8 |
| $\log \tan \delta_0$ | 9.37306 n | 9.40282 n | 9.39843 n | 9.44240 n |
| " $\sin(q+\alpha_0)$ | 9.95513 | 9.98200 | 9.99787 | 9.99999 |
| " $\frac{1}{15}$ | 8.82391 | 8.82391 | 8.82391 | 8.82391 |
| " q | 1.4045 | 1.4045 | 1.4045 | 1.4045 |
| " $\cos(q+\alpha_0)$ | 9.63557 | 9.45035 | 8.99450 | 7.91058 n |
| " Σ_1 | 9.5566 n | 9.6132 n | 9.6247 n | 9.6708 n |
| " Σ_2 | 1.0401 | 0.8548 | 0.3990 | 9.3154 n |
| " $\sec \delta_0$ | 0.01178 | 0.01345 | 0.01319 | 0.01604 |
| " $\sin(H+\alpha_0)$ | 9.97657 | 9.99407 | 9.99990 | 9.99642 |
| " $\frac{1}{15}$ | 8.82391 | 8.82391 | 8.82391 | 8.82391 |
| " H | 1.3100 | 1.3100 | 1.3100 | 1.3100 |
| " $\cos(H+\alpha_0)$ | 9.50486 | 9.21534 | 8.33292 n | 9.10697 n |
| " $\sin \delta_0$ | 9.36129 n | 9.38936 n | 9.38524 n | 9.42635 n |
| " Σ_3 | 0.1223 | 0.1414 | 0.1470 | 0.1464 |
| " Σ_4 | 8.4884n | 9.9147 n | 9.0282 | 9.8433 |
| " $\cos \delta_0$ | 9.9882 | 9.9866 | 9.9868 | 9.9840 |
| " i | 0.0539 n | 0.0555 n | 0.0571 n | 0.0583 n |
| " Σ_5 | 0.0421 n | 0.0421 n | 0.0439 n | 0.0423 n |
| f | + 3.770 | + 3.770 | + 3.770 | + 3.770 |
| N_1 | - .360 | - .410 | - .421 | - .469 |
| N_3 | + 1.325 | + 1.385 | + 1.403 | + 1.401 |
| $\Delta \alpha$ | + 4.74 | + 4.74 | + 4.75 | + 4.70 |
| α_0 | 46.95 | 40.18 | 31.54 | 3.19 |
| α | 51.69 | 44.92 | 36.29 | 7.89 |
| N_2 | + 10.97 | + 7.16 | + 2.51 | - 0.21 |
| N_4 | - 1.50 | - .82 | + .11 | + .70 |
| N_5 | - 1.10 | - 1.10 | - 1.11 | - 1.10 |
| $\Delta \delta$ | + 7.4 | + 5.2 | + 1.5 | - 0.6 |
| δ_0 | 62.2 | 62.1 63.8 | 58.8 | 54.7 |
| δ | 54.7 | 54.7 56.4 | 47.7 | 47.8 |
| | 52.3 | 54.7 56.4 | 47.7 | 47.8 |
| | 54.8 | 13.8 | 7.3 | 48.4 |

| | $\gamma 2290$ <i>hurd</i> | $\gamma 2510$ | $\gamma 2757$ <i>hurd</i> | γ Can |
|---------------------|---|--|--|---|
| T' | 12 56 ^{37.97} 38.01 | 13 9 ⁶⁶ 53.89 | 13 32 ⁵⁶ 37.97 ^{20.72} 37.97 | 13 32 ³² 37.97 |
| $\Delta T'$ | -5 15 33.93 | -5 15 31.74 | -5 15 24.07 | -5 15 27.98 |
| T | 8 5 ³ 10.74 | 9 5 ⁸ 28.94 | 9 44 ⁰ 29.92 | 10 57 ^{10.67} 11.21 |
| ΔT | -5 16 22.06 | -5 16 12.10 | -5 16 5.65 | -5 15 53.65 |
| $T' + \Delta T'$ | 7 41 ⁴ 4.08 | 7 54 ^{21.92} 22.15 | 8 40 ⁵⁹ 56.66 | 8 17 ³⁴ 9.99 |
| $T + \Delta T$ | 2 48 ⁷ 48.68 | 3 49 ⁷ 16.84 | 4 28 ²⁵ 24.31 | 5 41 ⁰² 17.56 |
| $\Delta = 2\theta$ | 4 52 ³⁷ 15.42 | 4 5 ¹⁸ 5.31 | 4 12 ³² 32.34 | 2 35 ³² 52.43 |
| θ | 2 26 ⁶⁸ 7.72 | 2 2 ⁵⁹ 32.72 | 2 6 16.17 | 1 17 ¹⁶ 56.22 |
| | 36 31 ^{55.2} 48.8 | 30 38 ^{8.85} 2.4 | 31 34 2.55 | 19 29 ^{2.40} 3.32 |
| Σ | 10 29 ¹ 52.76 | 11 43 ⁶⁶ 38.99 | 13 9 ⁸⁴ 20.96 | 13 58 ^{26.36} 27.55 |
| $\frac{1}{2}\Sigma$ | 5 14 ⁶ 56.38 | 5 51 ³³ 49.42 | 6 34 ²⁷ 40.48 | 6 59 ¹⁸ 13.78 |
| α | 5 14 ⁹ 51.68 | 5 51 44.92 | 6 34 36.29 | 6 59 7.89 |
| λ | ⁶⁷ 4.73 | ⁴¹ 4.88 | ³ 4.18 | ² 5.89 |
| δ | -13 16 ^{54.8} 52.3 ^{54.7} 56.4 <i>Stone</i> | -14 11 ^{9.9} 13.8 | -14 3 ^{7.3} 7.9 | -15 28 48.4 |

| | <i>hurd</i> | <i>hurd</i> | <i>hurd</i> | <i>hurd</i> <i>St. John</i> <i>Thackeray</i> |
|--------------------|--|---|---|---|
| $\log \tan \delta$ | 9.372992 ^{30 15} 146 | 9.402758 ⁷⁸ 435 | 9.398425 ⁴⁸ 536 | 9.442403 ⁰²⁶ |
| " $\sec \delta$ | 0.095001 007 | 0.065288 876 | 0.069547 476 | 0.025611 105 |
| " $\cos \lambda$ | 0 | 0 | 0 | 0 |
| " $\tan \phi'$ | 9.467993 ^{80 16} 153 | 9.468038 ⁴⁶ 311 | 9.467992 ⁹⁵ 80012 | 9.468014 ¹³¹ |
| ϕ' | -16 22 ^{17.4} 14.5 17.3 | ^{28.8} 19.9 19.4 | ⁷ 14.8 15.5 | 17.2 17.1 |
| h | -10.0 | -9.9 | -9.9 | -9.6 |
| ϕ | -16 22 ^{27.4} 24.5 <u>27.3</u> | ^{33.7} 29.8 <u>29.3</u> | ^{24.6} 24.8 <u>25.4</u> | 26.8 <u>26.7</u> |
| Mean | -16 22 ^{28.1} 25.7 | Naut. Alm. + Yarnall | | |
| | | 27.2 | " | " <i>hurd</i> |

| | | |
|----------------------|------------------------|------------------------|
| Berl. Jahr. δ | -14 11 7.5 | -15 28 48.2 |
| $\log \tan \delta$ | 9.402722 ²² | 9.442401 ¹⁰ |
| " $\tan \phi'$ | 9.468009 ⁸ | 9.468011 ⁵ |
| ϕ' | -16 22 16.6 | 16.9 |
| ϕ | 26.5 | 26.5 |

See p. 99

Effect of errors in data.

From Bessel's $f.357$

$$d\phi = \frac{1}{2} \sin 2\phi \tan \delta d\delta \text{ nearly}$$

$$d\phi = \frac{\sin 2\phi}{\sin 2\delta} d\delta$$

At Arequipa $\phi = -16^\circ 22'.5$ $\sin 2\phi = 0.541$

$$\delta = -6^\circ 30' \text{ to } -16^\circ$$

$$\delta = 4^h 28^m \text{ to } 0^h 50^m$$

$$\tan \delta = 2.36 \text{ to } 0.22$$

$$\sin 2\delta = 0.22 \text{ to } 0.53$$

Hence an error in δ affects the latitude by 0.64 to 0.06 its amount according to the declination of the star. For $\delta = 2^h$ coefficient is 0.16

An error in δ affects the latitude by 2.5 to 1.0 its amount.

Constant errors of collimation and level are eliminated if the same star is observed at both E & W transits.

| | δ | | $\cotan \delta$ |
|--------------------|----------------------------|-------|---------------------------|
| γ Leporis | $2^h 2.6^m = 30^\circ 39'$ | | $\frac{1.69}{0.59}$ |
| γ Cam. Maj. | 1 17.9 | 19 28 | $2.8\frac{3}{4}$ |
| β Orionis | 4 0.6 | 60 9 | 0.57 0.74 |
| γ Eridani | 2 13.1 | 33 16 | 1.52 |
| 64 " | 2 39.9 | 39 58 | 1.19 |
| 53 " | 1 53.2 | 28 18 | 1.86 |
| θ Cam. Maj. | 2 56.5 | 44 6 | 1.03 |
| | | | |
| λ Leporis | 2 26.1 | 36 32 | 1.85 |
| 11 Cam. Maj. | 1 58.8 | 29.42 | 1.75 |
| γ 2757 | 2 6.3 | 31 34 | 1.63 |

Stars in Trisby's Yarnall 3^h to 9^h and $-6^\circ 30'$
to $-16^\circ 0'$ as bright as 7.5 mag.

| No | Name | Mag | α 1897.0 | δ 1897.0 | t | E | W | Δt | h | Δh |
|------|--------------------|-----|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------|---------------------------|---------------------------|
| | | | ^h ^m | ^o ['] | ^h ^m | ^h ^m | ^h ^m | ^m | ^o ['] | ^o ['] |
| 1411 | BAC 1010 | 7.5 | 3 10.6 | -9 9 | 3 47 | 23 24 | 6 58 | | | |
| 1413 | ϵ Eridani | 5.5 | 3 10.9 | -9 12 | 3 46 | 23 25 | 6 57 | | | |
| 1456 | W. III, 278 | 7.2 | 3 18.3 | -8 9 | 4 4 | 23 14 | 7 22 | | | |
| 1505 | W. III, 442 | 7.0 | 3 27.1 | -8 12 | 4 3 | 23 24 | 7 30 | | | |
| 1507 | W. III, 456 | 7.0 | 3 27.4 | -8 57 | 3 51 | 23 36 | 7 18 | | | |
| 1513 | ϵ Eridani | 4.1 | 3 28.1 | -9 49 | 3 35 | 23 53 | 7 3 | 5.1 | 37 14 | 74 |
| 1778 | W. III, 965 | 7.5 | 3 51.7 | -10 3 | 3 31 | 0 20 | 7 23 | | | |
| 1780 | BAC 1229 | 7.5 | 3 51.7 | -13 54 | 2 11 | 1 41 | 6 3 | | | |
| 1786 | γ Eridani | 3.0 | 3 53.2 | -13 48 | 2 13 | 1 40 | 6 6 | 7.8 | 57 48 | 111 |
| 1845 | 37 Eridani | 6.0 | 4 5.4 | -7 11 | 4 18 | 23 47 | 8 23 | | | |
| 1848 | Lal. 7819 | 7.2 | 4 5.9 | -9 5 | 3 49 | 0 47 | 7 55 | | | |
| 1857 | α Eridani | 4.0 | 4 6.9 | -7 6 | 4 20 | 23 47 | 8 27 | | | |
| 1867 | W. IV, 114 | 7.3 | 4 8.7 | -10 39 | 3 20 | 0 49 | 7 29 | | | |
| 1879 | A Eridani | 5.5 | 4 9.6 | -10 31 | 3 23 | 0 47 | 7 33 | | | |
| 1886 | α^2 Eridani | 5.0 | 4 10.6 | -7 48 | 4 9 | 0 2 | 8 20 | | | |
| 1965 | Lal. 8431 | 7.0 | 4 23.0 | -11 21 | 3 8 | 1 15 | 7 31 | | | |
| 2180 | 64 Eridani | 6.0 | 4 55.1 | -12 41 | 2 40 | 2 15 | 7 35 | 6.3 | 51.7 | 94 |
| 2029 | 53 " | 5.5 | 4 33.5 | -14 31 | 1 54 | 2 40 | 6 28 | 9.2 | 62 30 | 130 |
| 2228 | W. IV, 1379 | 7.3 | 5 2.6 | -12 37 | 2 42 | 2 21 | 7 45 | | | |
| 2259 | W. V, 136 | 5.5 | 5 8.6 | -8 16 | 4 2 | 1 7 | 9 11 | | | |
| 2267 | β Orionis | 1.0 | 5 9.6 | -8 19 | 4 1 | 1 9 | 9 11 | 4.8 | 30 53 | 69 |
| 2290 | λ Leporis | 7.0 | 5 14.8 | -13 17 | 2 26 | 2 49 | 7 41 | 7.2 | 54 41 | 102 |
| 2324 | W. V, 449 | 7.0 | 5 20.9 | -13 13 | 2 28 | 2 53 | 7 49 | 7.2 | 54 10 | 100 |
| 2330 | BAC 1708 | 6.8 | 5 22.2 | -11 59 | 2 55 | 2 27 | 8 17 | | | |
| 2460 | κ Orionis | 4.0 | 5 42.8 | -9 42 | 3 37 | 2 6 | 9 20 | 5.1 | 36 43 | 74 |

| No. | Name | Mag. | α 1897.0 | δ 1897.0 | t | ϵ | W | Δt | h | Δh |
|------|-------------------------|------|-----------------|-----------------|--------|------------|----------------------------------|-----------------------|---------------------------|------------|
| | | | h m | $^{\circ}$ $'$ | $h.m.$ | $h.m.$ | $h.m.$ | m | $^{\circ}$ $'$ | $'$ |
| 2510 | γ Leporis | 4.5 | 5 51.7 | -14 11 | 2 2 | 3 50 | 7 54 | 8.5 | 60 36 | 121 |
| 2573 | W.V, 1479 | 7.0 | 5 59.5 | -14 5 | 2 6 | 3 54 | 8 6 | 8.2 | 59 43 | 117 |
| 2608 | W.VI, 44 | 7.5 | 6 4.5 | -14 3 | 2 7 | 3 57 | 8 12 | | | |
| 2621 | Batc 1994 | 5.0 | 6 6.8 | -6 31 | 4 28 | 1 39 | 10 35 | | | |
| 2704 | 11 $\frac{1}{2}$ Monc.* | 5.7 | 6 23.8 | -6 58 | 4 22 | 2 2 | 10 46 | | | |
| 2757 | W. VI, 990 | 7.5 | 6 34.6 | -14 3 | 2 7 | 4 28 | 8 42 | 8.2 | 59 21 | 120 |
| 2807 | 11 Can. Maj. | 6.0 | 6 42.2 | -14 19 | 1 58 | 4 44 | 8 40 | 8.8 | ^{61 20} 60 51 | 127 |
| 2857 | θ Can. Maj. | 5.0 | 6 49.4 | -11 54 | 2 57 | 3 52 | 9 46 | 6.0 | 47 6 | 86 |
| 2885 | W.VI, 1618 | 7.5 | 6 54.4 | -14 49 | 1 42 | 5 12 | 8 36 | | 65 15 | |
| 2891 | Lal. 13578 | 7.5 | 6 58.2 | -14 53 | 1 41 | 5 14 | 8 36 | | 65 53 | |
| 2918 | γ Can. Maj. | 3.6 | 6 59.1 | -15 29 | 1 18 | 5 41 | 8 17 | ^{12.7} 13 | 71 14 | 183 |
| 2988 | W.VII, 250 | 7.4 | 7 10.4 | -14 26 | 1 55 | 5 15 | 9 5 | 8.9 | 62 22 | 128 |
| 2992 | W.VII, 274 | 7.5 | 7 11.1 | -14 19 | 1 58 | 5 13 | 9 9 | | 61 20 | |
| 3007 | W.VII, 316 | 7.3 | 7 12.4 | -14 40 | 1 47 | 5 25 | 8 59 | | | |
| 3036 | Anom. | 7.5 | 7 15.7 | -14 40 | 1 47 | 5 29 | 9 3 | | | |
| 3075 | Anom. | 7.5 | 7 20.4 | -14 41 | 1 47 | 5 33 | 9 7 | | | |
| 3078 | Anom. | 7.2 | 7 20.7 | -15 2 | 1 36 | 5 45 | 8 57 | | | |
| 3112 | Lal. 14619 | 6.0 | 7 24.7 | -14 46 | 1 45 | 5 40 | 9 10 | | | |
| 3143 | W.VII, 835 | 7.5 | 7 29.1 | -14 18 | 1 59 | 5 30 | 9 28 | | | |
| 3162 | W.VII, 924 | 7.5 | 7 31.9 | -14 15 | 2 0 | 5 32 | 9 32 | | | |
| 3220 | 2 $\frac{1}{2}$ Puppis† | 7.0 | 7 40.7 | -14 26 | 1 55 | 5 46 | 9 36 | | | |
| 3222 | 4 Puppis | 4.5 | 7 41.2 | -14 19 | 1 58 | 5 43 | 9 39 | | | |
| 3277 | 9 Puppis | 5.0 | 7 47.0 | -13 37 | 2 18 | 5 29 | 10 5 | 7.5 | 56 25 | 110 |
| 3368 | W.VIII, 19 | 7.0 | 8 4.2 | -11 2 | 3 13 | 4 51 | 11 17 | | | |
| 3414 | W.VIII, 294 | 7.0 | 8 13.5 | -12 16 | 2 50 | 5 24 | 11 4 | | | |
| 3839 | 17, Hydree‡ | 7.5 | 8 50.4 | -7 34 | 4 12 | 4 38 | 13 ² 28 | | | |
| 3899 | Lal. 17585 | 6.8 | 8 58.3 | -13 36 | 2 18 | 6 40 | 11 16 | | | |

* 11, Monc. 6.9 precedes 11 $\frac{1}{2}$ by 0.5 and is 6" further north.

† 2, Puppis 7.3 " 2 $\frac{1}{2}$ " 0.5 " " 15" " "

‡ 17 $\frac{1}{2}$ Hydree 7.5 follows 17 $\frac{1}{2}$ " 0.03 " " 6" " "

6 59 24 =
14 23 45

Jan 8/47 am.

+82.6
-61.6
+21.0
+5.2
+1.48
+.13

52.0 30.6
20.2 41.4

+86.4
-62.8
+23.6
+5.9
+.54
+.19

53.6 32.8
21.0 41.8

+47.4
-96.9
-49.5
-12.4
-1.14
-.79

34.1 13.3
38.1 58.8

-67.2
+82.1
+14.9
+13.7
+.34
-.01

23.5 43.7
51.1 31.0

Cl E β Centauri

2 Bortis

Cl W α Centauri

Cl E α Cent

| | | | |
|---------------------|------|---------------------------|----------------------------|
| 49.2 B ₁ | 40.3 | 29.7 5 9.7 A ₁ | 28.3 8 10.2 B ₂ |
| 31 10 | 54.9 | 29.6 23.6 | 27.9 57.7 C ₁ |
| 31 30.50 30.8 | 9.7 | 29.3 37.5 | 28.0 5.7 |
| 51 | 31.7 | 29.2 51.5 | 28.2 20 |
| 11.5 | 42.7 | 29.3 6 5.5 | 27.7 33.7 |
| 32 53 0 | 54 | 29.4 47.5 | 27.79 47.7 |
| 6.8 | 46 | 29.4 7 8.5 B ₂ | |
| 33 20.50 20.7 | 15.7 | | |
| +1 49.80 | 37.7 | | |
| 31 30.70 34.3 | 52.3 | | |
| 6 33 47.7 | | | |

6 47 7.0

| | | | |
|----------------------|-------------|-------------|-------------|
| 6 31 30.60 | 6 45 53.69 | 7 7 29.41 | 7 7 27.97 |
| Red to 700 -4.68 | -2.32 | +1.23 | +1.22 |
| T 6 31 25.92 | 6 45 51.37 | 7 7 30.64 | 7 7 29.19 |
| α 13 56 32.86 | 14 10 58.29 | 14 32 35.78 | 14 32 35.78 |
| Δ 4 34 53.06 | 53.08 | 54.86 | 53.41 |
| + .19 | + .16 | -7.15 | - .01 |

1.45

.86

1.45

| Δ | C_c | ΔT |
|---|--------------------|------------|
| 0 = 4 34 53.25 + ΔT -1.37a -1.99c | +0.74 +.20 +.27 13 | 53.82 .38 |
| 53.24 +.63 -1.06 | +0.74 +.11 +.08 14 | .32 .38 |
| 53.71 -1.41 +2.03 | +0.74 -.20 -.12 27 | .58 .44 |
| 53.40 -1.41 -2.03 | +0.74 +.20 +.27 13 | .67 .53 |

$$0 = 0.81 + 4.06c \quad c = -.08$$

$$-4 \ 34 \ 53.43$$

$$= 0.46 + 4.02c \quad c = \frac{-.11}{-.10}$$

$$0 = 0.01 - 2.00a - 0.93c$$

$$2.00a = +.10$$

$$a = +.05$$

chron Sid. clock

¹⁸
6 59 24 = 14 23 45

19 0 0

~~-4 34 53.43~~

~~-4 34 53.43~~

~~14 24 30.57~~

14 25 6.57

~~19 10 1.37~~

19 10 1.37

~~2 22.02~~

19 15 5.20

36 53.96

3 9.23

11 55.97

19 11 55.97

19 11 19.97

11 55.97

3 9.14

19 10 1.37

14 24 30.48

23 45

+ 45.48 Clock slow

| | | | | | |
|-------|-------|-------|-------|--------|-------|
| +48.3 | +45.8 | +49.0 | -95.1 | -100.1 | +49.3 |
| -99.2 | -96.2 | -94.8 | +44.5 | +51.8 | -89.8 |
| -50.9 | -50.4 | -45.8 | -50.6 | -48.3 | -40.5 |
| -12.7 | -12.6 | -11.4 | -12.6 | -12.1 | -10.1 |
| -1.17 | -1.16 | -1.05 | -1.16 | -1.11 | -0.93 |
| -.92 | -.91 | -.80 | -.91 | -.86 | -.68 |

| | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|
| 40.8 7.5 | 40.8 5.0 | 43.8 5.2 | 26.0 69.1 | 33.9 66.2 | 34.0 15.3 |
| 33.0 66.2 | 30.5 65.7 | 28.0 66.8 | 44.0 0.5 | 9.5 42.3 | 35.8 54.0 |

β Orionis γ Eridani 64 Eridani 53 Eridani γ Leporis

| | |
|---------------------------------|-------------------|
| 6 5 48.5 A ₁ | 4 42.5 16.8 18.1 |
| 6 32 16.7 | 5 32 16.5 17.5 |
| 7 16 16.2 43 8.5 A ₃ | 6 22.5 17.0 17.7 |
| 8 1 17.0 43 46.5 | 7 13.5 17.5 18.0 |
| 8 46 17.5 44 25.5 | 8 4.5 17.6 18.0 |
| 11 0 16.7 46 20.5 | 10 39 17.3 17.3 |
| 12 8.5 17.1 47 18.5 | 11 58 17.6 17.6 |
| 6 13 - 6 48 17 | 12 56.5 56.5 |
| 14 26.5 17.4 49 16 | 13 17.5 17.5 18.5 |
| 15 35.5 16.7 50 14.5 | 14 37.5 17.0 17.0 |
| 17 57 17.1 52 14 | 15 59.5 17.7 17.7 |
| 18 44.5 17.1 52 54 | 16 0.5 57.8 |
| 19 33 17.8 53 35 | 17 52 57.8 |
| 20 20 16.7 54 14 | 18 44.5 58.5 |
| 6 21 8 16.4 54 55 | 19 36.5 58.4 |
| 6 13 16.95 6 48 17.22/17.19 | 20 31 18.2 16.87 |
| | 21 57.43 |

| | |
|--|-----------------|
| +7 28.5 +3 44.2 | +8 35 +4 17.5 |
| 6 45 3 22.5 | 7 45.5 3 52.8 |
| 6 1 3 0.5 +5 8.5 +2 34.2 | 6 55 3 27.5 |
| 5 16 2 38 4 30.5 2 15.2 | 6 4 3 2 |
| +2 50.2 +1 25.1 4 31 2 15.5 3 51.5 1 58.8 | 5 13 2 36.5 |
| 1 25.2 0 42.6 2 17 1 8.5 1 56.5 0 58.2 | 2 38.5 1 19.2 |
| +0 42.2 +0 21.1 +1 8.5 +0 34.2 +0 58.5 +0 29.2 | +1 19.5 +0 39.8 |
| -0 43.0 -0 21.5 -1 9.5 -0 34.8 -0 59 -0 29.5 | -1 20 -0 40 |
| 1 26.3 0 43.2 2 18.5 1 9.2 1 57.5 0 58.8 | 2 42 1 21 |
| 2 52.8 1 26.4 4 40 2 20 3 57 1 58.5 | 5 28.5 2 44.2 |
| 3 21.8 1 40.9 5 27.5 2 43.8 4 37 2 18.5 | 6 24 3 12 |
| 3 50.3 1 55.2 6 16 3 8 5 18 2 39 | 7 21 3 40.5 |
| 4 18.8 2 9.4 7 3 3 31.5 5 57 2 58.5 | 8 18.5 4 9.2 |
| -4 47.6 -2 23.8 7 51 -3 55.5 -6 38 -3 19 | -9 13.5 -4 36.8 |

| | | | | |
|------------------------|-------------|-------------|-------------|-------------|
| ΔT -4 32 39.20 | -4 32 39.20 | -4 32 39.20 | -4 32 39.20 | -4 32 39.20 |
| -27.57 | -22.46 | -16.71 | -12.60 | -1.82 |
| -.21 | -.17 | -.13 | -.10 | -.01 |
| 33 6.98 | 33 1.83 | 32 56.04 | 32 51.90 | 32 40.53 |

+23.2
-69.5
-46.3
-11.6
-1.08
-1.82
21.2 2.0

-62.4
+13.5
-48.9
-12.2
-1.12
-1.87
21.4 41.0

25.0 44.5 17.0 -3.5(?)

γ Can. May.

β 23

β Orionis

γ Eridani

64 Eridani

10 1 52.5? 33.9 42.2 $T' + \Delta T'$ 9 10 17.0 6 6 24.21 7 35 8.3

2 58.5 35.0 41.5 $T - \Delta T$ 1 9 ~~47.2~~ 4.2 1 40 15.12 2 40 25.6

4 5 35.6 40.1 Δ 8 1 12.8 4 26 9.09 5 19 47.3

5 14.5 38.1 41.1 \mathcal{D} 4 0 36.4 2 13 4.54 2 39 53.6

6 24.5 39.8 41.7 53 Eridani γ Leporis γ Can. May.

9 58 41.0 41.3 $T' + \Delta T'$ 6 26 43.5 7 54 23.6⁴ 8 17 13.02

11 49 41.8 41.9 $T - \Delta T$ 2 40 25.6 3 49 16.7⁷⁰ 5 41 20.74

13 41.5 41.5 41.5 Δ 3 46 17.9 4 5 6.9⁴ 2 35 52.65

15 38 42.5 42.4 \mathcal{D} 1 53 9.0 2 2 33.3⁴⁷ 1 17 32

17 36 42.3 42.0

21 44 45.7 43.4 $\mathcal{D} - \frac{1}{2} I$ Formensi sup. 46

23 9 46.7 43.0 β Orionis 64 Eridani 53 Eridani

24 38 50.5 44.63 1 48 51.5

26 6 52.2 43.6 49 16.2

27 36.5 55.0 43.3 2 37 19.4 49 41.5

57.23 | 10 13 42.77 | 42.40 | 57 38.4 50 7.0

[97] 3 59 11.3 37 57.8 50 32.5

59 53.8 38 55.4 51 49.8

4 0 15.3 39 24.4 52 29.2

4 0 36.4 39 53.6 53 9.0

0 57.9 40 23.1 53 49.0

1 19.6 40 52.4 54 30.0

2 2.8 41 52.1 55 53.2

2 17.3 42 12.1 56 21.0

2 31.6 42 32.6 56 49.5

2 45.8 42 52.1 57 18.2

3 0.2 43 12.6 57 45.8

-4 32.39.20

+ 17.04

+ 1.44

32 22.07

22.03

-57.9
+93.5
+35.6
+8.9
+.82

+105.7
-80.5
+25.2
+6.3
+.58

-29.6
+61.8
+32.2
+8.0
+.74

+71
-35
b = +.36 adopt

12.2 45.7
63.7 29.8

70.2 35.5 23.5 58.8
22.7 57.8 40.0 21.8

40 33 -77 46 47 27 23 47
α Persei Hydri β Persei γ Tauri

5 47 31

23.2 48 4

50.6 49 41.5 49.5 B₁

4.3 50 30.5 5 2 29.3 B₃ 29.3

18. 51 19 20.24 20.2 3 40.6 4 29.3

31.3 52 8 35.5 4 52 5 29.4

45.7 52 57 51 5 14.5 C₁ 29.4

12.3 54 34.5 21.2 C₁ 22.1 2 29.5

7 35 30.2 7 55 7 81.6 2 29.6 3 29.4

41.80 42 3 37.2 4 29.6

21.70 20.10 52 4 8 12 44.7 5 29.5

8 10 2.2 5

7 34 17.84 51 19.17 8 20.17 11 29.42

Red. to 8 30 -9.15 -6.35 -3.56 -3.04

T 7 34 8.69 51 12.82 8 16.61 11 26.38

α 3 1 29.52 18 35.69 35 37.48 41 23.38

T-α 4 32 39.17 32 37.13 39.13 wrong star

+26 +.81 +.23

.72 2.26 .65 .84

0 = 32 39.43 + ΔT + 1.10a - 1.32c A₂ C₂ Σ ΔT
-.23 +.13 -.10 39.43

37.94 -4.15 -4.72 +.87 +.47 +1.34 .38] 39.33

39.36 +1.33 -1.48 -.28 +.15 -.13 .23

29.26 +.70 -1.09

39.26 +.55 +1.04 -.12 -.10 -.22 .04

38.56 -5.43 +6.03 +1.14 -.60 +.54 .10] 39.07

39.30 +.68 +1.08 -.14 -.11 -.25 .05

39.27 +.54 +1.04 -.11 -.10 -.21 .06

39.28 +.16 +1.01 -.03 -.10 -.13 .15

39.20

| | | | | | |
|-------|--------|-------|---------------|-------|----|
| -73.2 | +105.0 | +53.0 | -1.09 | -74.8 | 37 |
| +69.7 | +57.0 | -99.2 | + .35 | +27.0 | |
| -3.5 | -48.0 | -46.2 | b = -.74 adpt | -47.8 | |
| rej. | -12.0 | -11.6 | | -12.0 | |
| | -1.10 | -1.07 | | -1.10 | |

| | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|
| level | 27.3 | 45.9 | 43.2 | 61.8 | 360 | 17.0 | 27.8 | 47.0 |
| found | 44.2 | 25.5 | 38.3 | 18.7 | 40.2 | 57.2 | 23.2 | 3.8 |

| | | | | |
|--------------|---------|----------|---------------------------|-----------|
| 15 23 | -80 27 | 22 45 | 15 16 15 12 | -6 57 |
| Cl W y Tauri | δ Musae | ε Tauri | β Suid. 11 Orionis | + Orionis |
| 52.2 | 55 33.5 | 54.4 | 15.6 | 24.4 |
| 13.3 | 56 36 | 17 | 30 | 45 |
| 24.2 | 57 38 | 28.2 | 51.3 | 55.7 |
| 35 | 58 41 | 39.3 | 2.2 | 57 |
| 45.7 | 59 43.5 | 50.7 | 12.8 | 16.5 |
| 56.3 | | 1.7 | 23.7 | 26.8 |
| 8 47 17.8 | | 9 9 24.2 | 34.5 | 9 45 47.6 |

| | | | | |
|------------|----------|---------|-----------|----------|
| | | | 55.7 | |
| | | | 9 32 10.2 | |
| 8 46 34.93 | 57 38.40 | 8 39.36 | 31 12.89 | 45 5.96 |
| +2.72 | +4.54 | +6.35 | +10.06 | +12.34 |
| 8 46 37.65 | 57 42.94 | 8 45.71 | 31 22.95 | 45 18.30 |
| 4 13 57.74 | 25 2.43 | 36 5.79 | 58 43.03 | 12 38.29 |
| 4 32 39.91 | 40.51 | 39.92 | 39.92 | 40.01 |
| -.65 | -1.95 | -.62 | -.65 | -.73 |
| .88 | 2.64 | .84 | .88 | .99 |

ΔT

| | | | |
|--------------------------------|-------------|-------------|-------------------|
| 0 = 39.40 + ΔT + 1.22a - 1.40c | -4 32 39.20 | 8th 8.30 pm | 11 57.23 |
| 37.94 | -4.15 | -4.72 | 4 34 53.43 |
| 39.29 | +.48 | +1.04 | 5 15 43.28 |
| 38.56 | -5.43 | +6.03 | Dec 28th 12.00 pm |

Hourly Rate = 0.093 8th 7.00 am - 8.30 pm

= 0.063 28th - 8th

| | | |
|--------------------------|-------------|--------------------------|
| 0 = 1.46 + 5.37a + 3.32c | 8 30 0 | |
| = 0.73 + 5.91a - 4.99c | -4 32 39.20 | |
| = 1.61 + 5.91a + 3.65c | 3 57 20.80 | Adopt 0.075 on Mean Time |
| | 19 13 57.93 | |
| | 8 43 22.97 | |
| | 1 25.74 | |
| = 0.88 + 8.64c c = -.10 | 8 11 57.23 | |
| 5.27a = -1.13 | 11 57.23 | |
| 5.91a = -1.23 a = -.21 | | |

27.2 4.2 27.0 3.5 1.5 25.3
0.8 24.0 0.5 24.2 27.8 4.0

$2 - \frac{1}{2} I$ For revisi. ref. 46

y Can. β Orionis 53 Eridani 64 Eridani β Orionis

| 22 | 23 | 37 | 17 | 3.9 | 2 | 43 | 11.6 | 4 | 3 | 0.2 |
|-----|------|----|-------|------|----------------|------|------|------|------|-----|
| 6 | 24.4 | 12 | 38 | 17.5 | A ₃ | 5.0 | 10.0 | 37 | 46 | 4.0 |
| 5 | 24.1 | | 39 | 44.5 | 4 | 6.8 | 10.5 | 38 | 15 | 4.2 |
| 2 | 23.5 | | 41 | 10.5 | 5 | 8.8 | 11.8 | 38 | 43.5 | 4.0 |
| 2 | 24.4 | | | | | | | 39 | 12.5 | 4.2 |
| 0 | 24.0 | | 45 | 14.5 | B ₁ | 8.2 | 8.5 | 40 | 38.5 | 4.2 |
| 2 | 24.2 | | 47 | 14.5 | 10.0 | 10.1 | 41 | 21.5 | 4.3 | 5.3 |
| 5 | 23.5 | 12 | 49 | 9.5 | 9.5 | 13.5 | 4.2 | 4.5 | 4.5 | 5.3 |
| 5 | 23.5 | | 51 | 1.5 | 8.7 | 8.6 | 4.2 | 4.7 | 4.3 | 5.2 |
| 2 | 23.2 | | 52 | 52.5 | 9.5 | 9.2 | 4.3 | 29.5 | 4.1 | 5.1 |
| 2 | 23.0 | | 56 | 25.5 | 10.2 | 8.3 | 4.4 | 5.5 | 4.5 | 5.0 |
| 6 | 23.3 | | 57 | 34.5 | 10.9 | 7.9 | 4.5 | 2.3 | 4.2 | 5.0 |
| 8 | 24.4 | | 58 | 4.5 | 14.4 | 9.9 | 4.5 | 5.2 | 4.9 | 4.9 |
| 8 | 23.2 | | 59 | 51.5 | 15.0 | 8.5 | 4.6 | 19.5 | 4.2 | 4.9 |
| 4.1 | 23.3 | 13 | 0 | 58 | 16.6 | 8.3 | 4.6 | 47.5 | 4.0 | 4.8 |
| 7.7 | 12 | 49 | 10.28 | 9.33 | 13 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |

53 End. 64 End. β Orionis

| | | | | | | | | | | |
|--------------|-----------------|-----|------|--------------------|---------|---------|---------|------|----|------|
| + 4 | 47.5 | + 2 | 23.8 | δ | -14 | 30.2 | -12 | 41.2 | -8 | 19.2 |
| 4 | 18.5 | 2 | 9.2 | | | | | | | |
| 3 | 49.5 | 1 | 54.8 | $\log \cos \delta$ | 9.98593 | 9.98926 | 9.99541 | | | |
| 3 | 21 | 1 | 40.5 | | | | | | | |
| 2 | 52 | 1 | 26 | " $\sin \delta$ | 9.45014 | 9.45014 | 9.45014 | | | |
| 7 | 26.5 | 0 | 43 | | | | | | | |
| + 0 | 25.5 | + 0 | 21.5 | Σ | 9.43607 | 9.43940 | 9.44555 | | | |
| | 43 | | | | | | | | | |
| - 0 | 42.5 | - 0 | 21.2 | | | | | | | |
| 1 | 25 | 0 | 42.5 | | | | | | | |
| 2 | 50.5 | 1 | 25.2 | | | | | | | |
| 3 | 18.5 | 1 | 39.2 | | | | | | | |
| 3 | 47.5 | 1 | 53.8 | | | | | | | |
| 4 | 15 | 2 | 7.5 | | | | | | | |
| - 4 | 43 | - 2 | 21.5 | | | | | | | |

-4 32 39.20
42.57
132
31 56.31

$$\begin{array}{r} -43239.20 \\ +51.26 \\ +.39 \\ \hline 3147.55 \end{array}$$

B Orionis

1897 phase. proj. 11700

199701ae.190
 P
 Sec 1.46

| $-\frac{1}{2} I$ Mean | | | $\log \frac{I}{I_0}$ | | $\log \text{denom}$ | $\log I$ | I | |
|-----------------------|------|------|----------------------|---------|---------------------|----------|---------|------|
| $h.$ | $m.$ | $s.$ | | | | | | |
| 3 | 0.2 | = 60 | 45.0 | 9.94076 | 9.38631 | 2.45254 | 283.5 | |
| 2 | 57.9 | | 44.5 | 2 | | 8 | 28.2 | |
| 2 | 45.7 | 60 | 41.4 | 9.94051 | 9.38606 | 2.40703 | 255.3 | |
| | 43.9 | | 41.0 | 48 | | 6 | 28.2 | |
| 2 | 31.4 | 60 | 37.8 | 9.94026 | 9.38581 | 2.35613 | 227.1 | |
| | 30.2 | | 37.6 | 4 | | 5 | 28.3 | |
| 2 | 17.1 | 60 | 34.3 | 9.94000 | 9.38555 | 2.29840 | 198.8 | |
| | 15.6 | | 33.9 | 3997 | | 3 | 28.3 | |
| 2 | 2.6 | 60 | 30.6 | 9.93974 | 9.38529 | 2.23171 | 170.5 | |
| | 1.6 | | 30.4 | 3 | | 2 | 85.1 | |
| 1 | 19.5 | 60 | 19.9 | 9.93897 | 9.38452 | 1.93145 | 85.4 | |
| | .0 | | 19.8 | | | | 42.7 | |
| 0 | 57.9 | 60 | 14.5 | 9.93858 | 9.38413 | 1.63081 | 42.7 | |
| | .6 | | 14.4 | | | | | |
| 0 | 36.4 | 60 | 9.1 | 9.93820 | 9.38375 | | | |
| 4 | 0 | 15.2 | 60 | 3.8 | 9.93781 | 9.38336 | 1.63158 | 42.8 |
| | | 14.9 | | 3.7 | 0 | 9 | 42.8 | |
| 3 | 59 | 53.8 | 59 | 58.4 | 9.93741 | 9.38296 | 1.93301 | 85.7 |
| | | .3 | | .3 | 0 | 2 | 86.0 | |
| 59 | 11.2 | 59 | 47.8 | 9.93664 | 9.38219 | 2.23481 | 171.7 | |
| | 10.2 | | 47.6 | 2 | | 3 | 28.8 | |
| 58 | 57.2 | 59 | 44.3 | 9.93638 | 9.38193 | 2.30202 | 200.5 | |
| | 55.7 | | 43.9 | 5 | | 5 | 28.7 | |
| 58 | 42.6 | 59 | 40.6 | 9.93611 | 9.38166 | 2.36028 | 229.2 | |
| | 41.4 | | 40.4 | 09 | | 30 | 28.8 | |
| 58 | 28.9 | 59 | 37.2 | 9.93585 | 9.38140 | 2.41169 | 258.0 | |
| | 27.1 | | 36.8 | 3 | | 71 | 28.9 | |
| 58 | 14.9 | 59 | 33.7 | 9.93560 | 9.38115 | 2.45770 | 286.9 | |
| | 12.6 | | 33.2 | 56 | | 4 | | |

64 *Eridani*

| | | | | | | | | | |
|----|------|------|------|---------|---------|---------|---------|-------|-------|
| 2 | 43 | 12.1 | = 40 | 48.0 | 9.81519 | 9.25459 | 2.58426 | 383.9 | |
| | | 5.6 | | 46.4 | 496 | | 49 | 41.1 | 37.8 |
| 42 | 52.0 | 40 | 43.0 | 9.81446 | 9.25386 | 2.53923 | 346.1 | | |
| | 46.8 | | 41.7 | 27 | | 42 | .3 | | 37.9 |
| 42 | 32.4 | 40 | 38.1 | 9.81372 | 9.25312 | 2.48882 | 308.2 | | |
| | 28.0 | | 37.0 | 58 | | 96 | .3 | | 38.1 |
| 42 | 12.0 | 40 | 33.0 | 9.81299 | 9.25239 | 2.43156 | 270.1 | | |
| | 8.7 | | 32.2 | 87 | | 68 | .2 | | 38.2 |
| 41 | 51.8 | 40 | 28.0 | 9.81225 | 9.25165 | 2.36535 | 231.9 | | |
| | 49.5 | | 27.4 | 16 | | 44 | 2.0 | | 115.3 |
| 40 | 52.5 | 40 | 13.1 | 9.81004 | 9.24944 | 2.06653 | 116.6 | | |
| | .0 | | .0 | 2 | | 55 | | | 58.2 |
| 40 | 23.1 | 40 | 5.8 | 9.80894 | 9.24834 | 1.76660 | 58.4 | | |
| | .0 | | | | | | | | |
| 39 | 53.6 | 39 | 58.4 | 9.80783 | 9.24723 | | | | |
| 39 | 24.2 | 39 | 51.0 | 9.80671 | 9.24611 | 1.76883 | 58.7 | | 59.0 |
| | .1 | | | | | | | | |
| 38 | 55.2 | 39 | 43.8 | 9.80562 | 9.24502 | 2.07095 | 117.7 | | 119.0 |
| | 54.7 | | .7 | 0 | | 7 | | | |
| 37 | 57.7 | 39 | 29.4 | 9.80342 | 9.24282 | 2.37418 | 236.7 | | 39.9 |
| | 55.4 | | 28.8 | 33 | | 27 | | | |
| 37 | 38.5 | 39 | 24.6 | 9.80268 | 9.24208 | 2.44187 | 276.6 | | |
| | 37.2 | | 23.8 | 56 | | 99 | .7 | | 40.1 |
| 37 | 19.2 | 39 | 19.8 | 9.80194 | 9.24134 | 2.50060 | 316.7 | | 40.1 |
| | 14.8 | | 18.7 | 77 | | 77 | | | |
| 36 | 0.4 | 39 | 15.1 | 9.80122 | 9.24062 | 2.55247 | 356.8 | | |
| | 55.1 | | 13.8 | 02 | | 67 | 7.0 | | 40.4 |
| 36 | 41.6 | 39 | 10.4 | 9.80049 | 9.23989 | 2.40103 | 397.2 | | |
| | 35.1 | | 8.8 | 24 | | 59896 | .4 | | |
| | | | | | | 921 | | | |

| | | | | | | | | |
|------|-----------------|----|--------------|-----------------|---------|----------------|--------------|-------|
| 1 57 | 45.8 26.8 | 29 | 26.4 21.7 | 9.69153 048 | 9.12760 | 2.71125 230 | 514.3 5.6 | 49.8 |
| 57 | 18.2 2.0 | 29 | 19.6 15.5 | 9.69001 8908 | 9.12608 | 2.66701 94 | 464.5 5.5 | 50.0 |
| 56 | 49.5 37.0 | 29 | 12.4 9.2 | 9.68838 766 | 9.12445 | 2.61749 821 | 414.5 5.2 | 50.5 |
| 56 | 21.0 11.4 | 29 | 5.2 2.8 | 9.68676 21 | 9.12283 | 2.56112 167 | 364.0 .5 | 50.9 |
| 55 | 53.2 45.8 | 28 | 58.3 56.4 | 9.68519 475 | 9.12126 | 2.49574 618 | 313.1 .5 | 154.8 |
| 54 | 29.8 28.5 | 28 | 37.4 1.1 | 9.68038 1 | 9.11645 | 2.19952 9 | 158.3 | 78.7 |
| 53 | 48.8 49.0 | 28 | 27.2 | 9.67801 | 9.11408 | 1.90086 | 79.6 | |
| 53 | 9.0 | 28 | 17.2 | 9.67567 | 9.11174 | | | |
| 52 | 29.0 29.2 | 28 | 7.2 1.3 | 9.67332 4 | 9.10939 | 1.90555 3 | 80.5 | 81.3 |
| 51 | 49.5 48.2 | 27 | 57.4 1.0 | 9.67099 0 | 9.10706 | 2.20891 900 | 161.8 | 165.2 |
| 50 | 32.2 24.8 | 27 | 38.0 36.2 | 9.66634 591 | 9.10241 | 2.51459 502 | 327.0 .4 | 55.9 |
| 50 | 6.6 49 57.0 | 27 | 31.6 29.2 | 9.66479 21 | 9.10086 | 2.58309 67 | 382.9 3.4 | 56.3 |
| 49 | 41.0 28.5 | 27 | 25.2 22.1 | 9.66324 248 | 9.09981 | 2.64263 339 | 439.2 .9 | 56.6 |
| 49 | 16.0 48 59.8 | 27 | 19.0 15.0 | 9.66173 075 | 9.09780 | 2.69529 627 | 495.8 6.9 | 57.0 |
| 48 | 51.2 32.2 | 27 | 12.8 8.0 | 9.66020 5902 | 9.09627 | 2.74258 376 | 552.8 4.3 | |

b

 β Orionis y Enidani 64 Enidani 53 Enidani y Leporis y Cam. Maj.

| | | | | | | |
|------|------------|------------|------------|------------|------------|------------|
| cl N | -.92 | -.86 | -.86 | -.88 | -.68 | -.84 |
| cl S | -.13 | -.20 | -.09 | -.19 | -.04 | -.07 |
| Mean | -.52 26 | -.53 26 | -.48 24 | -.54 27 | -.36 18 | -.46 23 |
| | -7.8 | -7.9 | -7.2 | -8.1 | -5.4 | -6.9 |

Reduction to 1897.0

From Frisby's Journal See p. 24

| No. | | α 1860 | Pre. | δ 1860 | Pre. |
|------|----------------|---------------|--------|---------------|-------|
| 2029 | 53 Eridani | 4 31 46.22 | +2.750 | -14 34 51.0 | +7.53 |
| | | 67 56.5 | | | |
| 2180 | 64 Eridani | 4 53 25.55 | +2.782 | -12 44 48.5 | +5.74 |
| | | 73 21.4 | | | |
| 2510 | η Leporis | 5 50 1.74 | +2.735 | -14 11 47.8 | +0.87 |

 μ 2029 μ 2180

Appr. 1878.0

| log n | 0.12611 | 0.12611 | α | δ |
|----------------------|------------------------------------|------------------------------------|-------------------|--------------------|
| " enia | 9.96 ⁷⁶² 598 | 9.981 ⁸⁹ 42 | 2029 | 4.32 35.7 -14 32.3 |
| | 386 | 353 | | 68 8.9 |
| " tan δ | 9.415 ⁷⁵⁹ 17 | 9.35 ¹⁵³ 452 | 2180 | 4 54 15.6 -12 43.1 |
| | 759 | 153 | | 73 33.9 |
| Σ | 9.508 ¹⁸ 26 | 9.462 ⁴ 05 | | |
| No | - .3223 | - .2898 | | |
| m | 3.0723 | 3.0723 | η Leporis | p. 24 |
| $\frac{da}{dt}$ | 2.750 ⁵ 2 | 2.782 ⁹ 4 | γ Can Maj. | |
| " n | 1.30220 | 1.30220 | | |
| " cos α | 9.574 ⁰⁷⁸ 66 | 9.456 ¹⁶⁷ 99 | | |
| | 298 | 387 | | |
| Σ | 0.876 ⁴⁶⁴ 86 | 0.759 ⁶⁷⁴ 19 | | |
| $\frac{d\delta}{dt}$ | 7.531 | 5.744 | | |

1897.0

| | α 1860 | $\Delta\alpha$ | α 1897.0 | δ 1860 | $\Delta\delta$ | δ 1897.0 |
|---------------------|---------------|----------------|-----------------|---------------|----------------|-----------------|
| 53 Eridani 2029 | 4 31 46.22 | +101.77 | 33 27.99 | -14 34 51.0 | +276.2 | 30 14.8 |
| | | 102.97 | 68 22.0 | | 209.9 | 18.6 |
| 64 Eridani 2180 | 4 53 25.55 | +102.95 | 55 8.52 | -12 44 48.5 | +212.5 | 41 16.0 |
| | | 101.18 | 73 47.1 | | 29.6 | 18.2 |
| η Leporis 2510 | 5 50 1.74 | +101.17 | 51 42.92 | -14 11 47.8 | +32.3 | 11 15.5 |
| | | 104.1 | 87 55.7 | | 159.1 | 93 |
| γ Can Maj. | 6 58 49.616 | +16.288 | 59 59.04 | -15 28 22.34 | -30.58 | 28 52.84 |
| | | | 104 46 | | | |

See p. 83 for values

from Argentine General Catalogue

Reduction to App. Place

Jan. 8/97

64 Eridani 53 Eridani γ Leporis γ Can. Maj.

| | | | | |
|----------------|----------|----------|----------|----------|
| q | 310 44 | 310 44 | 310 45 | 310 45 |
| α_0 | 73 47 | 68 22 | 87 56 | 104 46 |
| H | 342 19 | 342 20 | 342 17 | 342 14 |
| $q + \alpha_0$ | 24 31 | 19 6 | 38 41 | 55 31 |
| $H + \alpha_0$ | 56 6 | 50 42 | 70 13 | 87 0 |
| δ_0 | -12 41.3 | -14 30.2 | -14 11.3 | -15 28.9 |

| | | | | |
|------------------------|-------------|-------------|-------------|-------------|
| $\log \tan \delta_0$ | 9.35247 n | 9.41276 n | 9.40282 n | 9.44245 n |
| " $\sin(H + \alpha_0)$ | 9.61800 | 9.51484 | 9.79589 | 9.91608 |
| " $\frac{1}{\sin}$ | 8.82391 | 8.82391 | 8.82391 | 8.82391 |
| " q | 0.9237 | 0.9237 | 0.9238 | 0.9239 |
| " $\cos(H + \alpha_0)$ | 9.95897 | 9.97541 | 9.89244 | 9.78294 |
| Σ_1 | 8.7181 n | 8.6752 n | 8.9464 n | 9.1063 n |
| Σ_2 | 0.8827 | 0.8991 | 0.8162 | 0.6768 |

| | | | | |
|------------------------|-----------------------------|-----------------------------|-------------|-------------|
| " $\sec \delta_0$ | 0.01074 | 0.01407 | 0.01345 | 0.01605 |
| " $\sin(H + \alpha_0)$ | 9.91908 | 9.88865 | 9.97358 | 9.99940 |
| " $\frac{1}{\sin}$ | 8.82391 | 8.82391 | 8.82391 | 8.82391 |
| " h | 1.3068 | 1.3068 | 1.3068 | 1.3068 |
| " $\cos(H + \alpha_0)$ | 9.74644 | 9.80166 | 9.52951 | 8.71880 |
| " $\sin \delta_0$ | 9.34173 n | 9.39870 n | 9.38936 n | 9.42640 n |
| Σ_3 | 0.0605 | 0.0334 | 0.1177 | 0.1462 |
| Σ_4 | 9.1482 0.3950 | 9.2338 0.5072 | 0.2257 n | 9.4520 n |
| " $\cos \delta_0$ | 9.9893 | 9.9859 | 9.98655 | 9.9840 |
| " i | 0.4267 n | 0.4262 n | 0.4275 n | 0.4285 n |
| Σ_5 | 0.4160 n | 0.4121 n | 0.4140 n | 0.4125 n |

| | | | | |
|-----------------|-------------------|-------------------|--------|--------|
| f | +0.841 | +0.840 | +0.841 | +0.841 |
| N_1 | -.052 | -.047 | -.088 | -.128 |
| N_3 | +1.149 | +1.080 | +1.311 | +1.400 |
| $\Delta \alpha$ | +1.94 | +1.87 | +2.06 | +2.113 |
| α_0 | 8.50 ² | 27.9 ⁹ | 42.92 | 5.904 |
| α | 10.44 | 29.86 | 44.98 | 8.02 |

| | | | | |
|-----------------|------------------------------|------------------------------|------------------------------|-------------------|
| N_2 | +7.63 ² | +7.93 | +6.55 | +4.75 |
| N_4 | -2.48 | -3.22 | -1.68 | -.28 |
| N_5 | -2.61 | -2.58 | -2.59 | -2.59 |
| $\Delta \delta$ | +2.54 | +2.13 | +2.28 | +1.88 |
| δ_0 | 18.6 19.6 | 14.4 ⁸ 15.7 | 18.2 ² 14.3 | 52.8 ⁹ |
| δ | 18.5 16.1 17.1 | 10.3 12.7 13.6 | 13.2 15.9 12.0 | 51.0 |

Jan. 8/97 Resulting Latitude.

| β Orionis | γ Eridani | 64 Eridani | 53 Eridani | α Leporis | γ Comae |
|--------------------------------|-------------------------|----------------------------------|----------------------------------|-----------------------------|-----------------------------|
| T' 13 42 4.23 | 12 7 11.7 ⁴ | 10 58 58.96 | | | |
| $\Delta T'$ -4 31 47.55 | -4 32 3.25 | -4 32 14.54 | | | |
| T 5 42 11.82 | 6 48 17.2 ¹⁹ | 7 13 17.8 ³ | | | |
| ΔT -4 33 6.98 | -4 32 56.04 | 4 32 51.90 | | | |
| $T' + \Delta T'$ 9 10 16.68 | 6 6 24.21 | 7 35 8.5 ⁴⁹ | 6 26 44.2 ⁴² | 7 54 23.6 ⁴ | 8 17 13.9 ⁰² |
| $T + \Delta T$ 1 9 4.84 | 1 40 15.12 | 2 15 21.1 ¹⁵ | 2 40 25.9 ³ | 3 49 16.7 ⁷⁰ | 5 41 20.7 ³⁷ |
| $\Delta = 29$ 8 1 11.84 | 4 26 9.09 | 5 19 47.34 | 3 46 18.2 ⁴⁹ | 4 5 6.7 ⁹⁴ | 2 35 53.2 ^{52.65} |
| ϑ 4 0 35.92 | 2 13 4.54 | 2 39 53.6 ⁷ | 1 53 9.4 ²⁴ | 2 2 33.3 ⁴⁷ | 1 17 56.6 ³ |
| 60 8 58.8 | 33 16 8.10 | 39 58 24.9 ^{25.05} | 28 17 21.5 ^{18.6} | 30 38 20.7 ^{22.05} | 19 29 4.3 ⁴⁸ |
| Σ 10 19 21.52 | 7 46 39.33 | 9 50 29.6 ⁴ | 9 7 10.7 ³⁵ | 11 43 40.5 ³⁴ | 13 58 34.7 ^{33.39} |
| $\frac{1}{2} \Sigma$ 5 9 40.76 | 3 53 19.66 | 4 55 14.8 ² | 4 33 5.1 ³ | 5 51 50.2 ¹⁷ | 6 59 17.3 ^{16.70} |
| α 37.22 | 15.19 | 10.4 ⁶ | 29.8 ⁶ | 44.9 ⁸ | 8.02 |
| λ 3.54 | 4.47 | 4.4 ³⁶ | 6.3 ³¹² | 5.3 ¹⁹ | 8.68 |
| δ -8 18 71.7 | -13 48 4.0 | -12 41 13.5 ^{16.1 17.1} | -14 30 10.3 ^{12.7 13.6} | -14 11 13.2 ^{15.9} | -15 28 51.0 ^{12.0} |

| | | | | | |
|-----------------------------|----------------------|--------------------------|--------------------------|------------------------|-----------------------|
| $\log \tan \delta$ 9.165062 | 9.390306 | 9.35241 ⁴⁵ | 9.41274 ⁶ | 9.40277 ⁹⁷ | 9.442424 |
| " $\sec \delta$.303001 | .07773 ⁹ | .115578 | .05523 ⁴ | .06530 ⁴ | .02561 ⁸ |
| " $\cos \lambda$ 0 | 0 | 0 | 0 | 0 | 0 |
| " $\tan \delta'$ 9.468063 | 9.46804 ⁵ | 9.46799 ^{8 023} | 9.46798 ^{8 002} | 9.46807 ¹⁰¹ | 9.46804 ³⁶ |
| δ' -16 22 23.5 | 21.2 | 18.3 | 15.6 | 28.3 | 0 |
| h -7.8 | -7.9 | -7.2 | -8.1 | -5.4 | -6.9 |
| ϕ -16 22 31.3 | 29.1 | 25.5 | 23.7 | 33.7 ⁸ | 26.9 |
| | 28.7 | 22.2 | 21.6 | 30.3 | 27.4 |
| Mean | -16 22 | 28.1 ^{28.1} | Naut. Alm. + Yarnall | | |
| | | 28.1 | " " " Gould | | |

Corrected thread intervals.

On preceding pages the quantity $D - \frac{1}{2}I$ was computed with the wrong sign for $\frac{1}{2}I$. This accounts for the progressive value in the reductions, showing especially in γ Can. Maj. Corrected calculation is as follows:

| γ . 2290 | | | γ 2510 | | | γ 2757 | | | γ Can. Maj. | | |
|-----------------|------|------|---------------|------|------|---------------|------|------|--------------------|------|------|
| p.16 | p.20 | Mean | p.16 | p.20 | Mean | p.16 | p.20 | Mean | p.17 | p.20 | Mean |
| 29 - 34.8 | 34.8 | | 2 6 - 33.4 | 33.4 | | 2 10 - 10.8 | 10.8 | | 1 23 52.0 | 51.6 | 51.8 |
| 2 29 14.1 | 14.6 | 14.4 | 6 9.4 | 10.2 | 9.8 | 9 47.8 | 48.1 | 48.0 | 22 18.6 | 18.3 | 18.4 |
| 28 53.8 | 54.4 | 54.1 | 5 49.9 | 46.9 | 46.4 | 9 24.5 | 25.3 | 24.9 | 22 44.8 | 44.8 | 44.8 |
| 28 33.4 | 33.6 | 33.5 | 5 22.2 | 22.6 | 22.4 | 9 1.5 | 1.8 | 1.6 | 22 10.3 | 10.0 | 10.2 |
| 28 12.6 | 13.1 | 12.8 | 4 58.2 | 58.6 | 58.4 | 8 38.1 | 38.8 | 38.4 | 21 35.0 | 35.8 | 35.4 |
| 27 10.6 | 10.6 | 10.6 | 3 46.4 | 46.2 | 46.3 | 7 28.1 | 28.1 | 28.1 | 19 48.3 | 48.0 | 48.2 |
| 26 39.1 | 39.1 | 39.1 | 3 9.2 | 9.6 | 9.4 | 6 52.1 | 52.3 | 52.2 | 18 52.8 | 53.3 | 53.0 |
| 26 7.6 | 7.6 | 7.6 | 2 32.4 | 32.4 | 32.4 | 6 16.3 | 16.3 | 16.3 | 17 56.8 | 56.8 | 56.8 |
| 25 35.8 | 35.8 | 35.8 | 1 54.9 | 56.4 | 55.2 | 5 39.8 | 40.1 | 40.0 | 16 58.0 | 59.0 | 58.5 |
| 25 3.8 | 3.8 | 3.8 | 1 17.4 | 17.4 | 17.4 | 5 3.3 | 3.3 | 3.3 | 15 59.0 | 59.0 | 59.0 |
| 23 58.8 | 59.6 | 59.2 | 2 0 0.6 | - | 0.6 | 3 48.8 | 49.3 | 49.0 | 13 55.6 | 56.8 | 56.2 |
| 23 37.4 | 37.8 | 37.6 | 1 59 35.2 | - | 35.2 | 3 24.1 | 23.8 | 24.0 | 13 12.8 | 12.8 | 12.8 |
| 23 15.4 | 16.1 | 15.8 | 59 8.4 | - | 8.4 | 2 58.5 | - | 58.5 | 12 28.0 | 28.0 | 28.0 |
| 22 53.6 | 54.6 | 54.1 | 58 42.4 | - | 42.4 | 2 33.3 | - | 33.3 | 11 43.6 | - | 43.6 |
| 22 31.8 | - | 31.8 | 58 16.4 | - | 16.4 | 2 7.8 | - | 7.8 | 10 58.8 | - | 58.8 |

Continued on p. 22

Jan. 8/97 7-place logarithms + Encke

 β Orionis γ Eridani 64 Eridani 53 Eridani α Leporis γ Can. Maj.

| | | | | | | |
|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| $\log \tan \delta$ | 9.1650640 | 9.3903064 | 9.3524550 | 9.4127761 | 9.4027621 | 9.4424239 |
| " $\sin \delta$ | 0.3030009 | 0.0777392 | 0.1155783 | 0.0552349 | 0.0653040 | 0.0256123 |
| " $\cos \delta$ | | | | | | 9.9999999 |
| " $\tan \phi'$ | 9.4680649 | 9.4680456 | 9.4680333 | 9.4680112 | 9.4680661 | 9.4680361 |
| ϕ' | -16.22 | 23.7 | 21.2 | 19.7 | 16.8 | 23.9 |
| h | | -7.8 | -7.9 | -7.2 | -8.1 | -5.4 |
| ϕ | | 31.5 | 29.1 | 26.9 | 24.9 | 29.3 |

Mean 28.1

Corrected Throat Internals

 $9 - \frac{1}{2} I$

| β Orionis | | | | γ Eridani | | | | 64 Eridani | | | | 53 Sublani | | | |
|-----------------|-------------|-------------|------|------------------|-------------|------|------|-------------|-------------|------|------|-------------|-------------|------|------|
| $\delta.34$ | $\delta.39$ | $\delta.39$ | Mean | $\delta.34$ | $\delta.38$ | Mean | | $\delta.34$ | $\delta.38$ | Mean | | $\delta.34$ | $\delta.38$ | Mean | |
| 2 - | 57.9 | 57.9 | | 2 16 | 48.7 | 48.7 | 48.7 | 2 43 | - | 5.6 | 5.6 | 1 57 | 26.5 | 27.0 | 26.8 |
| 2 - | 43.9 | 43.9 | | 16 | 27.0 | 27.0 | 27.0 | 42 | - | 46.8 | 46.8 | 57 | 1.8 | 2.2 | 2.0 |
| 2 - | 30.2 | 30.2 | | 16 | 5.0 | 5.3 | 5.2 | 42 | 27.8 | 28.1 | 28.0 | 56 | 36.5 | 37.5 | 37.0 |
| 2 - | 15.6 | 15.6 | | 15 | 42.5 | 43.0 | 42.8 | 42 | 8.8 | 8.6 | 8.7 | 56 | 11.0 | 11.8 | 11.4 |
| 2 | 1.5 | 1.6 | 1.6 | 15 | 20.0 | 20.7 | 20.4 | 41 | 49.4 | 49.6 | 49.5 | 55 | 45.5 | 46.2 | 45.8 |
| 1 | 19.0 | 18.9 | 19.0 | 14 | 13.0 | 13.0 | 13.0 | 40 | 51.8 | 52.1 | 52.0 | 54 | 28.2 | 28.8 | 28.5 |
| 0 | 57.5 | 57.6 | 57.6 | 13 | 38.7 | 39.0 | 38.8 | 40 | 22.8 | 23.1 | 23.0 | 53 | 48.8 | 49.2 | 49.0 |
| 0 | 36.4 | 36.4 | 36.4 | 13 | 4.5 | 4.5 | 4.5 | 39 | 53.6 | 53.6 | 53.6 | 53 | 9.0 | 9.0 | 9.0 |
| 4 0 | 14.9 | 14.9 | 14.9 | 12 | 29.7 | 30.3 | 30.0 | 39 | 24.1 | 24.1 | 24.1 | 52 | 29.0 | 29.5 | 29.2 |
| 3 59 | 53.2 | 53.4 | 53.3 | 11 | 55.3 | 55.3 | 55.3 | 38 | 54.8 | 54.6 | 54.7 | 51 | 48.0 | 48.5 | 48.2 |
| 59 | 10.0 | 10.4 | 10.2 | 10 | 44.5 | - | 44.5 | 37 | 55.1 | 55.6 | 55.4 | 50 | 24.8 | - | 24.8 |
| 58 | 55.5 | 55.9 | 55.7 | 10 | 20.7 | - | 20.7 | 37 | 35.1 | 35.4 | 35.2 | 49 | 57.0 | - | 57.0 |
| 58 ⁴ | 41.2 | 41.6 | 41.4 | 9 | 56.5 | - | 56.5 | 37 | 14.6 | 15.1 | 14.8 | 49 | 28.5 | - | 28.5 |
| 58 | 27.0 | 27.2 | 27.1 | 9 | 33.0 | - | 33.0 | 36 | 55.1 | 55.4 | 55.2 | 48 | 59.8 | - | 59.8 |
| 58 | 12.6 | 12.6 | 12.6 | 9 | 9.0 | - | 9.0 | 36 | 34.6 | 35.6 | 35.1 | 48 | 32.2 | - | 32.2 |

Continued on p. 40

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 Berlin Jahrbuch.

β Orionis γ Eridani 64 Eridani 53 Eridani γ Leporis γ Can. Maj.

| | | | | | | |
|--------------------|-------------|------------|--|-------------|--------------------------------------|-------------|
| δ | -8 19 11.7 | -13 48 4.2 | ^{12 41} -74 30 18.8 | -14 30 18.5 | -14 11 9.6 | -15 28 50.9 |
| $\log \tan \delta$ | 9.1650640 | 9.3903082 | 9.3524727 | 9.4128187 | 9.4027 ⁴⁰ ₃₈ 9 | 9.4424231 |
| " $\sec \delta$ | 0.3030009 | 0.0777392 | 0.1155783 | 0.0552349 | 0.0653040 | 0.0256123 |
| " $\tan \rho'$ | 9.4680649 | 9.4680474 | 9.4680510 | 9.4680536 | 9.4680449 | 9.4680354 |
| ρ' | -16 22 23.7 | 21.5 | 21.9 | 22.3 | 21.2 | 19.9 |
| h | 7.8 | 7.9 | 7.2 | 8.1 | 5.4 | 6.9 |
| ρ | 31.5 | 29.4 | 29.1 | 30.4 | 26.6 | 26.8 |

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$+15 \ 23$
 $y \ 2auni$
 $CLW \ 33.4 \ B, \ 56.5 \ 23 \ 42 \ 1.2 \ 36.0 \ 59.5$
 $44.2 \ 56.4 \ 24 \ 23.5 \ 30 \ 56$
 $54.8 \ 56.7 \ 25 \ 5.5 \ 31 \ 59$
 $54.90 \ 5.6 \ 57.6 \ 25 \ 48 \ 34 \ 3.5 \ C_1$
 $16.5 \ 56.8 \ 27 \ 52 \ B, \ 34 \ 45$
 $38 \ C, \ 35 \ 27.5$
 $45 \ 36 \ 8.5$
 $52.18 \ 52.1 \ 36 \ 50$
 -57.21
 $54.97 \ 59.3$
 $8 \ 20 \ 6.5$
 $54.0 \ 58.2$
 $53.6 \ 13.3$
 $54.2 \ 35.6$
 $53.9 \ 46.9$
 $53.8 \ 58.2$
 $54.6 \ 9.5$
 $54.0 \ 20.7$
 $53.9 \ 43.2$
 $41 \ 58.2$

$8 \ 18 \ 54.94 \ 29 \ 56.80 \ 29 \ 54.00 \ 40 \ 58.20$
 $6.75 \ -4.94 \ -4.94 \ -3.13$
 $Red \ to \ 0 \ -16.67 \ +14.79 \ -14.80 \ +12.98$
 $8 \ 18 \ 48.19 \ 29 \ 51.86 \ 29 \ 49.06 \ 40 \ 55.07$
 $4 \ 13 \ 57.71 \ 25 \ 1.62 \ 25 \ 1.62 \ 36 \ 5.77$
 $4 \ 14 \ 50.48 \ 50.24 \ 47.44 \ 49.30$
 $-.43 \ -1.29 \ +.69 \ +.72$
 $.88 \ 2.64 \ 2.64 \ .84$

$0 = 4 \ 14 \ 50.05 + \Delta T + .55a + 1.04c \ - .11 \ - .07 \ - .18 \ 49.87$
 $48.95 \ -5.43 \ +6.03$
 $48.13 \ -5.43 \ -6.03$
 $49.52 \ +.68 \ -1.08 \ - .10 \ +.08 \ - .18 \ 49.50$
 $.40 \ +.61 \ -1.06 \ - .09 \ +.07 \ - .16 \ .37$
 $.42 \ +.90 \ -1.19 \ - .13 \ +.08 \ - .21 \ .37$
 $.56 \ +1.11 \ -1.32 \ - .16 \ +.09 \ - .25 \ .49$
 $.31 \ +.19 \ -1.00 \ - .03 \ +.07 \ + .04 \ .35$
 $.35 \ +.16 \ -1.01 \ - .02 \ +.07 \ + .09 \ .40$
 $0 = 48.13 + \Delta T - 5.43a - 6.03c \ 0 = 0.82 + 12.06c$
 $49.48 + \Delta T + .82a - 1.16c \ c = -.07$
 $1.10 + 5.98a - 4.99c \ a = -.20$
 $1.35 + 6.25a + 4.87c$

+ .63
+ .57
+ .64
+ .61
- .35
+ .26

49

| | | | | | |
|----------|-----------|-----------|-----------|-----------|---------|
| 18 40 | 33 0 | 40 55 | 50 55 | 66 139.5 | 25552.1 |
| i Tauri | i Aurigae | 4 Aurigae | β Eridani | 2 Orionis | |
| 15.2 | 34 | 55.4 | 41.5 | 28.6 | |
| 30 | 20 | 137 | 55.3 | 42.8 | |
| 51.8 | 44.7 | 41.1 | 11.2 | 3.7 | |
| 29 | 57 | 547 | 26.4 | 14.2 | |
| 13.8 | 9.6 | 85 | 37.2 | 24.6 | |
| 24.6 | 21.7 | 22.2 | 47.2 | 35 | |
| 35.5 | 34.1 | 36 | 57.6 | 45.2 | |
| 57.4 | 58.8 | 3.2 | 18.3 | 6.2 | |
| 51 12.1 | 56 15.4 | 9 1 21.5 | 8 32.4 | 18 20.2 | |
| 50 13.70 | 55 9.41 | 0 8.48 | 7 36.90 | 17 24.50 | |
| - 1.60 | - 0.80 | + .02 | + 1.25 | + 2.86 | |
| - 11.46 | - 10.65 | - 9.83 | - 8.60 | - 7.00 | |
| 50 12.10 | 55 8.61 | 0 8.50 | 7 38.15 | 17 27.36 | |
| 45 22.92 | 50 19.39 | 55 19.13 | 2 49.10 | 12 38.27 | |
| 49.18 | 49.22 | 49.37 | 49.05 | 49.09 | |
| + .42 | + .20 | + .19 | + .26 | + .26 | |
| .86 | .78 | .72 | .99 | .99 | |

[illegible]

-1.21
-1.09
-1.20
-1.17
+ .35
- .82

W E $\bar{110.8}$ $\text{dim } 10 \ 13 \ 42 =$
41.8 69.0 +58.6
43.0 15.6 $\bar{52.2}$ $\text{Chk } 6 \ 8 \ 5$
 $\bar{13.0}$
 $\bar{1.20}$
 $\bar{.85}$

-65 46 27 35 25 56 14 47
8 Doradus 136 Tauri 139 Tauri V Orionis
20.7 49.2 A 18 26
20.8 6 35.5 58.9 B_r 33.7 40.3
20.7 22.8 35.2 22 C₁ 56.6 1.7
20.8 39.8 35.1 29.7 2 28.3 12.3
20.5 30 35.5 37.9 3 19.7 23.1
20.7 55.5 35.4 45.6 4 31.2 33.7
20.5 49.20.5 35.052 53.2 5 42.7 44.5
5.8 6.1

5721.2 10 7 20.3
49 20.3⁶⁷ 51 35.28 56 19.69 6 23.11
8.10 8.47 9.25 10.90
49 28.77 51 43.75 56 28.94 6 34.01
44 38.47 46 53.68⁶⁹ 51 38.71⁶² 1 43.82
50.30 50.06 50.32 50.19
-1.30 -.66 -.67 -.73
1.59 .81 .82 .89
~~.84~~

9 0 0 10 13 42
-4 4 49.36 12 6.10
4 55 10.64 10 25 48.10
19 41 33.84 1 42.80
9 13 36.80 19 41 33.84
1 30.70 6 9 4.74
12 6.10 8 5

59.74

Reduction to Apparent Place

Jan. 15/27

| | 118 Jauri | 125 Jauri | 136 Jauri | 139 Jauri | Moon- |
|----------------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------------------|
| q | 313 33 | | | | $\delta + 27 \ 25.0$ |
| α_0 | 80 44 | 83 20 | 86 43 | 87 54 | $\pi \ 55 \ 35 = 3335$ |
| H | 335 37 | | | | $\lambda \ 0.0392$ |
| $q + \alpha_0$ | 34 17 | 36 53 | 40 16 | 41 27 | $\delta \ 71.15$ |
| $H + \alpha_0$ | 56 21 | 58 57 | 62 20 | 63 31 | $\phi' \ -16 \ 16.1$ |
| δ | +25 4.0 | 25 50.3 | 27 35.3 | 25 56.5 | $\phi' \delta \ -43 \ 41.1$ |
| | | | | | $\log \sin(\pi) \ 9.83928$ |
| $\log \tan \delta_0$ | 9.66999 | 9.68507 | 9.71811 | 9.68706 | $\pi \ 3.52310$ |
| $\sin(q + \alpha_0)$ | ^{.75073} 9.99429 | ^{.77829} 9.99705 | ^{.81047} 9.99929 | ^{.82084} 9.99971 | $p \ 9.99988$ |
| q | 0.9349 | 9.7588 | 9.7588 | 9.7588 | $\frac{1}{60} \ 8.22185$ |
| $\frac{1}{15}$ | 8.8239 | | | | $\Sigma \ 1.58411$ |
| Σ | ^{.17905} 9.4231 | ^{.2222} 9.4409 | ^{.2874} 9.4762 | ^{.2667} 9.4456 | $\Delta \delta \ 38.4$ |
| | | | | | $\delta' + 28 \ 3.4$ |
| $\sec \delta_0$ | 0.04296 | 0.04575 | 0.05242 | 0.04612 | $\log(p' - \delta) \ 9.85923$ |
| $\sin(H + \alpha_0)$ | 9.92035 | 9.93284 | 9.94727 | 9.95185 | $\sin \pi \ 3.52310$ |
| h | 1.3037 | 0.1 ² 76 | 0.1276 | 0.1276 | $p \ 9.99988$ |
| $\frac{1}{15}$ | 8.8239 | | | | $\Sigma \ 8.06778$ |
| Σ_2 | 0.0909 | 0.106 ² | 0.1273 | 0.1256 | $\log \ 0.01169$ |
| | | | | | $A_1 \ 0.98831$ |
| f | + .910 | + .910 | + .910 | + .910 | $1 - \lambda \ 0.9608$ |
| N_1 | ¹⁵¹ 265 | ¹⁶⁷ 276 | ¹⁹⁴ 299 | ¹⁸⁵ 279 | $\sin(\pi) \ 9.98263$ |
| N_2 | 1.233 | 1.277 | 1.341 | 1.335 | $B_1 \ 0.01737$ |
| $\Delta \alpha$ | ²⁹⁴ 2.408 | ³⁵⁴ 2.463 | ⁴⁴⁵ 2.550 | ⁴³⁰ 2.524 | $A_1 \ 9.99489$ |
| α_0 | 56.165 | 21.135 | 51.242 | 36.190 | $\text{Ferd} \delta \ 0.01226$ |
| α | 58.46 | 23.49 | 53.69 | 38.62 | $\text{Ferd} \ 1.029$ |

Reduction for Longitude.

53

1897phae.proj.11700

| | | | | | | | | |
|---|------------------|-------------------------|-----------------|-----------------|------------------|------------------|------------------------------------|--|
| $\alpha = \alpha' + T - T' + \Delta T - \Delta T' + (A \text{ Feod} - A')a + (B \text{ Feod} - B')b + (C \text{ Feod} - C')c \pm \frac{S}{\text{term}}$ | | | | | | | | |
| δ | $+28^{\circ} 3'$ | $33^{\circ} 0'$ | $25^{\circ} 4'$ | $32^{\circ} 7'$ | $25^{\circ} 50'$ | $27^{\circ} 35'$ | $25^{\circ} 56'$ | |
| $A \text{ Feod}$ | .793 .817 | .905 | .730 | .884 | .746 | .788 | .749 | |
| B | .809 .833 | .776 | .828 | .782 | .823 | .812 | .822 | |
| C | 1.134 1.168 | 1.192 | 1.104 | 1.181 | 1.114 | 1.129 | 1.112 | |
| $a - 24 \Delta A$ | | -.088 | +.087 | -.067 | +.071 | +.029 | +.068 | |
| $b - 82 \Delta B$ | | +.057 | +.005 | +.051 | +.010 | +.021 | +.011 | |
| $c - 07 \Delta C$ | | -.024 | +.064 | -.013 | +.054 | +.039 | +.056 | |
| ΔA_a | | +.021 | -.021 | +.016 | -.017 | -.007 | -.016 | |
| ΔB_b | | -.885 | -.004 | -.042 | -.008 | -.017 | -.009 | |
| ΔC_c | | -.165 | -.004 | +.001 | -.004 | -.003 | -.004 | |
| $\Delta T - \Delta T'$ | | +.040 | +.008 | +.005 | -.003 | -.015 | -.020 | |
| | | +6.626 | +1.275 | +0.768 | -0.433 | -2.643 | -3.427 | |
| Σ | | +5.687 | +1.254 | +0.748 | -0.465 | -2.685 | -3.476 | |
| Stem | | +1 11.15 | +1 11.15 | +1 11.15 | +1 11.15 | +1 11.15 | +1 11.15 | |
| $T - T'$ | | +40 20.27 | +7 45.58 | +4 40.61 | -2 44.23 | -16 5.60 | -20 50.01 | |
| Σ | | +41 37.06 | +8 57.98 | +5 52.51 | -1 27.28 | -14 57.13 | -19 42.34 | |
| α' | | 4 45 19.39 | 5 22 58.46 | 26 3.97 | 33 23.49 | 4 53.69 | 51 38.62 | |
| α | | 5 31 56.45 | 56.44 hwt | 56.48 | 56.21 hwt | 56.56 hwt | 56.28 hwt | |
| Mean hwt 5 31 56.42 By Greenwich Ephemeris Washington Ephem. | | | | | | | | |
| A_1 | 5 30 33.81 | log 60 | 1.77815 | α' | 2109.15 | Diff 1 hr. long | 146.40 | |
| $A - A_1$ | +82.61 | " (A - A ₁) | 1.91703 | α'' | -.53 | α Wash | 5 32 49.67 | |
| ΔA | +2.3500 | " $\frac{1}{\Delta A}$ | 9.62893 | Gr. M. J. | 14 35 8.62 | α Arg | 31 56.42 | |
| δA | +0.0020 | " χ | 3.32411 | Gr. S. J. | 5 31 56.42 | Δ | 53.25 | |
| | | " χ^2 | 6.64822 | " noon | 19 41 33.84 | Δ long | 0.3637 = | |
| | | " $\frac{1}{7200}$ | 6.14267 | " det | 9 50 22.58 | | 21 ^m 49 ^s 32 | |
| | | " δA | 7.30103 | Cor. K. Mean | 1 36.72 | W long | 5 8 12.04 | |
| | | " $\frac{1}{\Delta A}$ | 9.62893 | Gr. M. J. | 9 48 45.86 | | 4 46 22.72 | |
| | | " χ'' | 9.72085 | Δ long | 4 46 22.76 | | | |
| | | | | | 11.33 | Apr. 13/96 | Former book p. 169 | |
| | | | | | 4 46 17 | Mean | | |

4
 $b = -0.37$
 $b = -1.24$
 $+1.35$
 -1.89

| | | | | | |
|--------|-------|---------------|------|-------|-------|
| 40.5 | 13.5 | 42.0 | 4.0 | 31.0 | 69.2 |
| 29.0 | 56.0 | 42.7 | 4.5 | 43 | 42.7 |
| -18.33 | | 31.5 | 69.7 | 20 | 43 |
| B Cete | | 31.2 | 69.7 | 4 | 43 |
| 16.3 | 10 | 23 | 49 | 49.6 | 10.8 |
| 31.1 | 24 | 32 | 4 | 4.4 | 29 |
| 52.7 | 25 | 15 | 5 | 26.6 | 55.5 |
| 38 | 27 | 23 | 3 | 37.7 | 9.2 |
| 14.6 | 28 | 27.5 | | 48.7 | 22.5 |
| 25.5 | 29 | 31.2 | | 59.8 | 36 |
| 36.3 | 30 | 36 | | 11 | 49.3 |
| 58.2 | 31 | 39.3 | | 33 | 46 |
| 4 | 21 | 13.0 | 33 | 47.9 | 34.2 |
| | | 34 | 30 | | 4 |
| | | 35 | 14 | | 3 |
| 4 | 20 | 14.61 | 10 | 29 | 31.35 |
| 38 | 25.80 | Red. to 11.00 | 5.01 | 38 | 45.26 |
| 42 | 48.81 | 10 | 29 | 26.34 | 58 |
| Bl | -39 | 6 | 48 | 42.94 | 42.65 |
| | | 3 | 40 | 43.40 | -76 |
| | | | | | -2.38 |

| | | | | | |
|-------------------|---------------|-------|--|---------|-------------|
| B = 1.05 | 2.68 | .85 | .73 | | |
| $\Delta = -0.4$ | $\Delta = 40$ | 41.02 | $+\Delta T - 5.58a + 6.19c$ | $+.73$ | $+.12$ |
| $C_2 + 1.05$ | | 41.89 | $+.64$ | $+1.07$ | $-.08$ |
| | | 42.06 | $+1.07$ | $+1.30$ | $-.14$ |
| $T - \alpha + Bl$ | 41 | 48.42 | 41.52 | -2.40 | -2.97 |
| A_a | $+.01$ | 41.88 | $+.43$ | -1.01 | $-.06$ |
| C_c | $+.02$ | 41.90 | $+.88$ | -1.18 | $-.11$ |
| $\Delta T = 3$ | 41 | 48.45 | 41.85 | $+.37$ | -1.00 |
| at 4.20 pm | | 41.89 | $+.80$ | -1.14 | $-.10$ |
| | | 41 | 48.45 | | |
| | | 40 | 41.84 | | |
| | | 66.61 | Red. to 11.00 | | |
| | | 65.71 | loss in 6 ^h 40 ^m | $= .14$ | per hour |
| | | 0.90 | | | at 11.00 pm |
| | | | $\Delta T = -3$ | 40 | 41.84 |

-62.2
+81.3
+19.1
+4.8
+1.44

$L = +.48$
 $-.35$
 $+.13$

+82.9
-60.5
+22.4
+5.6
+.52

12 37 33 =
8 55 55

55

11.9 50.3

607 22.2

QES 60.0 21.3

11.0 49.5

^{-70 20}
y²⁰ Volantier

^{8 30}
β Can Min

^{.32 7}
α Cen

^{5 29}
α Can Min

^{28 16}
β Cen.

49 22 B,

56.2

41

39.3

52.5

20.7

54.8

55.1

23.40 50 23.5

32.8

15.6

19 18.7

54

17.7 28.2 B₄

45

26

30.4

51 25

17.9 38.8 5

57.2

36.4

42.3

52 26 C,

17.7 59.3 C₁

9.5

46.8

53.9

47

17.7 6.5 2

9 33.8

57.2

5.7

7.20

53

7.5

17.8 13.6 3

18

20 29.2

-43.94

23.26

27.5

17.8 20.5 4

15 31.6

45

53

48

⁷⁴
3 27.3 5

50 23.33

2 17.84

8 45.03

14 36.38

11 19

42.18

-1.58

+ 0.38

+ 1.44

+ 2.40

3.24

50 21.75

2 18.12

8 46.47

14 38.78

19

45.42

9 40.46

21 36.36

28 4.67

33 57.05

39

3.64

40 41.29

41.76

41.80

41.73

41.78

+ .23

+ .12

+ .10

+ .12

+ .11

1.75

.92

.78

.93

.81

$$0 = 41.98 + \Delta T + 0.86a + 1.18c$$

41.02

-5.58a + 6.19c

11 0 0

12 37 33

41.88

+0.62a - 1.08c

-3 40 41.84

12

14.55

41.52

-2.40a - 2.97c

7 19 18.16

12 49 47.55

$$0 = 0.96 + 6.44a - 5.01c$$

20 5 13.18

2

6.46

$$0.36 + 3.02a + 1.89c$$

11 14 4.98

20 5

13.18

$$0.72 + 6.04a + 3.78c$$

$$0.77 + 6.44a + 4.03c$$

1 50.43

8 57

7.39

$$0 = 0.19 - 9.04c \quad c = +.02$$

$$a = -.13$$

12 14.55 21st 11pm 55 5512 6.10 15th 9pm 1 12.39

8.44

Δ

12 13.61 21st 4.20pm by β Ceti

.94

Δ

.14 Hourly Rate Adpt. 10

56

-68.7 +74.3 -67.5 +74.9 -67.3 Jan. 21/97 Prime
 +73.9 -66.0 +74.6 -65.0 +74.0
 +5.2 +8.3 +7.1 +9.9 +6.7
 +1.3 +2.1 +1.8 +2.5 +1.7
 +.12 +.19 +.17 +.23 +.16
 before after before after before after before after
 20.0 48.7 52.0 22.0 18.6 48.9 53.0 21.9 17.0 50.3 54.8 20.2
 2.5 57.2 22.7 18.0 48.0 52.5 22.1 17.0 48.0 53.8 20.2 18.0 52.8
 +75.0
 -70.8
 +4.2
 +1.0
 +.09
 -.16

Orionis 1.40 γ Eridani ^{former hole} 1.191 53 Eridani 1.41 η Leporis 1.22
 4 46 3.5 47.0 5 14 21 49.2 6 13 14.5 50.1 7 22 28.5 29.7
 46 31 46.3 15 4 48.3 14 4 49.5 23 14.5 28.8
 46 59 46.1 15 48.5 48.7 14 53.5 48.7 24 1.0 28.1
 47 27.5 46.3 16 34 50.0 15 45 49.5 24 50 29.7
 47 56 46.5 17 18 49.5 16 36 49.5 25 37 29.0
 49 21 46.4 19 33 49.7 19 11.5 49.8 28 2.5 29.8
 50 4 46.7 20 41 49.6 20 29.5 49.1 29 15.5 [0?] 29.5
 50 47 47.0 - 21 50 50.0 30 30 30
 51 29.5 46.7 ~~clouds~~ 22 10.5 50.0 31 43.5 28.8
 52 12.5 46.8 - 24 32 50.2 32 0 30.0
 53 38 46.3 - 27 16.5 49.1 -
 54 7 46.5 - 28 13.5 50.1 -
 54 36 46.8 - 29 10 50.1 -
 55 4.5 46.5 - 30 7 50.1 -
 55 32.5 46.6 - 31 4 49.7 -
 4 50 46.57 5 21 49.29 6 21 49.70 7 30 29.34

ΔT 11 pm -3 40 41.84 -3 40 41.84 -3 40 41.84 -3 40 41.84
 -1 0.65 -55.56 -45.70 -34.42
 -.62 -.56 -.46 -.35
 -3 41 43.11 -3 41 37.96 -3 41 28.00 -3 41 16.61

Vertical Transits East

57

| | | | | | | | | | |
|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|
| after | -68.8 | after | +75.3 | after | -67.2 | before | -70.6 | after | +79.3 |
| | +73.6 | | -66.6 | | +75.2 | | +77.7 | | -69.9 |
| | +4.8 | | +8.7 | | +8.0 | | +7.1 | | +9.4 |
| 16.8 52.0 | +1.2 | 55.6 19.7 | +2.2 | 15.3 51.9 | +2.0 | 16.8 53.8 | +1.8 | 58.4 20.9 | +2.6 |
| | +1.1 | | +1.20 | | +1.8 | | +1.7 | | +2.4 |
| | -1.14 | | -0.5 | | -0.7 | | -0.8 | | -0.01 |
| 546 19.0 | | 15.3 57.3 | | 56.0 19.2 | | 57.4 20.3 | | 16.1 53.8 | |

0 Can May. 9 27.57 ^{p.23} 11 Can May. 9 Can May.

| | | | | | | | | | |
|---|------|------|------|---------|---------|------|------|------|----------------------|
| - | 8 | 1 | 42 | 30.9 | - | | | | |
| - | 2 | | 37.5 | 30.6 | - | | | | 11 Can May. |
| - | 3 | 13 | 30.1 | | - | p.71 | | p.23 | D-1/2 I |
| - | 4 | 0.5 | 31.3 | 8 18 42 | 31.2 | 9 13 | 42 | 8.6 | - 2 1 42.1 |
| - | 4 | 46.5 | 30.8 | 19 30 | 30.2 | 14 | 50.7 | 7.2 | 1 18.1 |
| - | 7 | 8.5 | 31.8 | 21 58.5 | 30.0 | 18 | 26.5 | 9.8 | 0 3.8 |
| - | p.70 | 8 | 19 | 31.0 | 23 14.5 | 30.6 | 20 | 16 | 8.9 1 59 25.8 |
| 7 | 34 | 15 | 15.0 | 9 32 | 32.0 | 24 | 31 | 31 | 22 11 11.0 1 58 47.6 |
| | 35 | 8.5 | 14.5 | 10 43.5 | 30.9 | 25 | 47 | 30.1 | 24 5 9.4 1 58 9.6 |
| | 36 | 3.5 | 15.3 | 11 57.5 | 31.7 | 27 | 5 | 30.5 | 26 4 10.0 1 57 30.6 |
| | 37 | 51.5 | 14.1 | - | | 29 | 42 | 29.8 | 30 9.5 8.9 56 12.1 |
| | 38 | 29 | 15.0 | - | | 30 | 36.5 | 31.1 | 31 35 9.0 58 44.8 |
| | 39 | 6 | 15.4 | - | | 31 | 31 | 31.8 | 33 3 9.6 55 17.6 |
| | 39 | 42.5 | 15.1 | - | | 32 | 23.5 | 30.3 | 34 31 8.6 54 51.4 |
| | 40 | 18.5 | 14.2 | - | | 33 | 18 | 30.4 | 36 2 8.8 54 24.1 |

7 34 14.82 8 9 31.11 8 24 30.58 9 22 8.15

I 1/2 I D-1/2 I

$$D = \frac{1}{2} [T + \Delta T' - (T + \Delta T)]$$

0 Can May. 11 Can May.

| | | | | | | | | | | | | | |
|----|------|----|------|-------|------|----|------|----|------|------|---|----|----------------|
| -0 | 53.5 | -0 | 26.8 | -2.56 | 1.4 | +5 | 49 | +2 | 54.5 | | | | |
| 1 | 48.5 | 0 | 54.2 | 55 | 34.0 | 5 | 1 | 2 | 30.5 | | | | |
| 3 | 36.5 | 1 | 48.2 | 54 | 40.0 | 2 | 32.5 | 1 | 16.2 | | | | |
| 4 | 14 | 2 | 7 | 54 | 21.2 | +1 | 16.5 | +0 | 38.2 | T+ΔT | 3 | 52 | 59.0 4 43 23.4 |
| 4 | 51 | 2 | 25.5 | 54 | 2.7 | -1 | 16 | -0 | 38 | | | | |
| 5 | 27.5 | 2 | 43.8 | 53 | 44.4 | 2 | 34 | 1 | 17 | T+ΔT | 8 | 45 | 58.4 8 40 58.7 |
| -6 | 3.5 | -3 | 1.8 | 53 | 26.4 | 5 | 11 | 2 | 35.5 | | | | |
| | | | | | | 6 | 5.5 | 3 | 2.8 | Δ | 5 | 52 | 56.4 3 57 35.3 |
| | | | | | | 7 | 0 | 3 | 30 | | | | |
| | | | | | | 7 | 52.5 | 3 | 56.2 | D | 2 | 56 | 28.2 1 58 47.6 |
| | | | | | | -8 | 47 | -4 | 28.5 | | | | |

| | | | | | | | | | | | | |
|----------|----|----|-------|----|----|-------|----|----|-------|----|----|-------|
| ΔT 11.4m | -3 | 40 | 41.84 | -3 | 40 | 41.84 | -3 | 40 | 41.84 | -3 | 40 | 41.84 |
| | | | 33.80 | | | 28.01 | | | 25.24 | | | 16.07 |
| | | | 34 | | | .28 | | | 1.26 | | | .16 |
| | -3 | 41 | 15.98 | 3 | 41 | 10.13 | | | 7.64 | 3 | 40 | 58.07 |

Prime Vertical

+50.2
-97.6
-47.4
-11.8
-1.09
after
+50.2
-49.8
-12.4
-1.14
-1.89

+49.6
-96.8
-47.2
-11.8
-1.09
-1.84

2 N

44.0 6.2
29.8 67.8
31.0 69.0
61 44.1

44.2 5.4
29.0 67.8
43.2 63.0
16.0 35.8

γ Eridani

53 Eridani

η Leporis p.22

γ Can May. p.23

-

-

-

-

-

Formisbach
p.191

0 6.5 26.4

1 4 27.4

2 0 27.4

p.41

26 20.5 52.1

27 13 51.9

28 4.5 51.1 11

28 58 52.5

29 49 51.9

-

48 3 29.0

49 28.5 29.1

↓

9 44 54.5 13.3 4 45.5 27.3 32 22.5 52.5 53 36.5 30.5

46 3.5 12.6 6 7.5 28.0 33 38 52.7 55 35 30.6

47 13 13.0 7 28.5 28.5 34 52.5 52.5 57 31.5 31.5

48 21 12.4 8 47.5 27.9 36 6.5 52.5 59 24 31.1

49 30 13.3 10 7 28.7 37 20 52.7 1 15.5 32.2

51 44 12.5 12 41 27.5 39 44.5 52.5 4 48.5 31.3

52 29 13.0 13 32.5 28.0 40 32.5 52.8 5 58.5 31.9

53 13.5 13.3 14 23.5 28.3 41 20.5 53.4 7 7.5 32.4

53 57 12.7 15 13.5 28.0 42 7.5 53.2 8 15 32.0

54 41.5 13.3 16 3.5 27.9 42 54.5 53.3 9 22.5 32.8

9 47 12.94 10 7 27.79 11 34 52.51 11 57 31.20

ΔT 11 fm. -3 40 41.84 -3 40 41.84 -3 40 41.84 -3 40 41.84

-11.96 -8.63 +5.73 +9.45

- .12 - .09 + .06 + .10

-3 40 53.92 -3 40 50.56 -3 40 36.05 -3 40 32.29

Transits W.

59

| | | | | | | |
|--------|--------|--------------|--------|--------|------|------|
| +106.2 | +48.2 | -112.6 | +48.6 | -100.0 | | |
| +51.8 | -100.4 | +51.7 | -101.2 | +43.0 | | |
| -54.4 | -52.2 | after before | -52.6 | -57.0 | | |
| -13.6 | -13.0 | | -13.2 | -14.2 | | |
| -1.25 | -1.20 | 34.0 14.2 | -1.21 | -1.31 | 40.0 | 60.0 |
| -1.00 | -1.95 | 40.2 60.2 | -1.96 | -1.06 | 31.5 | 11.5 |
| | | 40.2 60.2 | | | | |

11 Can Maj. 42757 β Orionis 440 θ Can Maj. p.70

12 45 49 35.9 13 20 7.5 11.8

46 17.5 35.5 20 44.2 11.6

46 46 35.2 21 21 11.6

47 15.5 36.0 21 58 12.0

47 44 35.7 22 34.5 11.9

49 10.5 36.2 24 24 12.2

49 53 35.8 25 18 12.0

50 36.5 36.5 26 13 13.0

p.23 51 19 36.3 27 6 12.2

21^m 52 2 36.6 27 59.5 12.1

- 12 26 2.2 C, 17.9 53 26.5 36.0 29 46 12.1

- 26 49 18.1 53 55.5 36.7 30 21.5 12.3

- 27 36.5 19.4 54 23.8 36.7 30 57 12.6

- 28 21.5 18.4 54 52 36.7 31 31.5 11.9

- 29 7.5 18.6 55 20 36.5 32 65 11.9

12 21 26.16 12 21 18.48 12 50 36.15 13 26 12.08

| | |
|--|-------------------------|
| +7 0.5 +3 30.2 1 55 17.4 | +6 5.5 +3 2.8 2 53 25.4 |
| 6 6.8 3 3.4 55 44.2 | 5 28.8 2 44.4 53 43.8 |
| 5 13.5 2 36.8 56 10.8 | 4 52 2 26 54 2.2 |
| 2 35.5 1 17.8 57 29.8 | 4 15 2 7.5 54 20.7 |
| +1 18 +0 39.0 58 8.6 | 3 38.5 1 49.2 54 39.0 |
| -1 15.5 -0 37.8 1 59 25.4 | 1 49 0 54.5 55 33.7 |
| -2 31.5 -1 15.8 2 0 3.4 | +0 55 +0 27.5 56 0.7 |
| | -0 53 -0 26.5 56 54.7 |
| | 1 46.5 0 53.2 57 21.4 |
| | 3 33 1 46.5 58 14.7 |
| -3 40 41.84 -3 40 41.84 -3 40 41.84 -3 40 41.84 | 4 8.5 2 4.2 58 32.4 |
| | 4 44 2 22 58 50.2 |
| +13.38 +13.36 +18.17 +24.02 | 5 18.5 2 39.2 59 7.4 |
| | -5 53.5 2 56.8 59 25.0 |
| + .14 + .14 + .18 + .24 | |
| - 3 40 28.32 -3 40 28.34 -3 40 23.49 -3 40 17.58 | |

-42.6
+88.2
+45.6
+11.4
+1.05
+.70

4.5 38.1

-61.2
+80.0
+18.8
+4.7
+.43

13.5 47.3

14.0 47.7

57.2 23.3

56.7 22.8

62
+.43
+.50
+.46
-.35
+.11

Jan. 22/97

57.7 23.8

13.0 47.0

+81.5
-60.0
+21.5
+5.4
+.50

E. 61.2 27.0

CE

57.2 23.3

4 Eme.

63 Inige

B Cete

4 Menae

17.4 10 19 48.5 A₃ 30.2

59 21.7

32.1 20 32.2 31.2

63 30.6

54 21 15 31.3

28.3 17.5

4.6 23 23.5 31.6

39.5 11

16.0 24 27 31.1

50.6 24.4

26.7 25 32.5 32.5

1.6 37.7

37.7 26 34.5 30.4

12.7 57.4

59.5 27 39 30.9

84.7 18.1

4 17 14.1

35 42.3

42 27.2

30 29 C₂ 30.0

4 16 15.79 31 125 C₃ 30.8

34 50.56

41 24.40

0 38 25.79 10 25 30.0 0

-4.13

-3.06

3 37 50.00 Red. to 11.00 5.66

34 46.43

41 21.34

+1.74 10 25 25.34

58 2.61

4 37.41

1.05 6 48 42.86

43.82

43.93

3 36 42.48

+1.09

+1.08

2.68

.85

.73

37 50.74 0 = 36 42.77 + ΔT - 5.58a - 6.19c + .67 + .56 + 1.23 44.00

Aa .00 43.91 + .64 - 1.07 -.08 + .10 + .02 43.93

Cc + .09 44.01 + 1.07 - 1.30 -.13 + .12 -.01 44.00

At 4.16 37 50.83 43.60 - 2.40 + 2.97 + .29 -.27 + .02 43.62

At 11.00 36 43.79 43.70 + .43 + 1.01 -.05 -.09 -.14 .56

Δ 7 67.04 43.83 + .88 + 1.18 -.11 -.11 -.22 .61

Red. to 11.00 66.37 43.77 + .37 + 1.00 -.04 -.09 -.13 .64

Rate in 6^h 44^m + .67 43.87 + .80 + 1.14 -.10 -.10 -.20 .67

= +1.10 per hour

Adopt

43.96

43.62

3 36 43.79

12 37 57 = 9 0 15

$$b = -1.14$$

$$+1.35$$

$$- .79$$

61

| | | | | | | | | |
|-------------------------|------|------|-------|--------------------|-----------------|---------------------|--------------|--|
| | 31.2 | 65.2 | -96.4 | | 6.2 | 40.2 | +46.4 | |
| | | | +46.5 | | | | -96.0 | |
| | | | -49.9 | | | | -49.6 | |
| CLW | 6.2 | 40.3 | -12.5 | | 31.0 | 65.0 | -12.4 | |
| | | | -1.15 | | | | -1.14 | |
| y^2 Volantius | | | | β Cass. Min. | α^2 Lem. | α Cass. Min. | β Lem. | |
| 10 45 26 B ₁ | | | | 39.2 | 43.2 | 44.2 | 42.7 | |
| 45 57 | | | | 0.2 | 59.5 | 58.3 | 58.7 | |
| 27.54 46 27.2 | | | | 10.5 | 23.7 | 19 | 22 | |
| 58.5 | | | | 21 | 36.2 | 29.4 | 33.8 | |
| 47 29 & | | | | 31.5 | 48.4 | 39.8 | 45.5 | |
| 48 30.7 C ₁ | | | | 42.1 | 0.5 | 50.1 | 57.2 | |
| 51 | | | | 59 3 | 12.8 | 0.7 | 9.1 | |
| 11.68 49 12 | | | | | 37.2 | 11 21.5 | 32.6 | |
| -43.24 | | | | | | | | |
| 27.74 | | | | | 5 53.6 | 35.4 | 16 48.4 | |
| 52.5 | | | | | | | | |

| | | | | |
|----------|----------|---------|----------|-------------|
| 46 27.64 | 58 21.07 | 4 48.34 | 10 39.82 | 11 15 45.56 |
| -2.22 | -0.27 | +0.79 | +1.75 | +2.59 |
| 46 25.42 | 58 20.80 | 4 49.13 | 10 41.57 | 15 48.15 |
| 9 40.44 | 21 36.37 | 28 4.68 | 33 57.06 | 39 3.64 |
| 44.98 | 44.43 | 44.45 | 44.51 | 44.51 |
| -1.38 | -1.73 | -.62 | -.74 | -.64 |
| 1.75 | .92 | .78 | .93 | .81 |

$$0 = 36 \quad 43.96 + \Delta T + 0.86a - 1.18c \quad 11 \quad 0 \quad 0 \quad 12 \quad 37 \quad 57$$

$$42.77 \quad -5.58 \quad -6.19 \quad -3 \quad 36 \quad 43.79 \quad 12 \quad 16.03$$

$$43.79 \quad +.62 \quad +1.08 \quad 7 \quad 23 \quad 16.21 \quad 12 \quad 50 \quad 13.03$$

$$43.60 \quad -2.40 \quad +2.97 \quad 20 \quad 9 \quad 9.74 \quad 2 \quad 6.53$$

$$0 = 1.19 + 6.44a + 5.01c \quad 11 \quad 14 \quad 6.47 \quad 20 \quad 9 \quad 9.74$$

$$= 0.19 + 3.02a - 1.89c \quad 1 \quad 50.44 \quad 9 \quad 1 \quad 29.30$$

$$.38 \quad 6.04 \quad 3.78$$

$$.41 + 6.44a - 4.03 \quad 12 \quad 16.03 \quad 0 \quad 15$$

$$0 = 0.78 + 9.04c \quad c = -.09 \quad 1 \quad 14.30$$

$$a = -.12$$

Jan 22/97 Prime

| | | | | |
|---------------------|---------------------|-----------|-------|--|
| -107.5 | +51.3 | -93.3 | +50.4 | |
| +49.1 | -94.0 | +50.2 | -93.8 | |
| -58.4 | -42.7 | -43.1 | -43.4 | |
| -14.6 | -10.7 | -10.8 | -10.8 | |
| -1.34 | -.98 | -.99 | -.99 | |
| ref. | | after | | |
| 0 60.5 35.3 16.0 | 33.5 59.8 38.7 11.7 | 32.7 61.0 | | |
| 31.2 17.8 37.2 56.8 | 38.2 12.0 33.4 60.4 | 39.0 10.4 | | |

β Orionis p.40 γ Eridani p.191 53 Eridani

4 42 65 50.0 5 10 26.5 54.7
 34.5 49.8 11 10.5 54.8

η Leporis p.22

7 18 33.5 34.7

43 3 50.1 11 54 54.2 not

20 8 35.1

43 31 49.8 12 38.5 54.5 seen

20 56 35.7

44 0 50.5 13 24 55.5

p.41

21 44 36.0

45 24.5 49.9 15 38.5 55.2

24 8.5 35.8

46 7.5 50.2 16 46.5 55.1 16 36 ? 55.6

25 22 36.0

46 50.5 50.5 17 55.5 55.5 6 17 55.5 55.5

26 35.5 35.5

47 33 50.2 19 4 54.9 19 17 56.5

27 57 36.3

48 16 50.3 20 14 55.2 20 37 55.2

29 6 36.0

49 42.5 50.8 22 35 55.1 23 22.5 55.1

50 11 50.5 23 22.5 55.1 24 18.5 55.1

50 40 50.8 24 11.5 56.3 25 16 56.1

51 8.5 50.5 24 59 55.7 26 12.5 55.6

51 clouds 25 47 55.4 27 10 55.7

4 46 50.28 5 17 55.15 6 17 55.60

7 26 35.68

| | | | |
|------------------------|-------------|-------------|-------------|
| 11 pm | | | |
| ΔT -3 36 43.79 | -3 36 43.79 | -3 36 43.79 | -3 36 43.79 |
| -1 1.30 | -56.20 | -46.34 | -35.06 |
| -.62 | -.57 | -.47 | -.36 |
| -3 37 45.71 | -3 37 40.56 | -3 37 30.60 | -3 37 19.21 |

Vertical Transits 2.

63

| | | | | | | | | |
|------|------|-------|------|-------|------|-------|------|------|
| | | +45.4 | | -96.0 | | +43.7 | | |
| | | -93.0 | | +45.4 | | -93.3 | | |
| | | -47.6 | | -50.6 | | -49.6 | | |
| | | -11.9 | | -12.6 | | -12.4 | | |
| | | -1.09 | | -1.16 | | -1.14 | | |
| 31.1 | 63.1 | -1.07 | 38.6 | 6.8 | 32.0 | 64.0 | 38.0 | 5.7 |
| 40.0 | 7.9 | | 30.5 | 62.5 | 38.7 | 6.7 | 30.4 | 62.9 |

| | | | | | | | | | | | | |
|------------|-------|-------|-------------|------------|------|-------|----|------|-------|----|------|-------|
| 0 Can May. | 42757 | p.23 | 11 Can May. | y Can May. | p.23 | | | | | | | |
| - | 7 | 57 | 47.5 | 36.4 | - | 9 | 6 | 29.5 | 19.2 | | | |
| - | | 58 | 33.5 | 36.6 | - | | 7 | 37 | 20.0 | | | |
| - | | 59 | 19.2 | 36.3 | - | | 8 | 43.5 | 18.6 | | | |
| - | 8 | 0 | 6 | 36.8 | - | | 9 | 52.5 | 19.1 | | | |
| - | | 0 | 53.5 | 37.8 | - | | 11 | 4 | 21.2 | | | |
| - | p.70 | 3 | 13 | 36.3 | - | p.71 | 14 | 37 | 20.3 | | | |
| - | | 4 | 25.5 | 37.5 | - | | 16 | 28 | 20.9 | | | |
| 7 | 30 | 19.5 | 19.5 | 5 | 37 | 37.08 | 20 | 36 | 36.0 | 18 | 20 | 20.0 |
| | 31 | 14 | 20.0 | 6 | 50 | 37.4 | 21 | 53.5 | 36.6 | 20 | 16.5 | 20.9 |
| | 32 | 7.5 | 19.3 | 8 | 35 | 37.7 | 23 | 11 | 36.5 | 22 | 14.5 | 20.5 |
| | 33 | 57.5 | 20.1 | 10 | 32 | 37.8 | 25 | 49.5 | 37.3 | 26 | 23 | 22.4 |
| | 34 | 34 | 20.0 | 11 | 22 | 37.7 | 26 | 42.5 | 37.1 | 27 | 48 | 22.0 |
| | 35 | 11.5 | 20.9 | 12 | 13.5 | 38.8 | 27 | 37 | 37.8 | 29 | 16.5 | 23.1 |
| | 35 | 48 | 20.6 | 13 | 3.5 | 38.1 | 28 | 31.5 | 38.3 | 30 | 45.5 | 23.1 |
| | 36 | 24 | 19.7 | 13 | 54 | 37.5 | 29 | 25 | 37.4 | 32 | 16 | 22.8 |
| 7 | 30 | 20.01 | | 8 | 5 | 37.31 | 8 | 20 | 37.12 | 9 | 18 | 20.94 |

| | | | | | | | | | | | |
|----|----|-------|----|----|-------|----|----|-------|----|----|-------|
| -3 | 36 | 43.79 | -3 | 36 | 43.79 | -3 | 36 | 43.79 | -3 | 36 | 43.79 |
| | - | 34.44 | | - | 28.65 | | - | 26.18 | | - | 16.70 |
| | - | .35 | | - | .29 | | - | .27 | | - | .17 |
| -3 | 37 | 18.58 | -3 | 37 | 12.73 | -3 | 37 | 10.24 | -3 | 37 | 0.66 |

Jan 22/97 Brnie

-69.0
+73.0
+ 4.0
+ 1.0
+ .09
- .16

+74.5
-69.3
+ 5.2
+ 1.3
+ .12
- .13

+72.2
-69.0
+3.2
+0.8
+ .07
- .18

18.0 51.0

54.0 20.5

53.1 19.1

17.5 51.8

53.0 20.0

17.8 51.5

17.5 51.5

53.1 19.0

Y Eridani ^{former lat. 19.1} 53 Eridani p.41

η Leporis

γ Can May

9 35 26.5 18.1 9 54 29.3 p.22

36 14.5 17.8 55 17.5 34.4

37 2.5 17.7 56 13.5 33.4

37 50.5 17.9 57 10.5 33.9

38 38.5 18.4 58 7.5 34.9 11 25 56.5 59.4 45 41.5 42.1

40 59 17.8 10 0 52 33.8 28 28 58.0 49 47 41.0

42 9.5 18.6 2 13.5 34.0 29 44 58.7 51 47 42.6

43 18 18.0 3 34 34.0 30 58.5 58.5 53 41 41.0

44 27.5 18.9 4 54 34.4 32 13 59.0 55 35.5 42.6

45 35.5 18.8 6 12.5 34.2 33 26 58.7 57 25.5 42.2

47 50.5 19.0 8 48 34.5 35 51.5 59.5 12 0 59.5 42.3

48 35 19.0 9 38.5 34.0 36 38.5 58.8 2 9.5 42.9

49 19.5 19.3 10 30.5 35.3 37 27 59.8 3 19 43.9

50 3.5 19.2 11 20.5 35.0 38 14 59.7 4 26 43.0

50 47 18.8 12 10 34.4 39 0.5 59.3 5 32.5 42.8

9 43 18.49 10 3 34.30 11 30 59.05 11 53 42.28

11 p
ΔT -3 36 43.79 -3 36 43.79 -3 36 43.79 -3 36 43.79

-12.60

-9.27

+5.09

+8.82

- .13

- .09

+ .05

+ .09

-3 36 56.52 -3 36 53.15 -3 36 38.65 -3 36 34.88

Vertical Transits W.

65

-69.3
+72.1
+2.8
+0.7
+.06
-.19

+70.8 -69.7
-69.7 +74.5
+1.1 +4.8
+0.3 +1.2
+.05 +1.1

+75.0
-69.6
+5.4
+1.4
+.13
-.12

52.5 18.3 17.7 52.0
-22 -14 54.3 20.2 17.6 52.0

11 Can May, 92757

B Orionis p40 9 Can May, p.70

- p.71
12 9 40 17^m 33.2

12 41 53.5 40.4 13 16 13 17.3

10 33.5 32.7

42 22.5 40.5 16 50 17.4

11 28 33.4

42 51 40.2 17 26.8 17.4

12 22.7 34.9

43 20.5 41.0 18 3.2 17.2

-cloud

43 49 40.7 18 40.5 17.9

16 13.5 30.4 } p.23

45 14.5 40.2 20 29.3 17.5

17 26.5 26.5 } wing* 17^m

45 57.5 40.3 21 23.7 17.7

18 38 26.0

46 40.5 40.5 22 17.5 17.5

19 49.5 26.2

47 23.7 41.0 23 11.5 17.7

22 11 26.7

48 6.2 40.8 24 4.5 17.1

22 58 27.2

49 31.3 40.8 25 52 18.1

23 44.5 27.4

49 59.5 40.7 26 26.5 17.3

24 30 26.9

50 28.5 41.4 27 2.7 18.3

51³⁰ 25 15.5 26.6

50 56.5 41.2 27 36.5? [16.9 24]

51 24.5 41.0 28 12.5 17.9

12 17 33.55 12 17 26.71

12 46 40.71 13 22 17.59

-3 36 43.79

-3 36 43.79

-3 36 43.79

-3 36 43.79

+12.74

+12.72

+17.52

+23.38

+ .13

+ .13

+ .18

+ .24

-3 36 30.92

-3 36 30.94

-3 36 26.09

-3 36 20.17

Clock Comparison

Jan. 23/97

| | | |
|---------------------|---------------------|--------------------|
| 18 9 15 = 9 45 27.5 | 20 15 30 = 11 51 22 | 22 12 40 = 1 48 13 |
| 1 15.44 | 1 15.67 | 1 15.87 |
| 14.54 | | |
| 18 10 30.44 | 20 16 45.67 | 22 13 55.87 |
| 20 9 9.74 | 20 13 6.30 | 20 13 6.30 |
| 22 1 20.70 | 0 3 39.37 | 2 0 49.57 |
| 3 36.47 | 0.60 | 19.80 |
| 21 57 44.23 | 0 3 38.77 | 2 0 29.77 |
| 12 16.63 | 12 16.77 | 12 16.77 |

| | |
|--------------------------------|--|
| 0. 2 ²⁵ 36 = 4 2 36 | 5 3 ³⁶ 56 = 8 37 ⁵⁶ 30 |
| 55.22 | 9.37 |
| -3 33 53.62 | -3 33 15.60 |
| 40.78 | |
| 0 28 42.38 | 5 4 46.63 |
| 27 25 | 3 30 |
| 1 15.78 | 1 16.63 |

Rate of chm, assuming sid. clock to have constant rate.

| | Hourly Rate |
|---------------------------|-------------|
| Jan. 22 4.3 12 15.36 obs. | |
| 11.0 | + 0.10 |
| 12.6 16.03 " | |
| 21.8 16.63 Comp. | 0.05 |
| 23.9 16.77 " | + 0.07 |
| | 0.00 |
| 23 1.8 16.77 " | - 0.04 |
| 4.2 16.67 obs. | |
| 8.0 17.16 " | + 0.13 |

Jan 23/97

67

before after
 57.8 36.5 15.0 37.8 -52.8
 15.0 36.8 59.5 36.5 +96.0
 cl-2. +42.5 +43.2
 +10.4 +10.8
 +.96 +.99
 -.35 -.35
 +.61 +.64
 β Ceti +1.62

20.5

35.2

57

8

19

29.8

40.5

2.1

4 13 17

4 12 18.79

0 38 25.78

3 3 53.01

+6.5

1.05

3 3 53.66

ha +.01

Ca -.05

 ΔT 3 43 53.62 at 4.12 pm 1024 (84 9701 (78

33 15.67 at 8.00 pm 12.19 124.37

 Δ 37.95 $\epsilon = \pm .35$ ± 1.12

 Red 5 m.7. 37.46 $\epsilon = \pm .23$ $\pm .75$
0.49 rate in 3.48^m

= .13 per hour.

Mean Errors

 β Orionis & γ Can May.

Jan 8, 21, 22

 β Orionis γ Can May.

| Jan. 8 | 21 | 22 | 8 | 21 | 22 |
|--------|------|-----|-------|-------|-------|
| 3 3 | 4 3 | 3 3 | 2 16 | 6 22 | 12 13 |
| 4 2 | 3 7 | 5 2 | 9 12 | 20 21 | 9 2 |
| 1 0 | 5 10 | 2 5 | 23 18 | 6 7 | 23 13 |
| 6 2 | 3 2 | 5 3 | 13 8 | 3 6 | 18 3 |
| 4 0 | 1 5 | 2 0 | 7 8 | 18 3 | 3 13 |
| 0 0 | 2 0 | 4 5 | 11 2 | 2 1 | 6 3 |
| 5 1 | 1 4 | 1 4 | 5 7 | 8 10 | 0 1 |
| 7 3 | 4 3 | 2 2 | 9 1 | 3 1 | 9 6 |
| 5 1 | 1 1 | 1 3 | 0 10 | 2 7 | 0 6 |
| 2 1 | 2 4 | 0 1 | 4 14 | 4 12 | 4 16 |
| 1 3 | 3 2 | 5 1 | 10 6 | 6 8 | 15 7 |
| 0 | 1 5 | 2 0 | 6 8 | 4 16 | 11 5 |
| 7 | 2 5 | 5 7 | 22 10 | | 22 |
| 0 | 1 5 | 2 5 | 12 | | 22 |
| 2 | 0 3 | 3 | 9 | | 19 |

m = 85

79

| | | | | | | | | | | | |
|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 9 | 9 | 16 | 9 | 9 | 9 | 4 | 256 | 36 | 484 | 144 | 169 |
| 16 | 4 | 9 | 49 | 25 | 4 | 81 | 144 | 400 | 441 | 81 | 4 |
| 1 | 4 | 25 | 100 | 4 | 25 | 529 | 324 | 36 | 49 | 529 | 169 |
| 36 | 1 | 9 | 4 | 25 | 9 | 169 | 64 | 9 | 36 | 324 | 9 |
| 16 | 9 | 1 | 25 | 4 | 25 | 49 | 64 | 324 | 9 | 9 | 169 |
| 25 | 1 | 4 | 16 | 16 | 16 | 121 | 4 | 4 | 1 | 36 | 9 |
| 49 | 1 | 1 | 9 | 1 | 4 | 25 | 49 | 64 | 100 | 81 | 1 |
| 25 | 9 | 16 | 1 | 4 | 9 | 81 | 1 | 9 | 1 | 16 | 36 |
| 4 | 49 | 1 | 16 | 1 | 1 | 16 | 100 | 4 | 49 | 225 | 256 |
| 1 | 4 | 4 | 4 | 25 | 1 | 100 | 196 | 16 | 144 | 121 | 49 |
| | 9 | 25 | 4 | 49 | 36 | 36 | 36 | 64 | 484 | 25 | |
| 1 | 25 | 25 | 25 | 484 | 64 | 16 | 256 | 484 | | | |
| 4 | 25 | 4 | 9 | 144 | 100 | | | | 361 | | |
| 1 | 9 | | | | | 81 | | | | | |

unit tenths of sec.

 Σ 182

1920

91

1402

101

954

317

1634

147

2895

186

896

 $\epsilon = \pm .35$ ± 1.12 $\epsilon = \pm .23$ $\pm .75$

cl. E

Jan. 23/97

$$L = \begin{array}{r} +.73 \\ -.35 \\ \hline +.38 \end{array}$$

Lentadyma

| | | | | | | | |
|----------|----------|---------|----------|----|----------------|----------------|-----------|
| | 70.0 | 38.4 | +108.4 | | 35.8 | 54.4 | +118.9 |
| | | | -82.5 | | | | -81.6 |
| | 25.5 | 57.0 | +25.9 | | 69.2 | 49.7 | +37.3 |
| | | | +6.5 +60 | | 27.4 | 54.2 | +9.3 +.86 |
| +21 48 | | -7 6 | | | | | |
| A, Tauri | o'ridani | y Tauri | | | 8 Mensae | very faint | |
| 58.6 | 14.7 | 17.7 | | 52 | 40.5 | 13 | hazy |
| 13.5 | 28.7 | 32.5 | | 53 | 23 | 4 | 14.2 |
| 35.7 | 49.6 | 53.7 | | 54 | 5 | 5 | 14.6 |
| 47.1 | 0.1 | 4.2 | | 56 | 10.5 | B ₁ | 15.3 |
| 58.3 | 10.6 | 15.2 | | 57 | 12.5 | 2 | 14.9 |
| 9.3 | 20.8 | 26.1 | | 58 | 15.5 | 3 | 15.5 |
| 20.5 | 31.3 | 37 | | 59 | 20 | [5] 4 | 15.2 |
| 42.7 | 52.2 | 58.2 | | 24 | C ₁ | | 14.4 |

7 32 57.7 41 6.2 48 12.5

| | | | | | | | | |
|-------------|-------|-------|-------|-------|----|-------|----|-------|
| 7 | 31 | 58.16 | 40 | 10.47 | 47 | 15.23 | 58 | 14.69 |
| Red to 8.00 | -4.61 | -3.26 | -2.10 | -0.29 | | | | |

| | | | | | | | | |
|----|-------|-------|-------|-------|-------|-------|-------|------|
| 31 | 53.55 | 40 | 7.21 | 47 | 13.13 | 58 | 14.40 | |
| 3 | 58 | 38.04 | 6 | 51.87 | 13 | 57.64 | 25 | 0.62 |
| 3 | 33 | 15.51 | 15.34 | 15.49 | 13.78 | | | |
| | +32 | +38 | +33 | +1.00 | | | | |

.85 1.00 .88 2.64

| | ΔT | C_2 | Σ | ΔT | |
|--------|------------|--------------|-------------|------------|-------|
| 0 = 33 | 15.83 | + ΔT | +67a -1.08c | -.14 | 15.64 |
| | | | | +.05 | |
| 15.72 | | +16 | -1.01 | -.03 | .64 |
| | | | | +.05 | 15.64 |
| 15.82 | | +55 | -1.04 | -.12 | .65 |
| | | | | +.05 | |
| 14.78 | | -5.43 | -6.03 | +1.14 | .62 |
| | | | | +.30 | |
| 15.63 | | +68 | +1.08 | -.14 | .54 |
| | | | | +.05 | |
| 15.83 | | +61 | +1.06 | -.13 | .74 |
| | | | | +.05 | 15.70 |
| 15.85 | | +90 | +1.19 | -.19 | .72 |
| | | | | +.06 | |
| 15.91 | | +1.11 | +1.32 | -.23 | .75 |
| | | | | +.07 | 15.67 |
| 15.70 | | +54 | +1.04 | -.11 | .74 |
| | | | | +.05 | |

$$b = \begin{array}{r} -0.96 \\ +0.35 \\ \hline -0.61 \end{array}$$

clw

$$\begin{array}{r} 44.2 \quad 71.5(?) \quad -115.7 \\ \quad \quad \quad +74.8 \\ \quad \quad \quad -40.9 \\ 50.5 \quad 24.3 \quad -10.7 \\ \text{Level adjustment} \quad -0.74 \end{array}$$

$$\begin{array}{r} 39.2 \quad 11.8 \quad +51.0 \\ \quad \quad \quad -94.2 \\ \quad \quad \quad -43.2 \\ 33.5 \quad 60.7 \quad -10.8 \\ \quad \quad \quad -9.9 \\ \hline +40.56 \end{array}$$

| + Jauri | i Jauri | i Amiga | § Amiga | 11 Orionis |
|---------|----------------|----------------|---------|------------|
| 58 | 37.7 | 342 | 3.4 | 32.6 |
| 9.3 | 52.5 | 42.5 | 17.1 | 43.1 |
| 20.5 | 14.3 | 7.1 | 30.6 | 54.0 |
| 30.8 | 25.2 | 19.5 | 44.4 | 4.6 |
| 9 43 | 36.2 | 31.8 | 28 58.2 | 8 32 15.5 |
| | 47.2 | 44.2 | | |
| | 58.0 | 56.5 | | |
| | 19.9 | 21.2 | | |
| | <u>19 34.5</u> | <u>24 29.2</u> | | |

| | | | | |
|-----------|----------|----------|----------|----------|
| 8 9 20.32 | 18 36.17 | 23 31.80 | 28 30.74 | 31 53.96 |
| + 1.53 | + 3.06 | + 3.87 | + 4.68 | + 5.24 |
| 9 21.85 | 18 39.23 | 23 35.67 | 28 35.42 | 31 59.20 |
| 36 5.71 | 45 22.88 | 50 19.34 | 55 19.07 | 58 42.96 |
| 33 16.14 | 16.35 | 16.33 | 16.35 | 16.24 |
| -.51 | -.52 | -.48 | -.44 | -.54 |
| .84 | .86 | .78 | .72 | .88 |

$$0 = 15.79^{82} + \Delta T + .61a - 1.06c$$

$$15.72 + \Delta T + .61a + 1.06c$$

$$c = +.05$$

$$0 = 1.04 + 6.04a + 4.97c$$

$$6.04a = -1.29$$

$$a = -.21$$

| | |
|-------------|------------|
| 8 0 0 | 8 37 56 |
| -3 33 15.67 | 12 17.20 |
| 4 26 44.33 | 8 58 13.20 |
| 20 13 6.30 | 5 15 47.20 |
| 8 13 38.03 | 1 27.10 |
| 1 20.87 | -51.88 |
| 12 17.16 | 20 13 6.30 |
| | 5 4 46.60 |
| | 1 27 45.38 |
| | 5 8 30 |
| | 1 16.60 |

Jan 25

Jan 26

 $16-50-30-8-19-5 \quad 19-15-0-10-43 \quad 11.5 \quad | \quad 18 \quad 9 \quad 15 = 9 \quad 45 \quad 27.5$

ff 57.59

O Can May

| $D - \frac{1}{2} I$ Mean | | $\log_{10}(D - \frac{1}{2} I)$ | $\log_{10} \text{denom.}$ | $\log I$ | I |
|--------------------------|--|--------------------------------|---------------------------|-----------------------|-----------------------|
| 2 59 25.0 = 44 51.2 | | 9.84837 | 9.28905 | 2.54980 | 354.6 |
| 59 7.4 44 46.8 | | 9.84782 | 9.28850 | 2.50459 | 319.6 ^{35.0} |
| 58 50.2 44 42.6 | | 9.84728 | 9.28796 | 2.45398 | 284.4 ^{35.2} |
| 58 32.4 44 38.1 | | 9.84670 | 9.28738 | 2. ³ 49657 | 249.2 ^{35.2} |
| 58 14.7 44 33.7 | | 9.84614 | 9.28682 | 2.33018 | 213.9 ^{35.3} |
| 57 21.4 44 20.4 | | 9.84442 | 9.28510 | 2.03087 | 107.4 |
| 56 54.7 44 13.7 | | 9.84356 | 9.28424 | 1.73070 | 53.8 ^{53.6} |
| 56 28.2 44 0.2 | | 9.84180 | 9.28248 | 1.73246 | 54.0 |
| 56 1.0 44 0.2 | | 9.84180 | 9.28248 | 1.73246 | 54.0 |
| 55 33.8 43 53.4 | | 9.84090 | 9.28158 | 2.03439 | 108.2 ^{54.2} |
| 54 39.5 43 39.9 | | 9.83913 | 9.27981 | 2.33719 | 217.4 |
| 54 21.0 43 35.2 | | 9.83851 | 9.27919 | 2.40476 | 254.0 ^{36.6} |
| 54 2.4 43 30.6 | | 9.83789 | 9.27857 | 2.46337 | 290.6 ^{36.6} |
| 53 44.1 43 26.0 | | 9.83728 | 9.27796 | 2.51513 | 327.4 ^{36.8} |
| 53 25.9 43 21.5 | | 9.83668 | 9.27736 | 2.56149 | 364.3 ^{36.9} |

| | | | | | δ | θ Can. Map. | 11 Can. Map. |
|---------|------|---------|---------|------|------------------|-----------------------|----------------------|
| Jan. 21 | 12.6 | chm. t. | 1 12.39 | | | -11 54.5 | -14 18.9 |
| | | | | 2.07 | log cos δ | 9.99055 | 9.98630 |
| 22 | 12.6 | " | 14.46 | | " sin δ | 9.45069 ¹³ | 9.45013 ^m |
| 23 | 8.6 | " | 16.60 | 2.57 | Σ | 9.44068 ^m | 9.43643 ^m |

ff. 57, 59
 $D - \frac{1}{2} I$ mean

11 Can. Map.
 log sin $(D - \frac{1}{2} I)$ log denom. log I I

| | | | | | | | |
|---|----|-----------|---------|---------|---------|---------|-----------------------|
| 2 | 1 | 42.1 = 30 | 25.5 | 9.70450 | 9.14093 | 2.54302 | 349.2 |
| | 1 | 18.1 | 30 19.5 | 9.70321 | 9.13964 | 2.47736 | 300.2 ^{49.0} |
| | 0 | 3.6 | 30 0.9 | 9.69917 | 9.13560 | 2.18037 | 151.5 |
| 1 | 59 | 25.6 | 29 51.4 | 9.69708 | 9.13351 | 1.88143 | 76.1 ^{75.4} |
| 1 | 58 | 47.6 | 29 41.9 | 9.69499 | — | — | — |
| | 58 | 9.1 | 29 32.3 | 9.69286 | 9.12929 | 1.88565 | 76.9 ^{77.6} |
| | 57 | 30.2 | 29 22.6 | 9.69068 | 9.12711 | 2.18886 | 154.5 |
| | 56 | 11.4 | 29 2.8 | 9.68621 | 9.12264 | 2.49436 | 312.2 |
| | 55 | 44.6 | 28 56.2 | 9.68471 | 9.12114 | 2.56281 | 365.4 ^{53.2} |
| | 55 | 17.5 | 28 49.4 | 9.68314 | 9.11957 | 2.62237 | 419.2 ^{53.8} |
| | 54 | 51.4 | 28 42.8 | 9.68162 | 9.11805 | 2.67504 | 473.2 ^{54.0} |
| | 54 | 24.1 | 28 36.0 | 9.68006 | 9.11649 | 2.72236 | 527.6 ^{54.4} |

72

+43.5
-95.5
-49.0
-12.2
-1.12
-1.87

-98.1
+51.8
-46.3
-11.6
-1.07
-1.82

Jan. 26/97

+44.9
-94.2
-44.3
-11.1
-1.02
-1.77

Prime Vertical

+51.4 E
-98.0
-46.6
-11.6
-1.07
-1.82

-98.0
+49.2
-48.8
-12.2
-1.12
-1.87

33.0 13.5 38.8 59.3

37.1 12.8

~~34.8 59.6~~ 41.2 10.2 33.5 64.5 40.0 9.2

38.0 57.5 36.2 15.6

35.0 59.2
Former both

Q N 30 Orionis p.40 y Eridani p.191

y Car Maj. p.23

4 26 18.5 2.0 54 37.5 5.7

8 50 40.5 30.2

26 46.5 1.8 55 22 6.3

51 48 31.0

27 14 1.1 56 5.5 5.7

52 54.5 29.6

27 42.8 1.6 56 50 6.0

54 4 30.6

28 11 1.5 57 35 6.5

55 14.5 31.7

29 36 1.4 59 49.5 6.2

58 46.5 29.8

30 18.7 1.4 0 58 6.6

0 38.5 31.4

31 1 1.0 2 6.5

2 31 31.0

31 44.5 1.7 3 16.5

4 26.5 30.9

32 27 1.3 4 26 7.2

6 26 32.0

33 53.3 1.6 6 46.5 6.6

34 22 1.5 7 34 6.6

34 51 1.8 8 23 7.8

35 20 2.0 9 10.5 7.2

35 48.5 1.6 9 59 7.4

4 31 1.55 5 2 6.65

9 2 30.82

8pm

ΔT -3 21 21.75 -3 21 21.75

-3 21 21.75

-34.33 -29.22

+10.27

- .24 - .21

+ .07

-3 21 56.32 -3 21 51.18

-3 21 11.41

Transits E & W

73

W

| | | | | | | |
|------|------|-------|-------|------|------|-------|
| | | +76.8 | +76.5 | | | +76.7 |
| | | -72.7 | -74.2 | | | -73.4 |
| | | +4.1 | +2.3 | | | +2.3 |
| 53.8 | 23.0 | +1.0 | +0.6 | 54.2 | 22.3 | +0.6 |
| | | +1.09 | +0.6 | | | +0.6 |
| 21.0 | 51.7 | -.16 | -.19 | 21.2 | 53.0 | -.19 |

Cl S y Eridani y Can. Maj. B. Ononis p. 40

| | | | | | | | | | |
|---|----|-------------------------|------|----|-------|-------|----|------|-------|
| | | - Former work p. 191 | | | p. 23 | 12 | 26 | 5 | 51.9 |
| | | | 11 | 25 | 29 | 51.4 | | 33.7 | 51.7 |
| 9 | 21 | 12.5 | 27.7 | 26 | 58 | 51.4 | 27 | 2.5 | 51.7 |
| | 22 | 0.2 | 27.6 | 28 | 25.5 | 51.5 | | 31.5 | 52.0 |
| | 22 | 48.5 | 28.4 | 29 | 52.5 | 53.1 | 28 | 0 | 51.7 |
| | 25 | 9.5 | 28.3 | 33 | 57.5 | 51.5 | 29 | 26 | 51.7 |
| | 26 | 19.5 | 28.6 | 35 | 56.5 | 52.1 | 30 | 9 | 51.7 |
| | 27 | 28.5 | 28.5 | 37 | 51 | 51.0 | 30 | 51.5 | 51.5 |
| | 28 | 37.5 | 28.9 | 39 | 45.5 | 52.6 | 31 | 34.5 | 51.8 |
| | 29 | 45.5 | 28.8 | 41 | 35.5 | 52.2 | 32 | 17 | 51.6 |
| | 32 | 0.5 | 29.0 | 45 | 10 | 52.8 | 33 | 42.3 | 51.8 |
| | 32 | 44.5 | 28.5 | 46 | 19 | 52.4 | 34 | 10 | 51.2 |
| | 33 | 29.5 | 29.3 | 47 | 29 | 53.9 | 34 | 39.2 | 52.1 |
| | 34 | 13.5 | 29.2 | 48 | 36 | 53.0 | 35 | 7.2 | 51.9 |
| | 34 | 57.5 | 29.3 | 49 | 41.5 | 51.8 | 35 | 35.5 | 52.0 |
| 9 | 27 | 28.62 | | 11 | 37 | 52.19 | 12 | 30 | 51.75 |

| | | | | | | | | | |
|----|----|--------|------------------|----|----|-------|----|----|--------|
| -3 | 21 | 21.75 | 11 ^{pm} | -3 | 20 | 51.98 | -3 | 20 | 51.98 |
| | | +14.37 | | | | +6.22 | | | +14.93 |
| | | + .10 | | | | + .04 | | | + .10 |
| -3 | 21 | 7.28 | | -3 | 20 | 45.72 | -3 | 20 | 36.95 |

$$b = -0.94$$

$$b = +0.35$$

$$-0.59$$

493.1
+53.8
546.9
500.8
45.9

Jan. 26/97

+54.0
-96.4
-42.4
-10.6
-98

42.0 12.0
33.3 63.2
33.1 63.1

CLW

32.3 60.8
41.3 12.5

| of Jauri | o' Enidani | y Jauri | 2 Jauri | 8 Meuse |
|----------|---------------------|---------|---------|---|
| 43.2 | 29.7 B ₁ | 26.8 | 4.2 | 58 29.2 B ₅ |
| 58.3 | 40.1 | 41.2 | 19.1 | 50 34.5 ^{24.4} _{24.9} |
| 21 | 50.5 | 2.4 | 40.8 | 51 16.5 ^{25.3} |
| 32.3 | 1 | 13.3 | 52 | 58.5 ^{25.6} |
| 43.7 | 11.2 | 24.1 | 29 | 52 40 ^{25.5} |
| 54.9 | 32.1 C ₁ | 34.6 | 13.7 | 53 20.5 ^{24.4} |
| 6.2 | 39.2 | 45.5 | 24.5 | |
| 29 | 46.2 | 7 | 46.6 | |

7.14 44.2

many star

28 0

many star
Red. to 8.00

| | | | | | | |
|---|----|-------|----|-------|----|-------|
| 7 | 35 | 24.00 | 44 | 2.78 | 46 | 25.02 |
| | | -4.04 | | -2.62 | | -2.23 |
| 7 | 34 | 19.96 | 44 | 0.16 | 46 | 22.79 |
| 4 | 13 | 57.61 | 22 | 37.89 | 25 | 0.22 |
| 3 | 21 | 22.35 | 21 | 22.23 | | 22.57 |
| | | -0.52 | | -0.51 | | -1.56 |

Aa Cc = ΔT.88

.86

2.64

$$0 = 21.83 + \Delta T + 0.55a + 1.04c - 0.07 - 0.01 - 0.08 \quad 21.75$$

$$21.76 \quad +.61 + 1.06 - 0.09 - 0.01 - 0.10 \quad .66$$

$$21.01 \quad -5.43 + 6.03 + .81 - 0.06 + .75 \quad .76] \quad 21.75$$

$$21.96 \quad +.68 + 1.08 - 0.10 - 0.01 - 0.11 \quad .85$$

$$21.90 \quad +.61 - 1.06 - 0.09 + 0.01 - 0.08 \quad .82$$

$$21.83 \quad +.90 - 1.19 - 0.14 + 0.01 - 0.13 \quad .70 \quad 21.75$$

$$21.92 \quad +1.11 - 1.32 - 0.17 + 0.01 - 0.16 \quad .76$$

$$21.82 \quad +.84 - 1.04 - 0.08 + 0.01 - 0.07 \quad .75$$

$$21.73 \quad +.19 - 1.00 - 0.03 + 0.01 - 0.02 \quad .71$$

$$\Delta T \quad -3 \quad 21 \quad 21.75 \quad \text{at } 8 \text{ pm.}$$

$$8 \ 41 \ 23 = 5 \ 18 \ 45$$

75

$$6 = \begin{array}{r} +.64 \\ -.35 \\ \hline +.29 \end{array}$$

$$\begin{array}{r} -60.7 \\ +88.8 \\ +28.1 \\ +7.0 \\ +.64 \\ \hline 59.8 \ 29.0 \end{array}$$

$$\begin{array}{r} -60.5 \\ +87.9 \\ +27.4 \\ +6.8 \\ +.63 \end{array}$$

Cl E

$$\begin{array}{r} 15.0 \ 45.5 \\ 59.2 \ 28.7 \end{array}$$

| 2 Jauri | i Jauri | i Aurigae | 4 Aurigae | 11 Orionis | 13 Bred. |
|----------|-----------|-----------|-----------|------------|----------|
| 28.4 | 52.3 | | 24.7 | 39.7 | 11 |
| 43.5 | 59.7 | 49.7 ? | 43.2 | 50.5 | 24.8 |
| 5.8 | 21.5 | 14.2 | 10.6 | 1.2 | 45.7 |
| 17.4 | 32.4 | 26.7 | 24.4 | 12 | 56.1 |
| 28.6 | 43.5 | 39.1 | 38.2 | 20 22.7 | 6.6 |
| 39.7 | 54.3 | 51.2 | 51.7 | | 16.8 |
| 57 | 5.3 | 3.8 | 5.5 | | 27.5 |
| 13.6 | 27.2 | 12 28.3 | 32.7 | | 48 |
| 58 28.7 | 7 34.3 | | 17 51.2 | | 25 2 |
| 57 28.52 | 8 6 43.39 | 11 39.00 | 16 38.02 | 20 1.22 | 24 6.50 |
| -0.41 | +1.10 | +1.91 | +2.73 | +3.29 | +3.96 |
| | 44.49 | 40.91 | 40.75 | 20 4.51 | 10.46 |
| 57 28.11 | 8 6 42.29 | 11 37.09 | 16 35.29 | 19 57.93 | 24 2.54 |
| 36 5.65 | 45 22.84 | 50 19.31 | 55 19.04 | 58 42.95 | 2 49.02 |
| 22.46 | 21.65 | 21.60 | 21.71 | 21.56 | 21.44 |
| -.50 | +.25 | +.23 | +.21 | +.26 | +.29 |
| .84 | .86 | .78 | .72 | .88 | .99 |

$$0 = 21.85 + .61a + 1.06c$$

$$8 \ 0 \ 0$$

$$8 \ 41 \ 23$$

$$21.84 + .67a - 1.12c$$

$$-3 \ 21 \ 21.75$$

$$12 \ 21.44$$

$$0 = .01 - .06a + 2.28c$$

$$4 \ 38 \ 38.25$$

$$8 \ 53 \ 44.44$$

$$c = .01$$

$$20 \ 24 \ 55.97$$

$$1 \ 27.68$$

$$0 = 0.84 + 6.04a - 4.97c$$

$$8 \ 13 \ 42.28$$

$$20 \ 24 \ 55.97$$

$$6.04a = -.89$$

$$1 \ 20.88$$

$$5 \ 20 \ 8.09$$

$$a = -.15$$

$$+ 12 \ 21.40$$

$$18 \ 45$$

Chrau

$$+ 1 \ 23.09$$

Sill. Clock

76

$$b = \frac{-1.06}{+3.5} = .71$$

Jan 26/97

R.W

Cl E

$\begin{array}{r} -97.2 \\ +50.7 \\ -46.8 \\ -11.6 \\ -1.07 \end{array}$
 $\begin{array}{r} +51.7 \\ -97.3 \\ -45.6 \\ -11.4 \\ -1.05 \end{array}$
 $\begin{array}{r} +85.7 \\ -64.5 \\ +21.2 \\ +5.3 \\ +.49 \end{array}$

48.0 97 22 10

33.0 64.3

y2 Volante 8 Cen. β Can Min 2 Cen. 2 Can Min

| | | | | | | | |
|----|------|------|------|------|------|------|------|
| 10 | 27 | 34.1 | 38.4 | 58.2 | 36.2 | 54 | 54.1 |
| | | 54 | 37.9 | 13.1 | 50.2 | 10.4 | 8 |
| 28 | 14.8 | 38.3 | 35.4 | | 11 | 34.9 | 28.7 |
| | | 35.5 | 38.5 | 46.8 | 21.5 | 47.3 | 39.3 |
| | | 37 | 38.5 | 57.9 | 32 | 59.5 | 49.6 |
| 30 | 7.8 | 38.5 | 9.2 | | 42.5 | 11.5 | 0.2 |
| | | 38.5 | 38.5 | 20.3 | 53 | 23.8 | 10.6 |
| 31 | 9.3 | 38.6 | 42.6 | | 13.8 | 48.3 | 31.2 |
| | | 40 | 38.5 | 36 | 57.6 | 43 | 27.9 |
| | | | | | 50 | 4.7 | 55 |
| | | | | | | | 45.3 |

| | | | | | | | | | | |
|----|----|-------|----|-------|----|-------|----|-------|----|-------|
| 10 | 30 | 38.41 | 35 | 57.90 | 42 | 32.01 | 48 | 59.38 | 54 | 49.78 |
|----|----|-------|----|-------|----|-------|----|-------|----|-------|

| | | | | | | | |
|--------------|-------|------|-------|-------|-------|-------|-------|
| Red to 11.00 | -4.82 | [34] | -4.12 | -3.95 | -2.87 | -1.81 | -0.85 |
|--------------|-------|------|-------|-------|-------|-------|-------|

| | | | | | | | | | | | | |
|----|----|-------|------|----|----|-------|----|-------|----|-------|----|-------|
| 10 | 30 | 33.59 | [34] | 78 | 35 | 53.95 | 42 | 29.14 | 48 | 57.57 | 54 | 48.93 |
|----|----|-------|------|----|----|-------|----|-------|----|-------|----|-------|

| | | | | | | | | | | |
|---|---|-------|----|------|----|-------|----|------|----|-------|
| 7 | 9 | 40.34 | 14 | 0.97 | 21 | 36.38 | 28 | 4.71 | 33 | 57.07 |
|---|---|-------|----|------|----|-------|----|------|----|-------|

| | | | | | | | | | | |
|---|----|-------|--|-------|--|-------|--|-------|--|-------|
| 3 | 20 | 53.25 | | 52.81 | | 52.76 | | 52.86 | | 51.86 |
|---|----|-------|--|-------|--|-------|--|-------|--|-------|

| | | | | | | | | | | |
|--|--|-------|--|------|--|------|--|------|--|------|
| | | -1.24 | | -.60 | | -.65 | | -.55 | | +.13 |
|--|--|-------|--|------|--|------|--|------|--|------|

| | | | | | | | | | | |
|--|--|------|--|-----|--|-----|--|-----|--|-----|
| | | 1.75 | | .84 | | .92 | | .78 | | .93 |
|--|--|------|--|-----|--|-----|--|-----|--|-----|

$$0 = 20 \ 52.01 + \Delta T - 2.40 \ a + 2.97 \ c + 1.34 \ - .36 \ - .02 \ 51.99$$

| | | | | | | |
|-------|------|-------|------|------|------|-------|
| 52.21 | +.67 | +1.08 | -.09 | -.13 | -.22 | 51.99 |
|-------|------|-------|------|------|------|-------|

| | | | | | | | |
|-------|------|-------|------|------|------|-------|-------|
| 52.11 | +.43 | +1.01 | -.06 | -.12 | -.18 | 51.93 | 51.99 |
|-------|------|-------|------|------|------|-------|-------|

| | | | | | | |
|-------|------|-------|------|------|------|-------|
| 52.31 | +.88 | +1.18 | -.12 | -.14 | -.26 | 52.05 |
|-------|------|-------|------|------|------|-------|

| | | | | | | |
|-------|------|-------|------|------|------|-------|
| 51.99 | +.37 | -1.00 | -.05 | +.12 | +.07 | 52.06 |
|-------|------|-------|------|------|------|-------|

| | | | | | | | |
|-------|------|-------|------|------|------|-------|-------|
| 51.90 | +.80 | -1.14 | -.11 | +.14 | +.03 | 51.93 | 51.98 |
|-------|------|-------|------|------|------|-------|-------|

| | | | | | | |
|-------|------|-------|------|------|------|-------|
| 51.96 | +.77 | -1.12 | -.11 | +.13 | +.02 | 51.98 |
|-------|------|-------|------|------|------|-------|

| | | | | | | |
|-------|------|-------|------|------|------|-------|
| 51.92 | +.74 | -1.11 | -.10 | +.13 | +.03 | 51.95 |
|-------|------|-------|------|------|------|-------|

$$\Delta T - 3 \ 20 \ 51.98$$

at 11 p.m.

$$b = \begin{array}{r} +.49 \\ -.35 \\ +.14 \end{array}$$

$$\begin{array}{r} -63.5 \\ +84.7 \\ +21.2 \\ +5.3 \\ +.49 \end{array}$$

$$11566 = 8340$$

157 47.8

58.4 26.3

| β Cen | ϕ Cen | ω Canori |
|-------------|------------|-----------------|
| 52.7 | 3 | 48 |
| 8.4 | 18.5 | 11.1 |
| 32.1 | 41.6 | very 22.5 |
| 43.6 | 53.3 | faint 34.2 |
| 55.5 | 5.2 | 45.5 |
| 7.2 | 16.5 | 57.2 |
| 19.0 | 28.3 | 16 19.7 |
| 42.5 | 51.4 | |

| | | |
|----------------|------|-------|
| 8 pm | 3 21 | 21.75 |
| 11 pm | 20 | 51.98 |
| Δ | | 29.77 |
| Red. to M.7. | | 29.57 |
| Rate in 3 hrs. | | .20 |

| | | |
|------------|----------|----------|
| 11 158.2 | 9 7.2 | |
| 10 55.47 | 8 5.00 | 15 34.03 |
| 59 - .01 | | |
| +15 | +1.33 | 2.56 |
| 46 | 6.33 | |
| 1059 55.32 | 8 3.67 | 15 36.47 |
| 39 3.67 | 47 14.48 | 54 44.78 |
| 51.79 | 51.85 | 51.81 |
| +11 | +11 | +11 |
| .81 | .82 | .82 |

$$0 = 52.21 + \Delta T + .66a + 1.09c$$

$$51.94 + .67a - 1.09c$$

$$0 = 0.27 + 2.18c \quad c = -.12$$

$$0 = 0.20 + 3.06a - 1.88c$$

$$3.06a = -.43 \quad a = -.14$$

$$11 \ 0 \ 0$$

$$-3 \ 20 \ 51.98$$

$$7 \ 29 \ 8.02$$

$$20 \ 24 \ 55.97$$

$$11 \ 14 \ 12.05$$

$$1 \ 50.45$$

$$+12 \ 21.60$$

chron

$$11 \ 56 \ 6$$

$$12 \ 21.67$$

$$12 \ 8 \ 27.67$$

$$1 \ 59.67$$

$$20 \ 24 \ 55.97$$

$$8 \ 35 \ 23.31$$

$$34 \ 0$$

$$+1 \ 23.31$$

clock

Hourly Rate +.07
Adopt

Partial Eclipse of Sun - Feb. 1/97

| | | | | Estimated | Observed | p. 82 |
|-------------------------|---------------------|----------------------------|----------------------------------|--------------------------|--------------------------|----------------|
| ϕ | $-16^{\circ} 22.5'$ | $\phi' 16^{\circ} 16.29'$ | Chaur. $\phi' 16^{\circ} 16.29'$ | Em. T. begin | 8 20 | 8 32 28 |
| $\log \cos \phi$ | 9.98202 | $\log \cos \phi'$ | 9.45014 | " end | 10 25 | 10 28 59 53 |
| " F | 12 | " G | 282 | λ | 4 46 20 | |
| " $\phi \cos \phi'$ | 9.98214 | " $\rho \sin \phi'$ | 9.44732 | | 71 35.0 | |
| | Begin | End | Begin | End | End | |
| μ | 121 31.3 | 152 46.3 | 124 38.30 | 153 46.04 | 153 44.54 | |
| λ | 71 35 | 71 35 | 71 35.00 | 71 35.00 | 71 35.00 | |
| $\mu - \lambda$ | 49 56.3 | 81 11.3 | 53 3.30 ^{18"} | 82 11.04 ^{2.4"} | 82 9.54 ^{32.4"} | |
| $\log \sin(\mu)$ | 9.88386 | 9.99485 | 9.902663 | 9.995947 | 9.995921 | |
| " $\rho \cos \phi'$ | 9.98214 | 9.98214 | 9.982135 | 9.982135 | 9.982135 | |
| " ξ | 9.86600 | 9.97699 | 9.884798 | 9.978082 | 9.978056 | |
| " $\cos \delta$ | 9.98097 | 9.98103 | 9.980972 | 9.981030 | 9.981030 | |
| " $\rho \sin \phi'$ | 9.44732 | 9.44732 | 9.446508 ^{p. 81} | 9.447313 | 9.447313 | |
| " $\sin \delta$ | 9.46187 | 9.46126 | 9.461808 | 9.461244 | 9.461244 | |
| Σ_1 | 9.42829 | 9.42835 ^{7.42835} | 9.428285 | 9.428343 | 9.428343 | |
| Σ_2 | 8.90919 | 8.90858 | 8.909121 | 8.908557 | 8.908557 | |
| " $\sin \delta$ | 9.46187 | 9.46126 | 9.461808 | 9.461244 | 9.461244 | |
| " $\cos(\mu - \lambda)$ | 9.80863 | 9.18522 | 9.778910 | 9.133514 | 9.134892 | |
| " $\rho \cos \phi'$ | 9.98214 | 9.98214 | 9.982135 ¹³⁵ | 9.982135 | 9.982135 | |
| " $\cos \delta$ | 9.98097 | 9.98103 | 9.980972 | 9.981030 | 9.981030 | |
| Σ_3 | 9.25264 | 8.62862 | 9.222853 | 8.576893 | 8.578271 | |
| Σ_4 | 9.77174 | 9.14839 | 9.742017 | 9.096679 | 9.098057 | |
| λ_1 | - .26809 | - .26813 | - .268092 | - .268129 | - .268129 | |
| λ_3 | - .17891 | - .04252 | - .167053 | - .037748 | - .037868 | |
| λ_2 | + .08113 | + .08102 | + .081119 | + .081013 | + .081013 | |
| λ_4 | + .59121 | + .14073 | + .552099 | + .124933 | + .125831 | |
| ξ | + .67234 | + .22175 | + .633218 | + .205946 | + .206344 | |

Method of Am. Ephemer.

| | | | | | |
|--------------------------|----------------------|----------------------|---------------------------------------|-----------------------|-----------------------|
| x | +0.11045 | +1.14674 | + ²¹³⁸²⁵ 130905 | +1.179748 | +1.178930 |
| ξ | + .73452 | + .94840 | + .767005 | + .950784 | + .950728 |
| $x-\xi$ | - .62407 | + .19834 | - .553180 | + .228964 | + .228202 |
| y | -0.16044 | +0.26474 | - .118075 | +278294 | +277958 |
| η | - .08918 | - .22561 | - .101039 | - .230381 | - .230261 |
| $y-\eta$ | - .07126 | + .49035 | - .017036 | +508675 | +508219 |
| $\log \cos(\mu-\lambda)$ | 9.80863 | 9.18522 | 9.778910 | 9.133514 | 9.134892 |
| " $\rho \cos \phi'$ | 9.98214 | 9.98214 | 9.982135 | 9.982135 | 9.982135 |
| " C | 7.63992 | 7.63992 | 7.63992 | 7.63992 | 7.63992 |
| " $\sin d$ | 9.46187 _m | 9.46126 _m | 9.461808 _m | 9.461244 _m | 9.461244 _m |
| " $\sin(\mu-\lambda)$ | 9.88386 | 9.99485 | 9.902663 | 9.995947 | 9.995921 |
| Σ_1 | 7.43069 | 6.80728 | 7.400965 | 6.755569 | 6.756 ⁹ 47 |
| Σ_2 | 6.98565 _m | 7.09603 _m | 7.004391 _m | 7.097111 _m | 7.097085 _m |
| x' | 7.9187 | 7.9184 | + .008292 | + .008287 | + .008287 |
| ξ' | .008292 | .008287 | + .0025175 | + .00056960 | + .00057141 |
| | .0026958 | .0006416 | | | |
| $x'-\xi'$ | + .005596 | + .007645 | + .0057745 | + .0077174 | + .0077156 |
| y' | 7.5312 | 7.5321 | | + .003405 | + .003405 |
| | + .003398 | + .003405 | + .003399 | | |
| η' | - .0009675 | - .0012474 | - .0010102 | - .0012506 | - .0012505 |
| $y'-\eta'$ | + .004366 | + .004652 | + .0044092 | + .0046556 | + .0046555 |
| $\log \sin d$ | 9.79523 _m | 9.29741 | 9.742866 _m | 9.359768 | 9.358320 |
| | 9.99718 | 9.96709 | 9.999794 | 9.959938 | 9.960116 |
| " $\cos d$ | 8.85285 _m | 9.69050 | 8.231368 _m | 9.706440 | 9.706051 |
| " $\tan d$ | 0.94238 | 9.60691 | 1.511498 | 9.653328 | 9.652269 |
| " $\sin N$ | 7.74788 | 7.88338 | 7.761514 | 7.887471 | 7.887370 |
| | 9.89677 | 9.93159 | 9.900256 | 9.932605 | 9.932581 |
| " $\cos N$ | 7.64008 | 7.66764 | 7.644360 | 7.667976 | 7.667966 |
| " $\tan N$ | 0.10780 | 0.21574 | 0.117154 | 0.219495 | 0.219404 |
| N | 52 2.35 | 58 40.76 | 52 38.93 | 58 53 56.7 | 58 53 37.5 |
| M | 263 29.15 | 22 1.38 | 268 14 9.8 | 24 14 0.4 | 24 10 52.3 |
| $M-N$ | 211 26.80 | -36 39.38 | 215 36 0.5 | -34 39 56.3 | -34 42 45.2 |

| | | | | | |
|-------------------------|------------------------------------|--|-----------------------------------|-----------------------|-----------------------|
| $\log f$ | 7.67 ⁶¹⁹ 403 | 7.67 ⁶¹⁹ 402 | 7.67619 | 7.67619 | 7.67619 |
| " ζ | 9.82759 | 9.34586 | 9.80155 | 9.31376 | 9.31459 |
| " Σ | 7.50 ³⁷⁸ 162 | 7.01 ²²⁰⁵ 988 | 7.47774 | 6.98995 | 6.99078 |
| " δ_0 | .00319 | .00105 | .003004 | .000977 | .000979 |
| " l | + .55793 | + .55812 | + .557955 | + .558130 | + .558130 |
| " I_1 | + .5547 ⁴ 6 | + .55707 | + .554951 | + .557153 | + .557151 |
| " $M-N$ | 211 26.8 | -36 39.4 | 215 36 0.5 | -34 39 56.3 | -34 42 45.2 |
| " $\log \sin(n)$ | 9.71743 _n | 9.77599 _n | 9.765016 _n | 9.754949 _n | 9.755463 _n |
| " m | 9.79805 | 9.72 ³⁴¹ 3032 | 9.7430 ⁷ 82 | 9.746502 | 9.745935 |
| " $\frac{1}{I_1}$ | 0.255 ⁹¹ 89 | 0.25409 | 0.255745 | 0.254026 | 0.254027 |
| " $\sin \psi$ | 9.77139 _n | 9.75349 _n | 9.763833 _n | 9.755477 _n | 9.755425 _n |
| " ψ | -36 12 | -34 32 | | | |
| " N | 52 2 | 58 41 | | | |
| " $N-\psi+180$ | 268 14 | | | | |
| " $N+\psi$ | | 24 9 | | | |
| " m | 9.79805 | 9.72 ³⁴¹ 3032 | 9.743072 | 9.746502 | 9.745935 |
| " $\cos(M-N)$ | 9.93102 _n | 9.90430 | 9.910143 _n | 9.915128 | 9.914882 |
| " $\frac{1}{n}$ | 2.14889 | 2.04821 | 2.138742 | 2.045134 | 2.045211 |
| " Σ_1 | 1.87796 _n | 1.67 ⁵⁹² 283 | 1.791957 _n | 1.706764 | 1.706028 |
| " I_1 | 9.74409 | 9.74591 | 9.744255 | 9.745974 | 9.745973 |
| " $\cos \psi$ | 9.90680 | 9.91582 | 9.910748 | 9.914875 | 9.914900 |
| " $\frac{1}{n}$ | 2.14889 | 2.04821 | 2.138742 | 2.045134 | 2.045211 |
| " Σ_2 | 1.799 ⁷ 98 | 1.70994 | 1.793745 | 1.705983 | 1.706084 |
| " $-N_1$ | + 75.502 | - 47.416 ⁴ 179 | + 61.938 | - 50.905 | - 50.819 |
| " $+N_2$ | + 63.06 ⁴ 9 | + 51.279 | + 62.194 | + 50.814 | + 50.826 |
| " I | + 12.438 | + 3.863 ⁵ 32.100 | - 0.2 ⁵ 46 | - .091 | + .007 |
| " Corrid time | 8 32.4 | 10 28.9 ⁷ 57.7 | | | |
| " $\Delta \text{ long}$ | 4 46.3 | 4 46.3 | | | |
| | 3 46.1 | 6 10.8 ⁴ 5 | | | |

$\log \Delta \mu 1''$ 1.17609 Calc. of ϕ' & p Doolittle p. 130

" 2.467 0.39217 1.56826 37.00 ϕ -16 22 ²⁷₃₀

" 8.983 0.95342 2.12951 134.74 2ϕ -32 44 54

" 8.883 0.94856 2.12465 133.24 4ϕ -65 29 48

$\log \Delta \mu 1''$ 7.9186 \log 8.3108 .020455 $\log \sin 2\phi$ 9.733157 $\log \cos 2\phi$ 9.924824

" $\Delta \mu 1''$ 7.9184 \log 8.8718 .074438 2.839258 6.861594

" $\Delta \mu 1''$ 7.5313 \log 8.4670 .073620 Σ 2.572415 Σ_3 6.786418

" $\Delta \mu 1''$ 7.5321 \log 7.9235 .008385 " $\sin 4\phi$ 9.95901 $\cos 4\phi$ 9.61778

8.4855 .030584 0.0644 \log 4.25527 \log

8.4807 .030248 Σ_2 0.02347 Σ_4 3.87305 \log

N_1 -373.6 N_3 +.0006115

N_2 + 1.1 N_4 - 7

$\phi - \phi'$ -6 12.5 $\log p$ 9.9992747

$\phi' - 16$ 16 14 " p' 9.999886

$\log \sin \phi$ 9.447427

" $\cos \phi$ 9.982249

T_0 8 32 28.0 10 28 59.0 10 28 53.0

t 3 ^{46 6.9} ~~33 40.0~~ 5 42 39.0 5 42 33.0

Δ 4 46 21.9 20.0 20.0

τ -15.4 -5.5 +.4

ω 4 46 6.5 14.5 20.4

10.5

17.4

4 46 12.0 = Longitude by eclipse observations
assuming the correctness of American Ephemeris data.

Partial Eclipse of Sun

Feb. 1/97

First Contact.

8 inch finder of 13 inch equatorial, aperture
reduced to 3 inches. Mag. Power 80 W.H. ob.
chron 1131 3 33 41 est. 1st late.

Telescope of sextant, L.D. Bailey, obs., time
by pocket watch, reduced 4 minutes later to chron
3 34 6.

Last Contact.

Finder of equatorial & chron is above
Time 5 30 12 uncertain by about 2^s as
definition was poor

5 inch equatorial, aperture reduced to
2 inches. Mag. Power 40 DeL. Stewart obs.
with pocket watch

Time 5 42 45

5 45 45 = chron 5-33-6 hence time by
chron = 5 30 6

| | | |
|---------|----------|----------|
| 3 33 41 | 5 30 12 | 5 30 6 |
| 12 26.9 | 12 27.0 | 12 27.0 |
| 3 46 8 | 5 42 39 | 5 42 33 |
| 4 46 20 | 4 46 20 | 4 46 20 |
| 8 32 28 | 10 28 59 | 10 28 53 |

Mean Places Latitude Stars from Gould's Cen.
Cat. vol XIV (Argentine General Catalogue)

1875.0

| G. No. | Name | α | Pre. | Sec. Var. | δ | Pre. | Sec. Var. | |
|--------|---------------------------------|----------|-------|-----------|----------|--------|-----------|--|
| 5226 | ⁵³ ϵ Endomi | 4 32 | 27.40 | +2.751 | +0.04 | -14 32 | 59.2 | +7.476 - .376 Jahr |
| 5689 | ⁶⁴ S " | 4 54 | 7.31 | +2.783 | +0.04 | -12 43 | 23.7 | +5.686 - .392 Suff " |
| 6117 | λ Leporis | 5 13 | 49.05 | +2.762 | +0.03 | -13 18 | 25.5 | +4.014 - .395 |
| 6992 | η " | 5 50 | 42.79 | +2.734 | +0.02 | -14 11 | 31.2 | +0.812 - .399 " |
| 8395 | 11 Can. Maj. | 6 41 | 9.00 | +2.737 | +0.01 | -14 17 | 35.7 | -3.581 - .392 |
| 8614 | θ " " | 6 48 | 22.93 | +2.796 | .000 | -11 53 | 0.9 | ^{4.202} -4.202 - .396 " |
| 8174 | = γ 2757 | 6 33 | 34.04 | +2.742 | +0.01 | -14 2 | 7.0 | -2.927 - .394 |

| | Pre. 1886 | | 21 years | | 22 years | |
|------|-----------|--------|----------|--------|----------|--------|
| 5226 | +2.751 | +7.434 | 57.77 | +156.1 | 60.52 | +163.5 |
| 5689 | +2.783 | +5.642 | 58.44 | +118.5 | 61.23 | +124.1 |
| 6117 | +2.762 | +3.970 | 58.00 | +83.4 | 60.76 | +87.3 |
| 6992 | +2.734 | +0.768 | 57.41 | +16.1 | 60.15 | +16.9 |
| 8395 | +2.737 | -3.625 | 57.48 | -76.1 | 60.21 | -79.8 |
| 8614 | +2.796 | -4.246 | 58.72 | -89.2 | 61.51 | -93.4 |
| 8174 | +2.742 | -2.975 | 57.58 | -62.4 | 60.32 | -65.4 |

| | 1896.0 | | | | 1897.0 | | | | |
|------|----------|----------|--------|------|--|----------|--------|-------------------|--------------------------|
| | α | δ | | | α | δ | | | Berlin Jahr. |
| 5226 | 4 33 | 25.17 | -14 30 | 23.1 | 4 33 | 27.92 | -14 30 | 15.7 | ⁵ 27.70 20.52 |
| 5689 | 4 55 | 5.75 | -12 41 | 25.2 | 4 55 | 8.54 | -12 41 | 19.6 | 8.53 21.30 |
| 6117 | 5 14 | 47.05 | -13 17 | 2.1 | ^{74 47} ^{73 47} 5 13 | 49.81 | -13 16 | 58.2* | |
| 6992 | 5 51 | 40.20 | -14 11 | 15.1 | ^{78 42} 5 51 | 42.94 | -14 11 | 14.3 | 42.77 11.90 |
| 8395 | 6 42 | 6.48 | -14 18 | 51.8 | ^{87 56} 6 42 | 9.21 | -14 18 | 58.5 [†] | |
| 8614 | 6 49 | 21.65 | -11 54 | 30.1 | ^{100 32} 6 48 | 24.44 | -11 54 | 34.3 | 24.25 35.18 |
| 8174 | 6 34 | 31.62 | -14 3 | 9.4 | ^{102 42} 6 33 | 34.36 | -14 3 | 12.4 [‡] | |

* 59.9 Stone 1880

† 57.2 " "

54.9 Munich "

‡ 10.4 " "

Feb. 1/97

-91.2
 $+53.6$
 -37.6
 -9.4
 -1.86
 31.0 60.2
 41.7 11.9
 61.8 31.8
 61.5 31.3
 11.8 42.3
 $+93.2$
 -54.1
 $+39.1$
 $+9.8$
 $+1.90$
 $b = +.82$
 $14.045.3$
 61.3 29.6
 -59.3
 $+90.9$
 $+31.6$
 $+7.9$
 $+1.73$

W S. Messier 48

i Tauri - Aur. & Aur.

| | | | | | | | | | |
|---|----|------|----|----|-------|----|------|--------------|------|
| 7 | 20 | 36.5 | B, | 26 | 48 | Q, | 3.7 | 8 | 43.2 |
| | 21 | 39.5 | | 27 | 30 | 2 | 18.4 | 8.2 | 2 |
| | 22 | 41.5 | | 28 | 11 | 3 | 40.2 | 33.1 | 29.3 |
| | 23 | 44.5 | | 28 | 53.5 | 4 | 51.2 | 45.4 | 43 |
| | 24 | 46.5 | | 29 | 34.5 | ✓ | 2.3 | 57.8 | 56.8 |
| | | | | 28 | 11.40 | | 13.2 | 10.2 | 10.4 |
| | | | | 5 | 32.86 | | 24.0 | 22.5 | 24.5 |
| | | | | | | | 45.8 | 48.4 | 51.6 |

7440.2

5410

| | | | | | | | | | | |
|--------------|----|-------|----|-------|----|-------|----|-------|----|-------|
| 7 | 22 | 41.70 | 22 | 38.54 | 43 | 2.09 | 47 | 57.77 | 52 | 56.76 |
| Red. to 8.00 | | -6.13 | | -6.14 | | -2.79 | | -1.98 | | -1.16 |
| 7 | 22 | 35.57 | 22 | 32.40 | 42 | 59.30 | 47 | 55.79 | 52 | 55.60 |
| 4 | 24 | 59.40 | 24 | 59.40 | 45 | 22.78 | 50 | 19.24 | 55 | 18.96 |
| 2 | 57 | 36.17 | | 33.00 | | 36.52 | | 36.55 | | 36.64 |
| | | -2.27 | | +2.16 | | + .71 | | + .65 | | + .59 |
| | | 2.64 | | 2.64 | | .86 | | .78 | | .72 |

Δa Δc Σ ΔT

| | | | | | | | | |
|--------|-------|--------------|--------|--------|-------|-------|-------|--------|
| 0 = 57 | 33.90 | + ΔT | -5.43a | +6.03c | +1.95 | + .60 | +2.55 | 36.45] |
| | 35.16 | | -5.43 | -6.03 | +2.23 | - .60 | +1.63 | 36.79] |
| | 37.23 | | + .61 | -1.06 | - .25 | - .11 | - .36 | .87 |
| | 37.20 | | + .90 | -1.19 | - .37 | - .12 | - .49 | .71 |
| | 37.23 | | +1.11 | -1.32 | - .46 | - .13 | - .59 | .64 |
| | 37.23 | | + .54 | -1.04 | - .22 | - .10 | - .32 | .91 |
| | 36.45 | | + .14 | +1.01 | - .05 | + .10 | + .05 | .50 |
| | 36.46 | | + .16 | +1.01 | - .06 | + .10 | + .04 | .50 |
| | 36.60 | | + .80 | +1.14 | - .29 | + .11 | - .18 | .42 |

$\Delta = -2$ 57 36.62

Correction for first error $- .35 \times .81 = -.28$
 omitted in reduction $+ .35 \times .93 = +.33$
 $+ .02$
 36.64

+53.6
42.8 10.8 -96.2
32.0 64.2 -42.6
-10.6
-1.97

-96.9
32.2 64.7 +51.7
42.0 9.7 -45.2
-11.3
-1.04

85
6 = -1.00
8 21 38 = 5 22 35

cl.w

11 Orionis β Eridani β Orionis γ Orionis β Tauri

31.2 17.3 18.1 20.7
37.8 31.6 32.3 36.5
58.5 58.5 52.2 53.1 59.7
9.3 9.1 3 3.6 12
20.1 19.3 13.3 13.9 23.6
30.6 29.7 23.8 24.2 35.5
56 41.5 40.2 34.4 34.7 47.2

0.9 55.2 55.7 10.6
0 7.7 8 9.2 11 9.6 8 18 26.7

56 29.00 59 19.38 7 13.33 10 13.91 17 23.61
-0.60 -0.06 +1.19 +1.68 +2.86

56 19.40 59 19.27 7 14.52 10 15.59 17 26.47

58 42.89 2 48.96 9 37.07 12 38.14 19 49.06

36.51 wrong * 37.45 37.45 37.41

+ .72 -1.00 -.99 -.81

.88 1.00 .99 .81

$$0 = 1.26 - 12.06c$$

$$8 \ 0 \ 0$$

$$8 \ 21 \ 38$$

$$c = +.10$$

$$-2 \ 57 \ 36.62$$

$$12 \ 27.18$$

$$0 = 37.22 + \Delta T + .89a - 1.15c$$

$$5 \ 2 \ 23.38$$

$$8 \ 34 \ 5.18$$

$$35.16 + \Delta T - 5.43a - 6.03$$

$$20 \ 48 \ 35.31$$

$$1 \ 24.45$$

$$0 = 2.06 + 6.22a + 4.88c$$

$$8 \ 13 \ 48.08$$

$$20 \ 48 \ 35.31$$

$$6.22a = -2.55$$

$$1 \ 20.90$$

$$5 \ 24 \ 4.93$$

$$a = -.41$$

$$12 \ 27.18$$

$$22 \ 35$$

$$0 = 36.50 + \Delta T + .37a + 1.05c$$

$$1 \ 29.93$$

$$= 33.90 - 5.43a + 6.03c$$

$$= 2.60 + 5.80a - 4.98c$$

$$5.80a = -2.10$$

$$a = -.36$$

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$$b = \frac{-0.82}{+0.35} = -0.47$$

cl.w

45.3 13.4 +58.7 57.6 -33.8
 44.6 11.8 +56.4 -8.4
 29.1 62.3 -91.4 -7.7

29.8 63.4 -93.2 -38.3
 44.2 10.7 +54.9 -9.6
 -88

| | | | | | |
|-----------|-----------|-----------|------------|-----------|-----------|
| i Tauri | i Aurigae | 4 Aurigae | 11 Orionis | β Eridani | 7 56 35 = |
| 13.5 | 1.3 | 2.5 | 32.4 | 39.5 | 5 9 15 |
| 28.2 | 18.3 | 11.7 | 47 | 53.6 | |
| 50 | 42.7 | 39 | 8.3 | 14.2 | |
| 0.7 | 55.2 | 52.8 | 19.1 | 24.6 | |
| 11.8 | 7.5 | 6.4 | 29.8 | 35 | |
| 22.7 | 19.8 | 20.2 | 40.5 | 45.5 | |
| 33.6 | 32.3 | 33.9 | 57.1 | 55.7 | |
| 55.6 | 57 | 1.3 | 12.5 | 16.7 | |
| 7 32 10.1 | 13.4 | 42 10.5 | 45 27.1 | 30.7 | |

7 31 11.80 36 7.50 41 6.48 44 29.76 48 35.06

Red. to 00 4.73 -3.92 -3.10 -2.55 -1.88

7 31 7.07 36 3.58 41 3.38 44 27.21 48 33.18

4 45 22.74 50 19.20 55 18.92 58 42.85 2 48.92

2 45 44.33 44.38 44.46 44.36 44.26

-.40 -.37 -.34 -.41 -.47

.86 .78 .72 .88 .99

Δa Δc Σ ΔT

0 = 45 43.93 + ΔT + .61a + 1.06c - .22 - .10 - .32 45 43.61

44.01 + .90 + 1.19 - .32 - .11 - .43 .58

44.12 + 1.11 + 1.32 - .40 - .12 - .52 .60

43.95 + .54 + 1.04 - .19 - .09 - .28 .67 43.62

43.79 + .19 + 1.00 - .07 - .09 - .16 .63

43.90 + .80 - 1.14 - .29 + .10 - .19 .71

43.74 + .88 - 1.18 - .32 + .11 - .21 .53

43.65 + .26 - 1.00 - .09 + .09 .00 .65 43.60

43.27 - .37 - 1.21 + .13 + .11 + .24 .51

42.73 - 1.85 - 2.44 + .67 + .22 + .89 .62

$\Delta T = -2$ 45 43.61

[illegible]

$$\begin{array}{rcl}
 0 = 44.00 + \Delta T + .79a + 1.15c & 8 & 0 & 0 & 7 & 56 & 35 \\
 43.82 + \Delta T + .84a - 1.16c & -2 & 45 & 43.61 & & 12 & 30.50 \\
 42.73 + \Delta T - 1.85a - 2.44c & 5 & 14 & 16.39 & 8 & 9 & 5.50 \\
 0 = 0.18 - .05a + 2.31c & 21 & 0 & 24.98 & & 1 & 20.35 \\
 c = -.08 / \underline{-.09} & 8 & 13 & 51.41 & 21 & 0 & 24.98 \\
 = 1.09 + 2.69a + 1.28c & & 1 & 20.91 & 5 & 10 & 50.83 \\
 2.69a = -.99 / \underline{-.97} & & 12 & 30.50 & & 9 & 15 \\
 a = -.37 / \underline{-.36} & & & & & 1 & 35.83
 \end{array}$$

Reduction for Latitude Obs. Jan. 21, 22, 26/97

Reduction to App. Place. Jan. 21/97

l
53 Eridani γ Leporis 2 Can. Maj. γ 2757 11 Can. Maj. γ Can. Maj.

| | | | | | | |
|------------------|----------|----------|----------|---------|----------|----------|
| l | 314 39 | 314 39 | 314 39 | 314 39 | 314 39 | 314 39 |
| d ₀ | 68 22 | 87 56 | 102 21 | 78 39 | 100 32 | 104 46 |
| H | 329 50 | 329 47 | 329 45 | 329 46 | 329 45 | 329 45 |
| l+d ₀ | 23 1 | 42 35 | 57 0 | 53 18 | 55 11 | 59 25 |
| H+d ₀ | 38 12 | 57 43 | 72 6 | 68 25 | 70 17 | 74 31 |
| δ | -14 30.3 | -14 11.2 | -11 54.6 | -14 3.2 | -14 18.9 | -15 28.9 |

| | | | | | | |
|--------------------|----------|----------|----------|----------|----------|----------|
| log tan δ_0 | 9.41282n | 9.40277n | 9.32411n | 9.39849n | 9.40684n | 9.44245n |
| " $\cos(H+d_0)$ | 9.59218 | 9.83037 | 9.92359 | 9.90405 | 9.91433 | 9.93495 |
| " $\frac{1}{H}$ | 8.82391 | 8.82391 | 8.82391 | 8.82391 | 8.82391 | 8.82391 |
| " $\frac{1}{H}$ | 0.9588 | 0.9590 | 0.9591 | 0.9590 | 0.9591 | 0.9591 |
| " $\cos(H+d_0)$ | 9.96397 | 9.86705 | 9.73611 | 9.77643 | 9.75660 | 9.70654 |
| Σ_1 | 8.7877n | 9.0161n | 9.0307n | 9.0855n | 9.1042n | 9.1604n |
| Σ_2 | 8.9228 | 8.8260 | 8.6952 | 8.7354 | 8.7157 | 8.6656 |

| | | | | | | |
|-------------------|----------|----------|----------|----------|----------|----------|
| " $\sec \delta_0$ | 0.01407 | 0.01345 | 0.00945 | 0.01320 | 0.01370 | 0.01605 |
| " $\cos(H+d_0)$ | 9.79128 | 9.92707 | 9.97845 | 9.96843 | 9.97376 | 9.98395 |
| " $\frac{1}{H}$ | 8.82391 | 8.82391 | 8.82391 | 8.82391 | 8.82391 | 8.82391 |
| " $\frac{1}{H}$ | 1.3005 | 1.3006 | 1.3004 | 1.3004 | 1.3004 | 1.3004 |
| " $\cos(H+d_0)$ | 9.89534 | 9.72763 | 9.48764 | 9.56568 | 9.52811 | 9.42644 |
| " $\cos \delta_0$ | 9.39875n | 9.38931n | 9.31466n | 9.38529n | 9.39314n | 9.42640n |
| Σ_3 | 9.9298 | 0.0649 | 0.1122 | 0.1059 | 0.1118 | 0.1243 |
| Σ_4 | 9.29409n | 9.11694n | 8.80220n | 8.95097n | 8.92125n | 8.85204n |
| " $\cos \delta_0$ | 0.59446 | 9.1818 | 8.9145 | 9.0869 | 9.0380 | 8.9771 |
| " $\cos \delta_0$ | 9.98593 | 9.98655 | 9.99055 | 9.98680 | 9.98630 | 9.98395 |
| " i | 0.6391n | 0.6398n | 0.6403n | 0.6401n | 0.6402n | 0.6403n |
| Σ_5 | 0.6250n | 0.6264n | 0.6308n | 0.6269n | 0.6265n | 0.6242n |
| Σ_6 | 0.5946n | 0.4174n | 0.1027n | 0.2514n | 0.2216n | 0.1532n |

f +.981 +.981 +.982 +.982 +.982 +.982

N_1 -.061 -.104 -.107 -.122 -.127 -.145

N_2 +.851 + 1.161 + 1.295 + 1.276 + 1.294 + 1.331

$\Delta \alpha$ +1.77 +2.04 +2.17 +2.14 +2.15 +2.168

α_0 27.92 42.94 24.44 34.36 9.21 5.904

α 25.17 40.20 21.65 31.62 6.48 5.904

α 29.69 44.98 26.61 36.50 11.36 8.07

α 26.94 42.24 23.82 32.76 8.63 8.07

N_3 +8.37 +6.70 +4.96 +5.44 +5.20 +4.63

N_4 -3.93 -2.61 -1.27 -1.78 -1.67 -1.42

N_5 -4.22 -4.23 -4.27 -4.23 -4.23 -4.21

$\Delta \delta$ +0.2 -0.1 -0.6 -0.6 -0.7 -1.00

δ_0 15.7 14.3 14.3 12.4 11.8 52.89

δ 22.9 15.2 30.7 10.8 12.4 52.5 56.3 53.9

δ 15.5 14.6 14.4 13.0 12.4 56.2 57.9 55.6

+10.4 11.1 11.0 11.0 11.0 11.0 11.0

90
89

| | | | | Resulting Latitude | | | |
|-------|-------|------|------|--------------------|-----|------|------|
| cl. N | -1.06 | -.58 | -.84 | -.44 | -89 | -.49 | -.84 |
| cl. S | -.10 | | -.05 | | -09 | | -.16 |

| β Orionis | | γ Eridani | | 53 Eridani | | γ Leporis | |
|---------------------|---|---|--|---|------|------------------|--|
| T' | 12 50 36.15 | 9 47 12.94 | 10 7 27.79 | 11 34 52.51 | | | |
| $\Delta T'$ | -3 40 23.49 | -3 40 53.92 | -3 40 50.56 | -3 40 36.05 | | | |
| T | 4 50 ⁴ 56.57 | 5 21 49.29 | 6 21 49.70 | 7 30 29.34 | | | |
| ΔT | -3 41 43.11 | -3 41 37.96 | -3 41 28.00 | -3 41 16.61 | | | |
| $T' + \Delta T'$ | 9 10 12.66 | 6 6 19.02 | 6 26 37.23 | 7 54 16.46 | | | |
| $T + \Delta T$ | 1 9 3.46 | 1 40 11.33 | 2 40 21.70 | 3 49 12.73 | | | |
| $\Delta = 29$ | 8 1 9.20 4 35 6.33 | 4 26 7.69 3 3 9.51 | 3 46 14.53 3 13 18.62 | 4 5 3.73 3 57 8.23 | | | |
| θ | 4 0 34.60 | 2 13 3.84 | 1 53 7.76 | 2 2 34.86 | | | |
| | 60 8 39.0 | 33 15 57.6 | 28 16 56.4 | 30 37 57.90 | | | |
| Σ | 10 19 16.12 | 7 46 30.35 | 9 6 58.93 | 11 43 29.19 | | | |
| $\frac{1}{2}\Sigma$ | 5 9 38.06 | 3 53 15.18 | 4 33 29.46 | 5 51 44.60 | | | |
| ω | 5 9 37.17 | 3 53 15.06 | 4 33 29.69 | 5 51 44.98 | | | |
| λ | | | | | | | |
| δ | -8 19 13.5 | -13 48 5.6 | -14 30 15.5 | -14 11 14.4 | 18.3 | | |

Yarnell
6
14.8

| | | | | | |
|--------------------|---|-----------|-----------|-----------|-------------|
| $\log \tan \delta$ | 9.1650904 | 9.3903209 | 9.4127926 | 9.4027834 | 8179 |
| " $\sec \delta$ | 0.3029282 | 0.0777246 | 0.0552097 | 0.0652739 | |
| " $\cos \delta$ | 0 | 0 | 0 | 0 | |
| " $\tan \phi'$ | 9.4680186 | 9.4680455 | 9.4680023 | 9.4680573 | 0918 |
| ϕ' | -16 22 17.2 | 21.2 | 15.7 | 14.7 | 22.7 27.2 |
| b | -8.7 | -6.6 | -7.3 | -7.5 | |
| ϕ | -16 22 ^{26.5} 25.9 | 27.8 | 23.0 | (22.0) | 30.2 (34.7) |

Berlin Jahrbuch

| | | | | | |
|--------------------|-----------|-----------|-----------|-----------|--|
| δ | 13.6 | 5.8 | 20.3 | 12.0 | |
| $\log \tan \delta$ | 9.1650919 | 9.3903227 | 9.4128343 | 9.4027621 | |
| " $\tan \phi'$ | 9.4680201 | 9.4680473 | 9.4680440 | 9.4680360 | |
| ϕ' | 18.0 | 21.5 | 21.0 | 20.0 | |
| ϕ | 26.7 | 28.1 | 28.3 | 27.5 | |

28.7

Jan. 21/97

| | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| -1.01 | -1.58 | -1.98 | -1.52 | -1.98 | -1.52 | -1.92 | -1.48 |
| -1.14 | | -1.05 | | -1.06 | | -1.04 | |

0 Can. Maj. 9/2757 11 Can. Maj. y Can. Maj.

| | | | |
|--------------------------|----------------------------|-----------------------------|-----------------------------|
| 12 26 12.08 | 12 21 18.48 | 12 21 26.16 | 11 57 31.20 |
| 13 26 26.16 | | | |
| 17.58 | | | |
| -3 40 28.32 | -3 40 28.34 | -3 40 28.32 | -3 40 32.29 |
| 7 34 14.82 | 8 9 31.11 | 8 24 30.58 | 9 22 9.15 |
| -3 41 15.98 | -3 41 10.13 | -3 41 7.64 | -3 40 58.07 |
| 9 45 54.50 | 8 40 50.14 | 8 40 57.84 | 8 16 58.91 |
| 3 52 58.84 | 4 28 20.98 | 4 43 22.94 | 5 41 11.08 |
| 5 52 55.66 | 4 12 29.16 | 3 57 34.90 | 2 35 47.83 |
| 4 52 57.25 | 4 20 25.07 | 4 20 28.92 | 4 8 29.46 |
| 2 56 27.83 | 2 6 14.58 | 1 58 47.45 | 1 17 53.92 |
| 44 6 57.45 | 31 83 38.7 | 29 41 51.75 | 19 28 28.8 |
| 13 38 53.34 | 13 9 11.12 | 13 24 20.78 | 13 58 9.99 |
| 6 49 26.67 | 6 34 35.56 | 6 42 10.39 | 6 59 5.00 |
| 6 49 26.61 | 6 34 36.50 | 6 42 11.36 | 6 59 8.07 |
| | | | 3.07 |
| -11 54 34.9 | ^{36.2} -14 3 13.0 | ^{12.4} -14 18 56.2 | ^{56.3} -15 28 53.9 |
| 9.324 0967 | ¹¹⁰³ 9.3984992 | ⁹³⁸ 9.4068585 | ⁵⁹⁴ 9.4424476 |
| 0.1439164 | 0.0695167 | 0.0611545 | 0.0255855 |
| 0 | 0 | 0 | 0 |
| ²⁶⁷ 9.4680131 | ¹⁰⁵ 9.4680159 | ¹³⁹ 9.4680130 | 9.4680331 |
| ^{17.1} 16.9 | 18.8 | 17.4 16.7 | 17.0 17.2 19.6 |
| -8.7 | -7.8 | -7.8 | -7.2 |
| ⁸ 25.8 | (27.5) | 25.2 (24.5) | 24.8 (25.0) 26.8 |
| 85.8 | | | 53.7 |
| 9.3241061m | | | 9.4424460m |
| 9.4680225- | | | 9.4680375 |
| 18.3 | | | 19.4 |
| 27.0 | | | 26.6 |

See p. 99

| | | Resulting Latitude | | | |
|--|-------------|--------------------|-------------|-------------|-------|
| cl. N } - .98 - .56 - .99 - .58 - .44 - .57 - 1.07 - .62 | | | | | |
| cl. S } - .13 - .56 - .16 - .58 - .13 - .57 - .18 - .62 | | | | | |
| β Orionis | | γ Eridani | | 53 Eridani | |
| γ Leporis | | | | | |
| T' | 12 46 40.71 | 9 43 18.49 | 10 3 34.30 | 11 30 59.05 | |
| $\Delta T'$ | -3 36 26.09 | -3 36 56.52 | -3 36 53.15 | -3 36 38.65 | |
| T | 4 46 50.28 | 5 17 55.15 | 6 17 55.60 | 7 26 35.68 | |
| ΔT | -3 37 45.71 | -3 37 40.56 | -3 37 30.60 | -3 37 19.21 | |
| $T' + \Delta T'$ | 9 10 14.62 | 6 6 21.97 | 6 26 41.15 | 7 54 20.40 | |
| $T + \Delta T$ | 1 9 4.57 | 1 40 14.59 | 2 40 25.00 | 3 49 16.47 | |
| $\Delta = 29$ | 8 1 10.05 | 4 26 7.38 | 3 46 16.15 | 4 5 3.93 | |
| θ | 4 0 35.02 | 2 13 3.69 | 1 53 8.08 | 2 2 31.96 | |
| | 60 8 45.3 | 33 15 55.35 | 28 17 1.2 | 30 37 59.4 | |
| Σ | 10 19 19.19 | 7 46 36.56 | 9 2 6.15 | 11 43 36.87 | |
| $\frac{1}{2} \Sigma$ | 5 9 39.60 | 3 53 18.28 | 4 33 33.08 | 5 51 48.44 | |
| α | 5 9 37.16 | 3 53 15.05 | 4 33 29.68 | 5 51 44.97 | |
| λ | | | | | |
| δ | -8 19 13.6 | -13 48 5.7 | -14 30 15.6 | -14 11 14.6 | 18.5 |
| | | | 23.0 | 14.7 | 15.4 |
| $\log \tan \delta$ | 9.1650919 | 9.3903218 | 9.4127935 | 9.4027852 | 8.197 |
| " $\sec \delta$ | 0.3029514 | 0.0777215 | 0.0552152 | 0.0652758 | |
| " $\cos \lambda$ | 0 | 0 | 0 | 0 | |
| " $\tan \phi'$ | 9.4680433 | 9.4680433 | 9.4680087 | 9.4680610 | 0.955 |
| ϕ' | -16 22 20.9 | 20.9 | 16.5 15.5 | 23.2 27.6 | |
| b | -8.4 | -8.7 | -8.5 | -9.3 | |
| ϕ | -16 22 29.3 | 29.6 | 25.0 (24.0) | 32.5 (36.9) | |
| Berlin Jahrbuch | | | | | |
| δ | 13.8 | 5.9 | 20.5 | 12.2 | |
| $\log \tan \delta$ | 9.1650949 | 9.3903236 | 9.4128360 | 9.4027639 | |
| " $\tan \phi'$ | 9.4680463 | 9.4680451 | 9.4680512 | 9.4680397 | |
| ϕ' | 21.3 | 21.2 | 22.0 | 20.5 | |
| ϕ | 29.7 | 29.9 | 29.0 | 29.8 | |
| | | | 30.5 | | |

| | | | | | | | |
|-------------|-----------|-------------|-------------|-------------|-----------|-----------|-------|
| Jan. 22/97 | | | | | | | |
| -1.07 | -1.60 | -1.08 | -1.64 | -1.12 | -1.66 | -1.14 | -1.66 |
| -1.13 | | -1.20 | | -1.19 | | -1.18 | |
| Cam May: | | 92757 | 11 Cam May: | y Cam May: | | | |
| 13 22 | 17.59 | 12 17 | 26.71 | 12 17 | 33.55 | 11 53 | 42.28 |
| -3 36 | 20.17 | -3 36 | 30.94 | -3 36 | 30.92 | -3 36 | 34.88 |
| 7 30 | 20.01 | 8 5 | 37.31 | 8 20 | 37.12 | 9 18 | 20.94 |
| -3 37 | 18.58 | -3 37 | 12.73 | -3 37 | 10.24 | -3 37 | 0.66 |
| 9 45 | 57.42 | 8 40 | 55.77 | 8 41 | 2.63 | 8 17 | 7.40 |
| 3 53 | 14.3 | 4 28 | 24.58 | 4 43 | 26.88 | 5 41 | 20.28 |
| 5 52 | 55.99 | 4 12 | 31.19 | 3 57 | 35.75 | 2 35 | 47.12 |
| 2 56 | 28.00 | 2 6 | 15.60 | 1 58 | 47.88 | 1 17 | 53.56 |
| 44 7 | 0.0 | 31 33 | 54.0 | 29 41 | 58.2 | 19 28 | 23.4 |
| 13 38 | 58.85 | 13 9 | 20.35 | 13 24 | 29.51 | 13 58 | 27.68 |
| 6 49 | 29.42 | 6 34 | 40.18 | 6 42 | 14.76 | 6 59 | 13.84 |
| | 26.60 | | 36.49 | | 11.35 | | |
| 6 49 | 23.81 | 6 34 | 33.75 | 6 42 | 8.62 | 6 59 | 8.07 |
| | | | | | | | |
| | | | | | | | 5.77 |
| -11 54 | 35.1 36.4 | -14 3 | 12.6 13.2 | -14 18 | 56.4 56.5 | -15 28 | 54.1 |
| | | | | | | | |
| 9.3240988 | 1124 | 9.3985010 | 4956 | 9.4068603 | 611 | 9.4424492 | |
| 0.1439216 | | 0.0695365 | | 0.0611622 | | 0.0255814 | |
| | 0 | | 0 | | 0 | | 0 |
| 9.4680204 | 0340 | 9.4680375 | 321 | 9.4680225 | 33 | 9.4680306 | |
| 18.0 | 19.8 | 20.2 | 19.5 | 18.2 | 18.4 | 19.7 | |
| -9.0 | | -9.6 | | -9.9 | | -9.9 | |
| 27.0 (28.8) | | 29.8 (29.1) | | 28.1 (28.3) | | 29.2 | |
| | | | | | | | |
| 36.0 | | | | | | 54.0 | |
| 9.3241082 | n | | | 9.4424484 | n | | |
| 9.4680298 | n | | | 9.4680298 | n | | |
| 19.1 | | | | 19.1 | | | |
| 28.1 | | | | 29.0 | | | |

See p. 99

1897phae.c

| | Resulting | Latitude | Jan. 26/97 |
|------------------|-------------------------------------|------------------|--------------------|
| Cl. N} | -87 | -80 | -84 |
| Cl. S} | -53 | -48 | -52 |
| | -19 | -16 | -19 |
| | β Orionis | γ Eridani | γ Com. Maj. |
| T' | 12 30 51.75 | 9 27 28.62 | 11 37 52.19 |
| $\Delta T'$ | -3 20 36.95 | -3 21 7.28 | -3 20 45.72 |
| T | 4 31 1.55 | 5 2 6.65 | 9 2 30.82 |
| ΔT | -3 21 56.32 | -3 21 51.18 | -3 21 11.41 |
| $T' + \Delta T'$ | 9 10 14.80 | 6 6 21.34 | 8 17 6.47 |
| $T + \Delta T$ | 1 9 5.23 | 1 40 15.47 | 5 41 19.41 |
| $\Delta = 29$ | 8 1 9.57 | 4 26 5.87 | 2 35 47.06 |
| ϑ | 4 0 34.78 | 2 13 2.94 | 1 17 53.53 |
| | 60 8 41.7 | 33 15 44.1 | 19 28 23.95 |
| Σ | 10 19 20.03 | 7 46 36.81 | 13 58 25.88 |
| $\% \Sigma$ | 5 9 40.02 | 3 53 18.40 | 6 59 12.94 |
| λ | 5 9 37.13 | 3 53 14.99 | 6 59 8.06 |
| λ | | | |
| δ | ¹⁹ -8 14.1 | -13 48 6.1 | -15 28 55.0 |

| | | | | | |
|--------------------|-----------|------------------|--------------|--------------|--|
| | | 50 993 | | | |
| $\log \tan \delta$ | 9.16 | 42161 | 9.3903254 | 9.4424566 | |
| " $\sec \delta$ | 0.3029381 | | 0.0777060 | 0.0255811 | |
| " $\cos \lambda$ | 0 | | 0 | 0 | |
| " $\tan \varphi'$ | 9.4680374 | | 9.4680314 | 9.4680377 | |
| φ' | -16 22 | 20.2 21.9 | 19.4 14.2 | 20.2 22.3 | |
| h | | -7.9 | -7.2 | -7.8 | |
| φ | -16 22 | 28.1 29.8 | 26.6 26.4 | 28.0 30.1 | |

Mean Places 1897.0 from Fitch's Yarnall

| | γ No. | α 1860 | Pre. 1878 | δ 1860 | Pre. 1878 |
|---------------|--------------|---------------|-------------|---------------|-----------|
| 9 Can May | 2857 | 6 47 41.12 | -11 51 59.6 | -4.215 | |
| γ 2757 | 2757 | 6 32 52.84 | -14 1 23.0 | -2.940 | |
| 11 Can May | 2807 | 6 40 27.96 | -14 16 42.6 | -3.594 | |

 $\Delta \delta$ 37 years δ 1897.0

| | | |
|---------------|--------|-------------|
| 9 Can May | -156.0 | -11 54 35.6 |
| γ 2757 | -108.8 | -14 3 11.8 |
| 11 Can May | -133.0 | -14 18 55.6 |

Berlin Jahrbuch

| | | | |
|----------------|-------------------------|------------------------|------------------------|
| δ | 19 14.3 | 48 6.3 | 28 54.8 |
| Right δ | 9.16541022 ^m | 9.3903273 ^m | 9.4424550 ^m |
| "true ϕ' | 9.4680403 ^m | 9.4680333 ^m | 9.4680361 ^m |
| ϕ' | 20.6 | 19.7 | 20.0 |
| h | 7.9 | 7.2 | 7.8 |
| ϕ | 28.5 | 26.9 | 27.8 |

Latitude - Summary of Results

 $\phi = -16^{\circ} 21' - "$ $\frac{1}{2}$ wt.

Dec 28/96

No threads

Jan. 8/97

| | | | | | | |
|------------|------------|------|--------|----|------|-----------|
| 2 Leporis | Yamell | 27.4 | } 27.3 | 28 | | |
| " | Could | 27.3 | | | | |
| 7 | Yamell | 33.7 | } 30.8 | 24 | 33.7 | } 30.8 26 |
| " | Could | 29.3 | | | 29.3 | |
| " | Jahrbuch | 26.5 | | | 26.6 | |
| 4 2757 | Yamell | 24.6 | } 25.1 | 26 | | |
| " | Could | 25.4 | | | | |
| 1 Can Maj. | Engl. Alm. | 26.7 | | 28 | 26.9 | 28 |
| | Jahrbuch | 26.5 | | | 26.8 | |
| 3 Orionis | Am. Ephem. | | | | 31.3 | } 28 26 |
| | Jahrbuch | | | | 31.5 | |
| 1 Eridani | Am. Ephem. | | | | 29.1 | 25 |
| | Jahrbuch | | | | 29.4 | |
| 64 " | Yamell | 28.5 | | | 28.5 | } 26.4 28 |
| " | Could | | | | 26.9 | |
| " | Jahrbuch | | | | 29.1 | |
| 53 " | Yamell | | | | 23.7 | } 24.5 28 |
| " | Could | | | | 24.9 | |
| " | Jahrbuch | | | | 30.4 | |
| 0 Can Maj. | Yamell | | | | | |
| " | Could | | | | | |
| " | Jahrbuch | | | | | |
| 11 " | Yamell | | | | | |
| " | Could | | | | | |

Arranged by Stars

| | Wtd Mean. | No nights | Mean Weighted by no. of obs. | |
|------------|-----------|-----------|------------------------------|--|
| 2 Leporis | 27.3 | 1 | | |
| | 31.8 | | | |
| 7 " | 30.8 | 4 | | |
| | 26.9 | | | |
| 4 2757 | 28.8 | 3 | | |
| 1 Can Maj. | 27.6 | 5 | | |
| 3 Orionis | 28.7 | 4 | | |
| 1 Eridani | 28.2 | 6 | | |
| 64 " | 26.4 | 1 | | |
| 53 " | 24.0 | 3 | | |
| 0 Can Maj. | 26.9 | 2 | | |
| 11 " " | 26.0 | 2 | | |

28.1

27.8⁵

Mean, Alm. double weight

- 16 22 27.9

Unweighted Mean 27.4

Jan. 21/97

Jan. 22/97

Jan. 26/97 Mr. 30/96 Dec. 2/96

Threads 20-30 10-20

Wts 2 1

34.7 }
30.2 } 31.7 25
27.5 }

24.5 }
25.2 } 25.0 15

26.8 24
26.6

25.9 30
26.7

27.8 17
28.1

36.9 }
32.5 } 34.0 20
29.8 }

29.1 }
29.8 } 29.6 22

29.6 27
29.0

29.3 29
29.7

29.6 30
29.9

28.0 24
27.8

28.1 30
28.5

26.6 28 27.8 29 28.0 29
26.9 28.1 28.3

22.0 }
23.0 } 22.7 28
28.3 }

27.5 }
25.6 } 26.2 23
27.0 }

25.0 }
24.8 } 24.9 20

24.0 }
25.0 } 24.7 23
30.5 }

28.8 }
27.0 } 27.6 22
28.1 }

28.3 }
28.1 } 28.2 12

No threads

No 5 lot

30 55 10

29 54 10

28 53 10

27 52 9

26 51 9

25 50 9

24 49 9

23 48 9

22 47 9

20 45 8

17 41 7

15 39 7

12 35 6

Results - Almanac Stars.

$$\phi = -16^{\circ} 22' -''$$

| | Berl. J. | | Berl. Engl. | | Berl. Am. |
|------------------|----------|--------------------|-------------|-----------------|-----------|
| γ Leporis | 26.5 | γ Can. Maj. | 26.5 26.7 | β Orionis | 31.5 31.5 |
| | 26.6 | | 26.8 26.9 | | 26.7 25.9 |
| | 27.5 | | 26.6 26.8 | | 29.7 29.3 |
| | 29.8 | | 29.0 29.6 | | 28.5 28.1 |
| | | | 27.8 28.0 | | |
| Mean | 27.6 | | 27.3 27.6 | | 29.1 28.7 |

| γ Erid. | Berl. Am. | 64 Erid. | Berl. | 53 Erid. | Berl. | θ Can. Maj. | Berl. |
|----------------|-----------|----------|-------|----------|-------|--------------------|-------|
| 29.4 | 29.1 | | 29.1 | | 30.4 | | 27.0 |
| 28.1 | 27.8 | | | | 28.3 | | 28.1 |
| 29.9 | 29.6 | | | | 30.5 | | |
| 26.9 | 26.6 | | | | | | |
| 28.1 | 27.8 | | | | | | |
| 28.3 | 28.0 | | | | | | |
| Mean | 28.4 28.2 | | 29.1 | | 29.7 | | 27.6 |

| | | No. det. | Weights | No. det. | Weights |
|--------------------|------|----------|---------|----------|---------|
| γ Leporis | 27.6 | 4 | 17 | 7 | 42 |
| γ Can. Maj. | 27.4 | 5 | 28 | 14 | 56 |
| β Orionis | 28.9 | 4 | 6 | 2 | 38 |
| γ Eridani | 28.3 | 6 | 15 | 9 | 117 |
| 64 " | 29.1 | 1 | 12 | 1 | 21 |
| 53 " | 29.7 | 3 | 19 | 6 | 162 |
| θ Can. Maj. | 27.6 | 2 | 10 | 2 | 12 |

unweighted mean 28."4

$$\frac{28."2}{\text{wtd by No. only}}$$

Weighted mean 28."1

$$\phi = -16^{\circ} 22' 28."1$$

Mr. - Almanac Stars

8 18970 λ Leporis

11 Jan. May.

Y 2757

-13 16 58.3 Yarnall p.25
 pm 59.4
 58.2 Gould p.83
 pm 58.9
 59.9 Stone

14 18 58.6 Yarnall p.95 -14 3 11.8 Yarnall p.95
 58.5 Gould p.83 12.4 Gould p.83
 57.2 Stone 10.4 Munich

54.9 Munich

Adopt 59.4

5.8

11.5

Hyd. Dec. 28 -13 16 55.9

-14 3 7.0

Jan 21

-14 18 56.5

12.1

22

56.7

12.3

| | | | | | | |
|------------------|-------------|-----------|-------|-----------|-------|------|
| log tan δ | 9.3730259 | 9.4068523 | 8.541 | 9.3984455 | 4912 | 4929 |
| | p.26 | p.91 | p.93 | p.26 | p.91 | p.93 |
| " tan ϕ' | 9.4680266 | 9.4680668 | 0.163 | 9.4679931 | 80079 | 0294 |
| ϕ' | -16 22 18.8 | 17.4 | 18.6 | 14.5 | 16.4 | 19.2 |
| | -10.0 | -7.8 | -9.9 | -9.9 | -7.8 | -7.6 |
| ϕ | 28.8 | 24.1 | 27.4 | 24.4 | 24.2 | 28.8 |
| | | 25.2 | 28.5 | | | |

λ Leporis

11 Jan May.

Y 2757

28.8

24.1 25.2

24.4

27.4 28.5

24.2

25.8

28.8

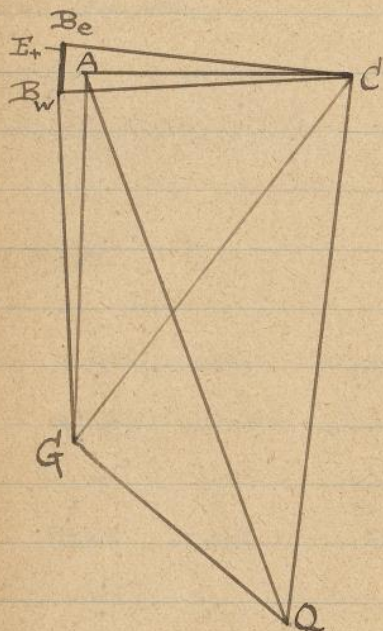
28.8

26.8

25.8

Survey - to determine difference of altitude between Observatory and R.R. station and also difference of latitude and longitude between Observatory and various points in vicinity.

Triangulation to determine length of line A Q.



A. Observatory - balcony of residence, SW corner, nail driven

Q. Quintana residence, floor of south piazza, nail driven in stone. 9th stone from East edge, $7\frac{3}{4}$ " from S edge. 12ft 8in. from East edge of floor, measuring in line to station A.

C. Roof of Carmen Alto church.

Nail driven in cement near central line of top of arch running N & S, and 3ft $4\frac{7}{8}$ in. from N. edge.

G. Temporary stake placed in ground SE of residence known as "Gobernador's" residence

B_w. West end of base line in Observatory grounds, + in brass plate sunk in ground N of pillar.

B_c. Temporary stake 2 ft. $9\frac{1}{16}$ in. east of + in brass plate, the eastern end of old base line.

Triangle $B_e B_w C$ Angle $\angle B_w$

$$265 \quad 51 \quad \overset{0}{25} - 184 \quad 42 \quad \overset{0}{20} = 81 \quad 9 \quad 0 \quad \text{u} \quad B_w \quad 81 \quad 9 \quad \overset{12}{44} \quad 81 \quad 9 \quad 18$$

$$265 \quad 51 \quad 35 - 184 \quad 42 \quad 20 = 81 \quad 9 \quad 15 \quad S \quad B_e \quad 89 \quad 44 \quad \overset{57}{59} \quad 89 \quad 44 \quad 58$$

$$C \quad 9 \quad 5 \quad 51 \quad 9 \quad 5 \quad 44$$

Angle B_e

$$261 \quad 1 \quad 5 - 171 \quad 16 \quad 20 = 89 \quad 44 \quad 45 \quad \text{u}$$

$$261 \quad 1 \quad 15 - 171 \quad 16 \quad 20 = 89 \quad 44 \quad 55 \quad S$$

Angle C

$$217 \quad 59 \quad 0 - 208 \quad 53 \quad 20 = 9 \quad 5 \quad 40 \quad \text{u}$$

$$217 \quad 57 \quad 55 - 208 \quad 52 \quad 20 = 9 \quad 5 \quad 35 \quad \overset{38}{\text{u}}$$

$$217 \quad 57 \quad 55 - 208 \quad 52 \quad 15 = 9 \quad 5 \quad 40 \quad S$$

$$B_w B_e = \overset{ft}{166.6620} \cdot 107 = c$$

To find $B_w C = b$

$$b : c :: \sin B_e : \sin C$$

u S

$$\log c \quad 2.2218366 \quad 2.2218366$$

$$\sin B_e \quad 9.9999959 \quad 9.9999959$$

$$\cos C \quad 0.8010270 \quad 0.8009874 \quad \overset{11}{196}$$

$$b \quad 3.0228595 \quad 3.0229515$$

$$CB_w = b \quad 1054.046 \quad 1054.269$$

Triangle $B_w G C$ Angle B_w

Adjusted

$$\begin{array}{rcl}
 -92 \ 3 \ 10 + 265 \ 51 \ 25 - 81 \ 9 \ 0 = 92 \ 39 \ 15 & \} & u \\
 -92 \ 3 \ 10 + 265 \ 51 \ 20 - 81 \ 9 \ 0 = 92 \ 39 \ 10 & \} & 3u \\
 184 \ 42 \ 20 - 92 \ 3 \ 20 & & 92 \ 39 \ 0 \ S \ G \ 38 \ 21 \ 55 \\
 184 \ 42 \ 0 - 92 \ 3 \ 15 & & 92 \ 38 \ 45 \} u \ C \ 48 \ 59 \ 5
 \end{array}$$

Angle G

S

$$\begin{array}{rcl}
 33 \ 52 \overset{45}{50} - 355 \ 30 \ 48 = 38 \ 21 \ 57 & u & B_w \ 92 \ 38 \ 56 \\
 33 \ 49 \ 5 - 355 \ 30 \ 55 = & \left[\begin{array}{l} 21 \ 50 \\ 18 \ 10 \end{array} \right] & S \ G \ 38 \ 21 \ 50 \\
 33 \ 52 \ 52 - 355 \ 30 \ 55 = & 21 \ 57 \}^{54} S & C \ 48 \ 59 \ 14
 \end{array}$$

Angle C

$$\begin{array}{rcl}
 266 \ 58 \ 0 - 217 \ 59 \ 0 = 48 \ 59 \ 0 & \} & u \\
 266 \ 57 \ 10 - 217 \ 57 \ 55 = 48 \ 59 \ 15 & \} & u \\
 266 \ 57 \ 10 - 217 \ 57 \ 55 = 48 \ 59 \ 15 & \} & S \\
 266 \ 57 \ 0 - 217 \ 57 \ 40 = 48 \ 59 \ 20 & \}^{18} & S
 \end{array}$$

To find GC $GC : B_w C :: \sin B_w : \sin G$

U p. 101

S p. 101

Old Survey p. 109

| | | | |
|------------------------|-----------|-----------|--------------------------------------|
| log $B_w C$ | 1054.05 | 1054.27 | 1054. 50 ⁶⁰ |
| log $B_w C$ | 3.0228.62 | 3.0229.52 | 3.0231. 70 ⁰⁸⁸ |
| " $\sin B_w$ | 9.999535 | 9.999535 | 9.999535 |
| " $\csc G$ | 0.207138 | 0.207151 | 0.207144 |
| " GC | 3.229535 | 3.229638 | 3.2297. 49 ⁷⁶⁷ |
| GC | 1696.43 | 1696.83 | 1697. 65 ³³ |

Triangle GAC

Angle G

$$25 \ 48 \ 45 - 355 \ 30 \ 48 = 30 \ 17 \ 57 \ \text{ell} \ G$$

$$25 \ 48 \ 50 - 355 \ 30 \ 55 = 30 \ 17 \ 55 \ S \ A$$

$$25 \ 48 \ 52 - 355 \ 30 \ 55 = 30 \ 17 \ 57 \ S \ C$$

Adjusted

ell

18 16

$$G \ 30 \ 17 \ 58$$

23 09

$$A \ 96 \ 22 \ 54$$

35

$$C \ 53 \ 18 \ 52$$

Angle A

$$\begin{array}{l} -77 \ 43 \ 35 \\ -77 \ 43 \ 45 \end{array} \left. \begin{array}{l} 347 \\ 40 \end{array} \right\} + 173 \ 58 \ 10 = 263 \ 45 \ 30 \ S$$

S

$$G \ 30 \ 18 \ 15$$

$$A \ 96 \ 22 \ 53$$

$$C \ 53 \ 18 \ 52$$

Angle C

$$266 \ 57 \ 10 - 213 \ 38 \ 55 = 53 \ 18 \ 15 \ \text{ell}$$

$$266 \ 57 \ 10 - 213 \ 38 \ 35 = 53 \ 18 \ 35 \ S$$

$$266 \ 57 \ 0 - 213 \ 38 \ 30 = 53 \ 18 \ 30 \ S$$

Angle A, 2d determination

$$228 \ 55 \ 0 - 132 \ 32 \ 10 = 96 \ 22 \ 50 \ \text{ell}$$

$$299 \ 6 \ 55 - 202 \ 44 \ 21 = 96 \ 22 \ 34 \ S$$

$$GA : GC :: \sin C : \sin A$$

$$GA = \frac{GC \sin C}{\sin A}$$

$$AC : GC :: \sin G : \sin A$$

$$AC = \frac{GC \sin G}{\sin A}$$

ell

S

old

$$\log \sin C \quad 9.9041078 \quad 9.9041344 \quad 9.904121$$

$$" \ GC \quad 3.229535 \quad 3.229638 \quad 3.229767$$

$$" \ \csc A \quad .002703 \quad .002699 \quad .002701$$

$$" \ \sin G \quad 9.702943 \quad 9.702939 \quad 9.702941$$

$$" \ GA \quad 3.136346 \quad 3.136471 \quad 3.136589$$

$$" \ AC \quad 2.935181 \quad 2.935276 \quad 2.935409$$

GA

AC

Triangle G A Q

Angle G

$$25 \ 48 \ 45 - 252 \ 46 \ 10 = 133 \ 2 \ 35 \ 96$$

$$25 \ 48 \ 50 - 252 \ 46 \ 5 = 133 \ 4 \ 45 \ S$$

$$25 \ 48 \ 52 - 252 \ 46 \ 10 = 133 \ 2 \ 42 \ S$$

Adjusted

u

$$G \ 133 \ 2 \ 26$$

$$A \ 21 \ 13 \ 16$$

$$Q \ 25 \ 44 \ 18$$

Angle A

$$98 \ 56 \ 50 - 77 \ 43 \ 35 = 21 \ 13 \ 15 \ S$$

$$98 \ 56 \ 50 - 77 \ 43 \ 45 = 21 \ 13 \ 5 \ S$$

S

$$G \ 133 \ 2 \ 44$$

$$A \ 21 \ 12 \ 54$$

$$Q \ 25 \ 44 \ 22$$

Angle Q

$$232 \ 1 \ 40 - 206 \ 23 \ 55 = 25 \ 37 \ 45 \ S$$

Angle A

$$228 \ 55 \ 0 - 207 \ 41 \ 35 = 21 \ 13 \ 25 \ u \quad A Q : G A :: \sin G : \sin Q$$

$$223 \ 57 \ 14 - 202 \ 44 \ 21 = 21 \ 12 \ 53 \ S \quad A Q = \frac{G A \sin G}{\sin Q}$$

Angle Q

$$359 \ 58 \ 52 - 334 \ 14 \ 25 = 25 \ 44 \ 27 \ u$$

$$6 \ 5 \ 25 - 340 \ 21 \ 4 = 25 \ 44 \ 21 \ S$$

u

S

Old

$$\log G A \quad 3.136346 \quad 3.136471 \quad 3.136589$$

$$" \sin G \quad 9.863841 \quad 9.863805 \quad 9.863823$$

$$" \cos Q \quad .362248 \quad .362231 \quad .362240$$

$$" A Q \quad 3.362435 \quad 3.362507 \quad 3.362652$$

A Q,

Triangle GCA

Angle G

$$355 \ 30 \ 48 - 252 \ 46 \ 5 = 102 \ 44 \ 43 \ u$$

$$355 \ 30 \ 55 - 252 \ 46 \ 5 = 102 \ 44 \ 50 \ S$$

$$355 \ 30 \ 55 - 252 \ 46 \ 10 = 102 \ 44 \ 45 \ S$$

Adjusted
u

$$G \ 102 \ 44 \ 43$$

$$C \ 29 \ 43 \ 37$$

$$Q \ 47 \ 31 \ 40$$

Angle C

$$296 \ 41 \ 12 - 266 \ 57 \ 35 = 29 \ 43 \ 37 \ u$$

$$296 \ 40 \ 55 - 266 \ 57 \ 10 = 29 \ 43 \ 45 \ S$$

$$296 \ 40 \ 45 - 266 \ 57 \ 0 = 29 \ 43 \ 45 \ S$$

S

$$G \ 102 \ 44 \ 43$$

$$C \ 29 \ 43 \ 41$$

$$Q \ 47 \ 31 \ 36$$

Angle Q

$$6 \ 5 \ 25 - 318 \ 33 \ 45 = 47 \ 31 \ 40 \ S$$

$$CQ : GC :: \sin G : \sin Q$$

$$CQ = \frac{GC \sin G}{\sin Q}$$

u

S

old

$$\log GC \quad 3.229535 \quad 3.229638 \quad 3.229767$$

$$" \sin G \quad 9.989165 \quad 9.989165 \quad 9.989165$$

$$" \cos Q \quad .132176 \quad .132184 \quad .132180$$

$$" CQ \quad 3.350876 \quad 3.350987 \quad 3.351112$$

CQ

Triangle ACQ

Angle A

$$173 \ 58 \ 10 - 98 \ 54 \ 25 = 75 \ 3 \ 45 \ S \ 24.$$

$$299 \ 6 \ 55 - 223 \ 57 \ 14 = 75 \ 9 \ 41 \ S$$

$$207 \ 41 \ 35 - 132 \ 32 \ 10 = 75 \ 9 \ 25 \ U$$

Adjusted

U

$$A \ 75 \ 9 \ 45$$

$$C \ 83 \ 2 \ 37$$

$$Q \ 21 \ 47 \ 38$$

Angle C

$$296 \ 41 \ 12 - 213 \ 38 \ 55 = 83 \ 2 \ 17 \ U$$

$$296 \ 40 \ 55 - 213 \ 38 \ 35 = 83 \ 2 \ 20 \ S$$

$$296 \ 40 \ 45 - 213 \ 38 \ 30 = 83 \ 2 \ 15 \ S$$

S

$$A \ 75 \ 9 \ 55$$

$$C \ 83 \ 2 \ 32$$

$$Q \ 21 \ 47 \ 33$$

Angle Q

$$340 \ 21 \ 4 - 318 \ 33 \ 45 = 21 \ 47 \ 19 \ S$$

$$AQ:AC::\sin C:\sin Q$$

$$AQ:CQ::\sin C:\sin A$$

U

S

Old

$$\log AC \quad 2.935181 \quad 2.935276 \quad 2.935409$$

$$\sin Q \quad .430311 \quad .430338 \quad .430324$$

$$\sin C \quad 9.996791 \quad 9.996790 \quad 9.996790$$

$$\sin A \quad .014728 \quad .014222 \quad .014225$$

$$CQ \quad 3.350876 \quad 3.350987 \quad 3.351112$$

$$AQ_1 \quad 3.362283 \quad 3.362404 \quad 3.362523$$

$$AQ_2 \quad 3.362395 \quad 3.361999 \quad 3.362127$$

 AQ_3 AQ_4

$$AQ_1 \quad 2303.5 \quad 2304.1 \quad 2304.9$$

$$AQ_2 \quad 2302.9 \quad 2303.6 \quad 2304.2$$

$$AQ_3 \quad 2303.5 \quad 2301.4 \quad 2302.1$$

$$\text{Mean} \quad 2303.3 \quad 2304.1 \quad 2303.7$$

$$2303.3$$

$$2303.0$$

$$2303.7$$

$$\text{Mean } 2303.3$$

Results

From triangulation

2303.33

From direct measure

2305.43

~~2292.8~~

2304.4

Mean 2296.0 ft.

Base Line $B_w B_e$

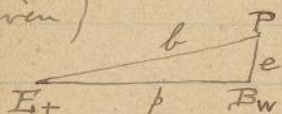
Point B_w is the same as + on West Plate of former Survey.

Point B_e is 2 ft 9 $\frac{1}{16}$ in East of + in East plate of former Survey.

 $B_w E_+$

From direct measurement by S.D. Bailey $B_w E_+ = 49.9596^m$.

From record left by A.E. Dinglass distance E_+ to center of stone pier is 50.1896^m (direct measurement not given)



$$e = 4.7409 \text{ S.D.B.}$$

$$B_w = 90 \ 7 \ 0 \quad " \quad 90 \ 6 \left\{ \begin{array}{l} 0 \text{ W.U.} \\ 20 \text{ S.D.S.} \end{array} \right.$$

$$b = 50.1896 \text{ A.E.D.}$$

To find p

$$b + \frac{e}{\sin B} : b + \frac{e}{\sin E} :: \tan \frac{1}{2} B$$

$$b : e :: \sin B : \sin E$$

$$P = 180 - (E + B)$$

$$p : b :: \sin \frac{1}{2} P : \sin B$$

S.D.B.

 $\frac{u+s}{2}$

$$49.9596^m \text{ S.D.B.}$$

$$49.9561 \text{ A.E.D. + comp.}$$

$$49.9578 \text{ Mean}$$

$$\log e \quad 0.6758608 \quad 0.6758608$$

$$" \sin B \quad 9.9999991 \quad 9.9999993$$

$$" \csc B \quad 8.2993863 \quad 8.2993863$$

$$" \csc E \quad 1.7006137 \quad 1.7006137$$

$$" \sin E \quad 8.9764736 \quad 8.9752464$$

$$E \quad 5 \ 25 \ 13 \quad 5 \ 25 \ 13$$

$$B \quad 84 \ 27 \ 47 \quad 84 \ 28 \ 37$$

$$" b \quad 1.7006137 \quad 1.7006137$$

$$" \sin P \quad 9.9979689 \quad 9.9979791$$

$$" \csc B \quad 9 \quad 7$$

$$" p \quad 1.6985835 \quad 1.6985935$$

$$p \quad 49.9555 \quad 49.9567$$

$$49.9561$$

$$\log p \quad 1.6986033$$

$$" \text{mult.} \quad 0.5159938$$

$$2.2145971$$

$$p \text{ ft.} \quad 163.9068$$

Adopt.

$$B_w E_+ = 163.9068$$

$$2 \text{ ft } 9 \frac{1}{16} \text{ in} = 2.7552$$

$$B_w B_E = 166.6620$$

Adopt.

Line $B_w C$.

The point C on roof of Carmen Alto church was placed as near as possible to that used in former surveys (viz. "3 ft $4\frac{7}{8}$ inches from N wall and 10 ft $\frac{5}{8}$ in from W foot of arch measured on circumference) But as the arch of the roof has been partly built up and the roof covered with cement, the latter measure could not be used at all. The N wall moreover is so irregular that the first measure can be laid out only approximately. The point agreed upon is near the middle of the arch and as near 3 ft $4\frac{7}{8}$ in from the north wall as the vertical of the latter can be determined.

After its adoption the angle between base line and line to church station as determined by W.B. Blymer was turned off on the theodolite and indicated that the new station was $4\frac{1}{8}$ in west of that formerly used.

The distance $B_w C$ may be calculated from data of previous surveys as follows:



$$CP = 1039^{\text{ft}} 224 \text{ S.D.B.}, 1039.086 \text{ A.S.D.}$$

$$B_w P = 4.7409 \text{ S.D.B.}$$

$$CB_w P = 8^\circ 57' 0'' \text{ W.U.}, 8^\circ 57' 5'' \text{ S.D.S.}$$

$$= 90.70 - 81.755 = 8.945 \text{ S.D.B. + W.B.C.}$$

$$C = 0^\circ 8' 0'' \text{ W.U.}$$

$$CB_w = C_x + xB_w$$

$$C_x = CP \cos C$$

$$xB_w = B_w P \cos CB_w P$$

u + s

B + C

$$\log B_w P \quad 0.6758608$$

$$" \text{ Mt ft. } \quad 0.5159938$$

$$" \cos CB_w P \quad 9.9946791 \quad 9.9946382$$

$$" \frac{B_w x}{C_x} \quad 1.1865337 \quad 1.1864928$$

$$C_x B_w x \quad 15.365 \quad 15.363$$

SDB

AED

$$" CP \quad 3.0167175 \quad 3.0166515$$

$$" \cos C \quad 9.9999988 \quad 9.9999988$$

$$" C_x \quad 3.0167163 \quad 3.0166503$$

$$1054.606 \quad \text{SDB}$$

$$C_x \quad 1039.241 \quad 1039.083$$

$$.446 \quad \text{AED}$$

$$1039.162$$

$$.75 \quad \text{WBC}$$

$$B_w x \quad 15.364$$

$$1054.60 \quad \text{Mean}$$

$$CB_w \quad 1054.526$$

Comp. by WBC

from his measures 1054.75

These are appreciably larger than the values calculated from present data p. 101

Azimuth observations - Feb. 4/97 W.L.

Sum upper + N limits
Carmen Alto Church Cross

Sum lower + S limits

| Chrm | A | B | Vert. Circle | Chrm | A | B | Vert. |
|--------|----------|-----------|--------------|--------|-----------|-----------|--------|
| 5 54 8 | 288 51 0 | 108 51 0 | 6 34.5 | 6 3 14 | 109 59 0 | 289 59 0 | 3 59.5 |
| 57 15 | 289 3 10 | 109 3 0 | 5 52.0 | 5 38 | 110 8 30 | 290 8 40 | 3 28 |
| 59 44 | 289 13 0 | 109 12.50 | - [17.7] | 7 31 | 110 15 20 | 290 15 30 | 3 4 |

Cross on Carmen Alto Church upper + N limits

| Before sun sb. | | | | After sun sb. | | | |
|----------------|-----------|--|--|---------------|--------|--|--|
| A | B | | | A | B | | |
| 9 27 40 | 189 27 40 | | | 189 28 0 | 9 28 0 | | |
| 28 0 | 28 0 | | | 28 0 | 28 0 | | |
| 28 0 | 28 0 | | | 28 0 | 28 0 | | |
| 28 0 | 28 0 | | | 28 0 | 28 0 | | |

Reduction

| Mean Chrm | A | B | Vert. | Chrm | A | B | Vert. |
|---------------------------|------------------------|----------------------------------|----------|---------------------------|------------------------|-----------|---------|
| 5 57 2 | 289 2 23 | 109 2 17 | 5 54.7 | 6 5 28 | 110 7 37 | 290 7 43 | 3 30.5 |
| +12 30 | 289 2 20 | Ref. | -8.5 | +12 30 | 290 7 40 | | -13.0 |
| Semi-diam | 16 $\frac{20}{15}$ | Par. | +0.1 | | 16 $\frac{17}{15}$ | | +0.1 |
| 6 9 32 | 289 18 $\frac{40}{35}$ | | 5 46.3 | 6 17 58 | 289 51 $\frac{28}{25}$ | | 3 17.6 |
| 12 14 13 App. sun | | 2 84 13.7 | | 12 14 13 | | | 86 42.4 |
| 5 55 19 t | | Semi-diam | 16.3 | 6 3 45 t | | | 16.3 |
| 58° 49' 45" t (Approx) | | 2 84 30.0 | | 90° 56' 15" t (Approx) | | | 86 26.1 |
| | | $\delta - 15 54 \frac{37}{26.6}$ | | | | -15 54 30 | |
| | | $\phi - 16 22 28$ | | | | -16 22 28 | |
| | | $\phi + \delta - 32 17 5$ | | | | -32 16 58 | |
| | | 2 84 29 0 | | | | 86 26 7 | |
| | | $\phi - \delta - 0 27 51$ | | | | -0 27 58 | |
| $\frac{1}{2} = 26 5 57.5$ | | 2 + $\phi + \delta$ | 52 11 55 | $\frac{1}{2} = 27 4 34.5$ | | 54 9 9 | |
| 58 23 2.5 | | 2 - (") | 116 46 5 | 59 21 32.5 | | 118 43 5 | |
| 42 0 34.5 | | 2 + $\phi - \delta$ | 84 1 9 | 42 59 4.5 | | 85 58 9 | |
| 42 28 25.5 | | 2 - (") | 84 56 51 | 43 27 2.5 | | 86 54 5 | |

Calculation of z from Chron. times.

$$\cos z = \cos \phi \cos \delta \cos t + \sin \phi \sin \delta$$

| | | | | | |
|-----------------|-------------------------------------|-----------------------|------------------|-----------------------|-----------------------|
| $\log \cos t$ | 8.310342 | 8.213829 _m | $\log \sin \phi$ | 9.450116 _n | 9.450116 _n |
| " $\cos \delta$ | 9.983036 | 9.983040 | " $\sin \delta$ | 9.437959 _n | 9.437908 _n |
| " $\cos \phi$ | 9.982017 | 9.982017 _h | Σ | 8.888075 | 8.888024 |
| Σ | 8.275395 | 8.178886 _n | M_z | +0.0772814 | +0.0772723 |
| N_0 | +0.01885 ³ ₄₆ | -0.0150968 | $\cos z$ | +0.0961350 | +0.0621755 |
| | | | $\log \cos z$ | 8.982882 | 8.793620 |
| | | | z | 84 29 0 | 86 26 7 |

Calculation of azimuth

$$\tan \frac{1}{2} a = \sqrt{\frac{\cos \frac{1}{2} (z + \phi + \delta) \sin \frac{1}{2} (z + \phi - \delta)}{\cos \frac{1}{2} [z - (\phi + \delta)] \sin \frac{1}{2} [z - (\phi - \delta)]}}$$

Red. to centre of sun.

| | | | |
|----------------------|--|------------------------------------|--|
| $\log A$ | 9.953292 | 9.949586 | $\delta a = \pm \frac{S}{\sin z}$ |
| " B | 9.825614 | 9.833658 | S 16 15.4 |
| " $\frac{1}{C}$ | 0.280483 | 0.292722 | $\sin z$.9954 .9981 |
| " $\frac{1}{D}$ | 0.170534 | 0.162582 | δa 16 ²⁰ _{10.9} 16 ¹⁷ _{13.8} |
| Σ | 0.229923 | 0.238548 | |
| $\frac{1}{2} \Sigma$ | 0.114962 | 0.119274 | |
| $\frac{1}{2} a$ | 52 29 47 | 52 46 14.7 | |
| a | 104 59 34 | 105 32 29 | = az. of sun reading from N pt towards W |
| Hor. C. | 289 18 ⁴⁰ ₃₅ | 289 51 ³⁶ ₂₅ | |
| Δ | 184 ¹⁸ ₁₉ ⁶ ₅₇ | 184 18 ⁵⁴ ₅₆ | |
| Mean Δ | 184 ¹⁸ ₁₉ ⁵⁷ ₀ | | = Circle reading for N pt. |
| | 9 27 58 | | = " " Cross on Church |
| | 185 ⁶ ₅₈ | | = az. Cross on Church N-WSE |

Astronomical observations. Feb. 6/97 Del. S. ob.

Sun lower + N. limb

Sun upper + S limb

| Chm | A | B | Vert. C. | Chm | A | B | Vert. C. |
|-------------------------|------------|-----------|-------------------------------|-------------|-------------|------------|----------|
| 4 14 59 | 87 52 40 | 267 52 40 | 28 23.5 | 4 35 6 | 269 32 0 | 89 32 10 | 24 55.2 |
| 18 49.5 | 88 4 40 | 268 4 40 | ^{27 59.5} 28 29.5 | 39 45 | 269 46 20 | 89 46 30 | 23 50.0 |
| 23 4 | 88 17 50 | 268 17 40 | 27 11 | 43 7 | 269 57 0 | 89 56 50 | 23 2.0 |
| 27 50 | 88 33 0 | 268 32 40 | 26 21 | 48 42 | 270 14 10 | 90 14 20 | 21 43.0 |
| Means 4 26 10.6 | 88 12 2.5 | 268 11 55 | ^{28.75} 27 56.25 | 4 41 40.0 | 269 52 22.5 | 89 52 27.5 | 23 22.55 |
| Corr. 12 32.5 | 88 11 58.8 | Ref. | - 1.85 | + 12 32.5 | 89 52 25 | | - 2.23 |
| T 4 33 43 Semi-d. | 14 21.8 | Par. | + .1 | 4 54 12.5 | 14 57.3 | | + .1 |
| Nov 2 14 21 | 26 21 | Semi | + 16.25 | 12 14 21.2 | 37 28 | | - 16.25 |
| t _h 4 19 22 | 88 28 44 | | | | 89 36 40 | | |
| t _o 64 50 30 | | Appt 2 | 1.62 | 17 69 57 45 | | | 66 56 |

Dunitama Stone

| Before | A | B | After | A | B |
|------------------|------------|---|----------------------------|------------|----------|
| 98 54 30 | 278 54 10 | | 278 54 50 | 98 54 40 | |
| 20 | 20 | | 40 | 40 | |
| 30 | 30 | | 40 | 40 | |
| 30 | 30 | | 40 | 40 | |
| 98 54 27.5 | 22.5 | | 42.5 | 40 | |
| 98 54 25 | | | 41 | | |
| | | | z + (q + s) | 30 25 1 | 35 16 6 |
| q - 16 22 28 | - 16 22 28 | | z - (q + s) | 93 47 35 | 98 38 6 |
| s - 15 18 49 | - 15 18 32 | | z + (q - s) | 61 2 39 | 65 53 10 |
| q + s - 31 41 17 | - 31 41 0 | | z - (q - s) | 63 9 57 | 68 1 2 |
| z 62 6 18 | 66 57 6 | | $\frac{1}{2}[z + (q + s)]$ | 15 12 30.5 | 17 38 3 |
| q - s - 1 3 39 | - 1 3 56 | | $\frac{1}{2}[z - (q + s)]$ | 46 53 47.5 | 49 19 3 |
| | | | $\frac{1}{2}[z + (q - s)]$ | 30 31 19.5 | 32 56 35 |
| | | | $\frac{1}{2}[z - (q - s)]$ | 31 34 58.5 | 34 0 31 |

Calculation of z from chron. times

$$\cos z = \cos \phi \cos \delta \cos t + \sin \phi \sin \delta$$

| | | | | | |
|-----------------|----------|----------|-------------------|-----------------------|-----------------------|
| log $\cos t$ | 9.628513 | 9.534832 | log $\sin \delta$ | 9.421773 _n | 9.421641 _n |
| " $\cos \delta$ | 9.984300 | 9.984310 | " $\sin \phi$ | 9.450166 _n | 9.450116 _n |
| " $\cos \phi$ | 9.982017 | 9.982017 | Σ | 8.871889 | 8.871757 |
| Σ | 9.594830 | 9.501159 | N_z | 0.074454 | 0.074432 |
| N_1 | | | | .393396 | .317073 |
| | | | $\cos z$ | 0.467850 | 0.391505 |

Calculation of azimuth

$$\tan \frac{1}{2}a = \sqrt{\frac{\cos \frac{1}{2}[z+\phi+\delta] \sin \frac{1}{2}[z+(\phi-\delta)]}{\cos \frac{1}{2}[z-(\phi+\delta)] \sin \frac{1}{2}[z-(\phi-\delta)]}}$$

| | | |
|-----------------------|---------------------------|---------------------------|
| log A | 9.984518 ⁸ | 9.979098 |
| " B | 9.705753 | 9.735444 |
| " $\frac{1}{C}$ | 0.165377 | 0.185841 |
| " $\frac{1}{D}$ | 0.280891 | 0.252342 |
| Σ | 0.136536 ⁹ | 0.152725 |
| " $\tan \frac{1}{2}a$ | 0.068268 ⁷⁰ | 0.076362 |
| $\frac{1}{2}a$ | 49 29 6.3 ⁶ | 50 0 41 ⁴¹ |
| a | 98 58 12 | 100 1 38 ²² |
| Hor. Circle | 88 28 74 ^{26 21} | 89 36 70 ^{37 28} |
| Δ | 349 29 57 ^{28 9} | 349 34 32 ^{36 6} |

| | |
|---------------|-----------------------|
| Mean Δ | 349 32 8 |
| | 98 54 33 |
| | 109 22 25 |
| | 74 47 42 ⁵ |
| | 185 10 7 |

Reduction to centre of sun

$$\delta a = + \frac{S}{\sin z}$$

$$S = 16' 15''.1$$

$$\sin z = .8838 \quad .9202$$

$$\delta a = 14 21.8 \quad 14 57.3$$

Circle reading N pt.

= Az. 2 hours N-WS E

 Δ az Cannon Mt Spire - 2 hours ^{p. 266}

= Az " " "

Triangle - sky, 2 house, RR station.

(Reference point at RR. station is SW corner of balcony of residence.)

Angle A

$$\begin{aligned}
 357 \ 44 \ 0 - 293 \ 34 \ 10 &= 64 \ 9 \ 50 \text{ ri} \quad 206 \ 47 \ 30 - 98 \ 24 \ 55 = 107 \ 52 \ 40 \text{ Ang.} \\
 163 \ 0 \ 55 - 98 \ 57 \ 20 &= 64 \ 3 \ 35 \text{ S} \quad -359 \ 58 \ 48 + 287 \ 47 \ 30 = 72 \ 11 \ 23 \text{ U} \\
 288 \ 0 \ 48 - 223 \ 57 \ 10 &= 64 \ 3 \ 38 \text{ S} \quad 340 \ 22 \ 5 - 232 \ 32 \ 28 = 107 \ 49 \ 37 \text{ S} \\
 116 \ 22 \ 45 - 52 \ 19 \ 25 &= 64 \ 3 \ 20 \text{ U} \\
 111 \ 7 \ 49 - 47 \ 4 \ 22 &= 64 \ 3 \ 27 \text{ U}
 \end{aligned}$$

Angle Q

Angle R

Means

$$\begin{aligned}
 \text{U} \quad \text{S} \quad 340 \ 34 \ 50 - 332 \ 27 \ 10 &= 8 \ 7 \ 40 \text{ S} \\
 340 \ 34 \ 40 - 332 \ 27 \ 5 &= 8 \ 7 \ 35 \text{ S} \\
 A \ 64 \ 3 \ 24 \quad 64 \ 3 \ 36 & \\
 Q \ 107 \ 48 \ 37 \quad 107 \ 48 \ 37 & \\
 R \ 8 \ 7 \ 25 \quad 8 \ 7 \ 35 & \\
 \text{Adjusted} & \\
 A \ 64 \ 3 \ 34 \quad 64 \ 3 \ 40 & \\
 Q \ 107 \ 48 \ 48 \quad 107 \ 48 \ 41 & \\
 R \ 8 \ 7 \ 38 \quad 8 \ 7 \ 39 &
 \end{aligned}$$

$$\begin{aligned}
 A \ 64 \ 3 \ 34 \quad 64 \ 3 \ 40 \\
 Q \ 107 \ 48 \ 48 \quad 107 \ 48 \ 41 \\
 R \ 8 \ 7 \ 38 \quad 8 \ 7 \ 39
 \end{aligned}$$


$$\begin{aligned}
 AR: AQ: \sin A: \sin R \\
 QR: S
 \end{aligned}$$

$$\begin{aligned}
 \log AQ \ 3.3625579 \quad 3.3609719 \quad 3.3625579 \quad 3.3625579 \\
 \log Q \ 9.9786635 \quad 9.9786682 \quad 9.9538797 \quad 9.9538858 \\
 \log R \ 0.8496379 \quad 0.8496231 \quad 0.8496379 \quad 0.8496231 \\
 AR \ 4.1892733 \quad 4.1892632 \quad 4.1660755 \quad 4.1660668 \\
 AR \ 15518.8 \quad 15518.5 \quad 15462.3 \quad 15461.9
 \end{aligned}$$

$$\begin{aligned}
 AR \quad 15462.1 \text{ ft.} = 2.91 \frac{1}{2} \text{ miles} \\
 15518.6
 \end{aligned}$$

AR

$$\begin{aligned}
 14658.0 \quad 14657.7 \\
 14657.8
 \end{aligned}$$



$\frac{7}{4}$ m. $A \quad Q$
 AQ 2304.4 0.436 A 64 3 37
 AR 15518.6 2.94 Q 107 48 44
 RQ 14657.8 2.78 R 8 7 39

A₃ AQ 185 9 26 p. 121 C.A. church
 - 7⁵ 47 32 p. 266 Δ ch. + 2
 $\therefore A_3 AQ$ 109 21 54 N-WS E
 $\therefore A_3 AR$ 173 25 31

Difference of level between obsy & RR station

1. Absolute.

RR. from obsy

| | | | |
|----------|---------|---------------------------|-------------------|
| - 2° 10' | | lower edge of signal flag | u |
| - 1 52.5 | 3.456 | flow of balcony | S |
| - 2 52.0 | 3.386 | " " " | u |
| - 1 53.0 | 3.376 | " " " | u |
| - 1 53.0 | 3.418 | " " " | u |
| - 1 53.0 | 3.416 | " " " | u |
| - 1 53.0 | 3.3736 | mean of 4 | u |
| 1 53.0 | 16.6416 | " " " | level above tel u |

obsy from R.R.

| | | | |
|--------|--------|------------------|-----|
| + 1 47 | 16.378 | flow of balcony | SS |
| 1 47.5 | 16.394 | level above tel. | u S |
| 1 49.5 | 3.614 | " below " | u S |
| 1 49.2 | 3.613 | " " " | u |
| 1 48.2 | 16.430 | " above " | u |
| 1 49.6 | 16.410 | " " " | u |

Results

| | | | |
|--------------|-------------------|----------|----------|
| RR from obsy | $\bar{x} = 17.00$ | | |
| 10 - 3.456 | S = 6.544 | = 112.66 | |
| | 627 | 111.25 | |
| 3.399 | u 6.601 | 112.22 | |
| | u 6.6340 | 112.78 | |
| | | 112.50 | |
| obsy from RR | | | Means |
| | S 6.386 | 108.56 | u 110.68 |
| | u 6.404 | 108.87 | S 110.61 |
| | | | 109.90 |
| | | | 110.64 |

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2 Differential, seen from 2

obs

| | | | | | |
|----|------|-------|----------------------------------|--|---|
| +1 | 6.9 | -34.3 | = 0 32.6 | } step anem. rod - diff. to floor of balcony. | S |
| +1 | 7.4 | -34.3 | 0 33.1 | | |
| +0 | 31 | | ^{sdts} 11 40.8 = 11.816 | flow of balcony | u |
| +0 | 30.8 | | 11 40.8 .816 | | u |
| 0 | 31 | | 11 42.6 .852✓ | | u |
| 0 | 32 | | 11 42.8 .856✓ | | S |
| 0 | 31.7 | | 11 43.3 .866✓ | | S |

RR station

| | | | | | |
|----|---------------------------|---|---------------|-----------------|---|
| -1 | 53.6 | | | flow of balcony | S |
| -1 | 54.5 | 3 | 16.4 = 3.328✓ | | u |
| -1 | ^[54.5] 24.5 | 3 | 16.8 .336✓ | | u |
| -1 | 54 | 3 | 19.5 .390✓ | | S |

| u | S | Results |
|------------------------------------|-------------------|----------------|
| 41.7 40.8 | | Means |
| + 1.828 | 1.8610 | ⁿ |
| + 1.414 | 1.4305 | 1.844 = 31.35 |
| - 6.668 | 6.610 | 6.639 = 112.86 |
| 8.496 | 8.471 | |

| u | S |
|--------|--------|
| 31.08 | 31.64 |
| 113.36 | 112.37 |

8.274

Azimuth observations May 18, 1897 ^{will}_{pm}
 N limit Sun. S limit

| Chrm | B | Chrm | B |
|------------|-------------|-----------|-------------|
| 4 18 31 | 336 3 0 | 4 23 46 | 335 1 20 |
| 19 29.5 | 335 57 10 | 24 38 | 334 56 40 |
| 21 1.5 | 48 40 | 25 30.5 | 52 0 |
| 22 10.5 | 42 20 | 26 13 | 48 10 |
| 4 20 18.12 | 335 52 47.5 | 4 25 1.88 | 334 54 32.5 |

Cross Carmen Alto Church.

Before

After

| A | B | A | B |
|----------|-----------|----------|-----------|
| 35 20 30 | 215 20 30 | 35 20 40 | 215 20 50 |
| 20 | 30 | 40 | 50 |
| 30 | 40 | 30 | 40 |
| 30 | 30 | 30 | 40 |
| 27.5 | 32.5 | 35.0 | 45.0 |

Mean 215° 20' 35"

| | | | | |
|----------------|-----------------------|-----------------|-----------|-----------|
| Chrm Corr. | + 16 15.7 | log sin ϕ | 9.4501160 | 9.4501160 |
| Corrected chrm | 4 36 33.8 4 41 17.6 | " cos δ | 9.5288525 | 9.5288525 |
| App moon | 11 56 14.3 11 56 14.3 | Σ | 9.9781685 | 8.9781685 |
| t | 4 40 19.5 4 45 3.3 | N_2 | 3524 | 47668 |
| t | 70 4 52.5 71 15 49.5 | cos 2 | 0.9540774 | 0.9602465 |
| log cos t | 9.9732095 9.9763533 | " cos 2 | 9.8774158 | 9.8809544 |
| " cos δ | 9.9737698 9.9737698 | z | 47 42 28 | 78 45 44 |
| " cos ϕ | 9.9820177 9.9820177 | ϕ | -16 22 28 | |
| Σ | 9.9289970 9.9321408 | δ | +19 42 49 | |
| N_1 | .8491746 .8553439 | $\phi + \delta$ | 3 22 46 | |
| N_2 | -.0950974 -.0950974 | $\phi - \delta$ | -36 7 47 | |
| z | 9.4880339 9.4624700 | | | |
| N_1 | .3076337 .2900481 | | | |

| | | A | | B | | |
|---------------------|---|--|------------------------------|---|--|--|
| | | $\tan \frac{1}{2}a = \sqrt{\frac{\cos \frac{1}{2}(z+\phi+\delta) \sin \frac{1}{2}(z+\phi-\delta)}{\cos \frac{1}{2}(z-\phi+\delta) \sin \frac{1}{2}(z-\phi-\delta)}}$ | | | | |
| $z+\phi+\delta$ | 81 ⁴ ⁹ 3 49 | 82 ⁸ ⁵⁴ 5 35 | | | | |
| $z+\phi-\delta$ | 41 ³⁶ ⁴⁶ 38 44 | 42 ³⁸ ²⁶ 39 57 | | | | |
| $z-(\phi+\delta)$ | 74 ²¹ ³⁷ 28 37 | 75 ²³ ²² 24 53 | | | | |
| $z-(\phi-\delta)$ | 113 ⁵² ⁵ 48 45 | 114 ⁵³ ⁵⁰ 50 34 | | | | |
| A | 40 ³³ ^{34.5} 31 54.5 | 41 ⁴ ²⁷ 2 47.5 | | | | |
| B | 20 ⁴⁸ ^{20.5} 49 5.5 | 21 ¹³ 19 58.5 | | | | |
| C | 37 ¹⁰ ^{48.5} 41 33.5 | 37 ⁴¹ ²¹ 42 26.5 | | | | |
| D | 56 ⁵⁶ ^{2.5} 54 22.5 | 57 ²⁶ ⁵⁵ 25 15.5 | | | | |
| $\log A$ | 9.8808 ⁶⁵⁸⁴ 8395 | 9.8774 ²⁹⁰⁵ 4781 | | | | |
| $\sin B$ | 9.550 ⁴⁷²⁸ 7221 | 9.560 ⁶⁰¹¹ 8465 | | | | |
| $\sec C$ | .098 ⁶⁸³⁷ 7559 | .101 ⁶⁶⁹⁹ 7439 | | | | |
| $\csc D$ | .076 ⁷³³⁸ 8709 | .074 ²¹⁹² 3600 | | | | |
| Σ | 9.607 ⁶⁵⁴⁸⁷ 71881 | 9.614 ³⁷⁸⁰⁷ 4235 | | | | |
| $\tan \frac{1}{2}a$ | 9.8035 ²⁷⁴⁴ 9440 | 9.8072 ⁶⁸⁹⁰⁴ 2118 | | | | |
| $\frac{1}{2}a$ | 32 ²⁶ ^{43.6} 27 52.4 | 32 ³⁹ ^{44.7} 40 51.9 | | | | |
| a | 64 ⁵³ ²⁷ 55 45 | 65 ¹⁹ ²⁹ 21 44 | | | | |
| Hor Circle | 335 37 19 | 335 10 5 | | | | |
| Δ | 40 ³⁰ 33 48 | 40 ²⁹ ³⁴ 31 49 | = reading of circle N. point | | | |
| Mean Δ | 40 ³⁰ 32 26 | | | | | |
| Circle Cross | 215 20 35 | | | | | |
| Ag. Cross | 174 ⁴ 58 9 | | | | | |
| | 185 ⁹ ³⁶ 41 51 | | | | | |

Red. to centre of sun

$\delta a = \pm \frac{S}{\sin z}$

S 15' 50".5 = 950.5

$\sin z$.977 .981

δa 928.7.4 932.44

-15 28.7 +15 32.4

335 52 47.5 334 54 32.5

Aymutt observations, May 22/97 Wed.

Sun N

S

| chm | B | chm | B |
|-----------|-------------|------------|-------------|
| 4 11 57 | 339 24 50 | 4 16 14.5 | 338 27 40 |
| 12 58 | 19 0 | 17 6.5 | 23 0 |
| 13 56 | 13 20 | 17 56 | 18 10 |
| 14 53 | 8 0 | 18 42 | 14 0 |
| 4 13 26.0 | 339 16 17.5 | 4 17 29.75 | 338 20 42.5 |

Cross Cassin Alta Church.

| Before | After | chm. |
|-------------|------------|------------------|
| 217 18 30 | 217 19 0 | 7.05 pm 16 26.06 |
| 20 | 0 | .28 |
| 20 | 0 | 4.15 " 16 25.78 |
| 20 | 10 | |
| 217 18 22.5 | 217 19 2.5 | |
| 217 18 42.5 | | |

chm corr. +16 25.78

Corrid chm. 4 29 51.78 4 33 55.53 log sin ϕ 9.4501160_nApp. noon 11 56 28.32 11 56 28.32 " " δ 9.5457250t 4 33 23.46 4 37 27.21 Σ 8.9958410_n

t 68 20 51.9 69 21 48.15 cos 2 0.2323914 0.2175409

log cos t 9.5669937 9.5470851 log cos 2 9.3662200 9.3375409

" cos δ 9.9713913 9.9713913 ϕ -16 22 28" cos ϕ 9.9820177 9.9820177 δ 20 34 9 Σ 9.5204027 9.5004941 $\phi + \delta$ 4 11 ⁴/₂1 \sin_1 .3314383 .3165878 -2 76 ³³/₄ 44 77 26 7 \sin_2 -.0990469 -.0990469 $\phi - \delta$ -36 56 37

| | | | | | |
|----------------------|---|------------|-------------------------------|----------|-------|
| $z+(\phi+\delta)$ | 80 45 25 | 81 37 48 | Red. to sun's center | | |
| $z+(\phi-\delta)$ | 39 37 7 | 40 29 30 | $\Delta a = \frac{S}{\sin z}$ | | |
| $z-(\phi+\delta)$ | 80 45 25 72 22 3 | 73 14 26 | | | |
| $z-(\phi-\delta)$ | 113 30 21 72 22 3 | 114 22 44 | $S \quad 15 \ 49.8 = 949.8$ | | |
| A | 40 22 42.5 | 40 48 54 | $\sin z$ | .973 | .976 |
| B | 19 48 33.5 | 20 14 45 | Δa | 924.2 | 927.0 |
| C | 36 11 1.5 40 22 42.5 | 36 37 13 | -15 24.2 +15 27.0 | | |
| D | 56 45 10.5 36 11 1.5 | 57 11 22 | 339 16 17.5 338 20 42.5 | | |
| $\log \cot$ | 9.8818396 | 9.8789949 | | | |
| $\sin B$ | 9.5300587 | 9.5391374 | | | |
| $\sin C$ | .0930577 | .0954974 | | | |
| $\sin D$ | .0776306 | .0754795 | | | |
| Σ | 9.5825866 | 9.5891092 | | | |
| $\tan \frac{1}{2} a$ | 9.7912933 | 9.7945546 | Results were | | |
| $\frac{1}{2} a$ | 31 44 2.6 | 31 55 36.7 | Feb. 4 | 185 9 1 | |
| a | 63 28 5 | 63 50 13 | May 18 | 9 36 | |
| Hour circle | 339 0 53 | 338 36 10 | " 22 | 8 58 | |
| Δ | 42 28 58 | 42 26 23 | 185 9 12 N-WSE | | |
| Mean Δ | 42 27 40.5 | | S.E.S. | | |
| Cross | 217 18 42.5 | | Feb. 6 | 185 10 7 | |
| | 185 8 58 | | Wtd Mean | 185 9 26 | |
| | | | | | adopt |

Feb. 23/97

d Argus
d E. -

cl W

+93.0
-55.0+38.0
+9.5+1.87
-1.35

+1.52

-91.9

+54.3

-37.6

-9.4

-1.86

+1.35

-1.51

60.8 32.2

31.2 60.7

13.0 42.8

42.0 12.3

10.6 53.5 B₂

2 Can. Maj.

10.7 10.7 3

45 B₁

10.6 27.7 4

55.7

8 22 15 = 6 49 40

10.8 45 5

6.7

6.58

10.67 19.3 C₁

17.3

8 0 0

8 22 15

30.7 2

cloudy

28.2

-1 30 29.40

12 50.12

42.08 42.2 3

50 C₁

6 29 30.60

8 35 5.12

31.08 53.5 4

57

22 15 19.52

1 24.62

11.00 53.5 4

57

7 54 4.7 5

4.2

4.24

8 14 11.08

22 15 19.52

11.5

-57.41

1 20.96

6 51 49.26

6.83

8 12 18.5

12 50.12

49 40

7 52 10.88

8 11 6.70

2 9.26

6 21 41.59

6 40 38.49

1 30 29.26

1 30 28.21

+1.69

-1.53

Red. to 8.00

-1.29

+1.83

1.33

1.04

$$0 = 29.95 + \Delta T - .97a - 1.65c$$

$$27.68 \quad .00a + 1.04c$$

$$0 = 28.82 + \Delta T - .48a - .30c$$

$$0 = 2.27 - .97a - 2.69c$$

$$\text{If } a = -.36 \text{ (Feb. 4), } c = +1.00$$

$$\text{If } c = -.09 \text{ } a = a = +2.60$$

Do not reduce well

Adopt 28^s

$$0 = 28.66 + \Delta T - .97a - 1.65c$$

$$= 29.51 + \Delta T + .00a + 1.04c$$

$$= 0.85 + .97a + 2.69c$$

$$\text{If } a = -.36 \text{ Feb. 1, } c = -.19$$

$$\text{If } c = -.09 \quad a = -.62$$

$$0 = 29.08 + \Delta T - .48a - .30c$$

$$+ .24 \text{ (} a = -.50 \text{)}$$

$$+ .04 \text{ } c = -.15$$

$$29.36$$

From 2 Can. Maj. if $c = -.10$, 29.41

Adopt 29.40

Mar. 13/97 Desaguadero Bolivia

Time by sextant. Chron. Parkinson & Frodsham 4026.

Observations in yard W of Steamship Office. Mercury Horizon

2 Alt \odot Chron

Index Corr.

97 0 36.5

off arc. On arc

W.U. ob.

96 50 58

359 27 30 } app 0 31 30 } app

40 20.5

40 }

30 }

96 30 7 24 43.5

20 } app.

60 }

96 45 7 24 9.62

30 }

60 }

 \odot

359 27 30 0 31 45

97 0 57

359 59 38

96 50 18

+ 22 = Index Corr.

40 39

96 30 7 27 1.5

96 45 7 26 28.88

John Bergelund ob. W.U. at chron.

 \odot

87 30 7 44 6

10 44 48

86 50 45 31

87 10 7 44 48.53 \odot

86 30 7 48 30.5

Reduction on p. 128

86 10 49 12

86 20 7 48 51.25

W.U. ob.

 \odot

64 0 54.5

63 40 37

63 20 8 35 18.5

63 40 8 34 36.67 \odot

64 0 8.5

63 40 50.5

63 20 8 37 32.5

63 40 8 36 50.50

Mar. 14/97 am. Desaguadero Bolivia.

Attempted observations at same altitudes as yesterday p.m., but clouds prevented.

| 2 alt \odot | chm 4026 | | W.U. ob. |
|----------------------|-----------|-------------|-------------------|
| 66 0 | 45 | Off arc. | On arc. |
| 66 20 | 27.5 | 359 27 30 | 0 32 0 |
| 66 40 | 1 1 10 | 28 0 | 31 50 |
| 66 20 | 1 0 27.50 | 28 0 | 31 30 |
| 66 40 ⁽¹⁾ | 1 3 25.5 | 27 40 | 31 40 |
| 67 0 | 8 | 359 27 47.5 | 0 31 45 |
| 67 20 | 4 50 | 359 59 46. | |
| 67 0 | 1 4 7.83 | | +14 = Index Corr. |

| | | |
|----------|------------|-------------------|
| 87 48 10 | 1 48 22 | J.B. ob. W.U. chm |
| 88 0 50 | 48 48 | |
| 87 54 30 | 1 48 35.00 | |

Red to middle, adding internal 11.1 from differences 33.3
 W.U. ob. yesterday from and this am.
 21.5
 22.5
 23
 22
 22.2
 11.1
 33.3

| | | |
|-------|-----------|------------------------------|
| 96 30 | 6.5 39.8 | Same alt. as yesterday p.m., |
| 40 | 28.5 39.6 | but images poor, seen thru |
| 50 | — | clouds. |
| 97 0 | 2 8 11 | 37.7 |
| 96 45 | 2 7 39.03 | |

Reduction p. 128

| 2 alt \bar{O} | Chrom. | W. obs. |
|-----------------|------------------|------------|
| 98 40 | 29.5 | Sun clear. |
| 99 0 | 15 | |
| <u>99 20</u> | <u>2 10 58.5</u> | |
| 99 0 | 2 10 14.33 | |

O

| | |
|--------------|----------------|
| 98 40 | 49 |
| 99 0 | 33.5 |
| <u>99 20</u> | <u>2 13 16</u> |
| 99 0 | 2 12 32.83 |

Reduction of set above by equal altitudes.
for midnight

Chauvenet I, 202

Mar. 13 pm 7 24 9.6

$$\Delta T_0 = \frac{\Delta' \delta t \tan \phi}{15 \sin t} + \frac{\Delta' \delta t \tan \delta}{15 \tan t}$$

" 14 am 2 7 39.0

2t 18 43 29.4

$$A = -\frac{t}{15 \sin t} \quad B = \frac{t}{15 \tan t}$$

T₀ 16 45 54.3

$$\Delta T_0 = -A \Delta' \delta \tan \phi + B \Delta' \delta \tan \delta$$

At local midnight, assuming long. $4^h 36^m 20^s$ W. or $31^m 52^s$ E of Wash.

 $\delta = -2^\circ 25' 43''$ $\Delta \delta = 59''.15$ lat $-16^\circ 33'.5$

log -A 9.9912

" tan ϕ 9.47322 nT₀ 16 45 54.30" $\Delta' \delta$ 1.77195 ΔT_0 -15.³⁵₄" tan δ 8.62750 nChrom. ^{app} Mid. 16 45 38.95

" B 9.8782 n

Mean ^{app} 12 9 18.71" Σ_1 1.2364 n

Chrom Corr. 4 36 20.24 at app. midnight

 Σ_2 0.2776Sh₁ -17.24Sh₂ + 1.89 ΔT_0 -15.35

Mar. 13/97 Desaguadero
local M.T.

Mar. 17/97

Sextant for Time

Bliss PTF 4026

1 29 24.5 75 0

30 8 20

4026

1131

30 50 40

1-56-0 = 8.55 52.75

1 31 32.5 76 0

1 30 28.75

33 7 75 40

0 43 30

359 39 0

33 49.5 76 0

40

20

34 31 20

30

10

1 35 14 76 40

30

28.20

1 34 10.38

for

14 39 76 40

15 23 20

16 5.5 0

8 16 48.5 75 40

8 15 44.00

18 22 76 0

19 45 75 40

19

adopt 47.5 49 2, clouds 20

8 20 30.5 " 0

8 19 26.12

Reduction.

T' 8 15 44.00 8 19 26.12

Chaur. I, 199

T 1 34 10.38 1 30 28.75

$$\Delta T_0 = A \Delta' \delta \tan \varphi + B \Delta' \delta \tan \delta$$

Δ 6 41 33.62 6 48 57.37

$$\delta = -1 \ 2 \ 35 = 3755''$$

T⁰ 4 54 57.19 4 54 57.44

$$\Delta' \delta = +59.25$$

$$\varphi = -16 \ 22 \ 28$$

log A ⁴⁶³⁰ 9.4363 n 9.4652 n

" tan φ 9.46811 n 9.46811 n

" $\Delta' \delta$ 1.77269 1.77269
3.57641 n 3.57641 n

" tan δ 4.68557 4.68557

" B 9.2693 9.2629

Σ_1 0.7038 0.7060

Σ_2 9.3040 n 9.2976 n

N_1 +5.06 +5.08

N_2 - .20 - .20

ΔT_0 +4.86 +4.88 Mean

Chaut app. nom 4 54 62.05 62.32 62.18

Mean " " 12 8 17.84

Chaut Corr. ^h 4 ^m 46 ^s 44.34 at app. nom = 12.08 M.J.

Reduction by Single Altitudes Sextant Observations at Desaguadero, Mar. 13, 14/97 pp. 123, 124.

$$\text{Chaur. I, 210} \quad \tan \frac{1}{2}t = \sqrt{\frac{\sin(s-q) \sin(s-\delta)}{\cos s \cos(s-l)}} \quad S = \frac{1}{2}(l+q+\delta)$$

Mar. 13 pm

| | | | | | | |
|----------------------|-----------|------------|-----------|-----------|-----------|-----------|
| Mean Chron. | 7 24 9.6 | 7 26 28.9 | 7 44 48.3 | 7 48 51.2 | 8 34 36.7 | 8 36 50.5 |
| p. 132 | 8 33 | 8 33 | 8 33 | 8 33 | 8 33 | 8 33 |
| Appr. Corr. Wash T. | 5-21 39 | 5-21 39 | 5-21 39 | 5-21 39 | 5-21 39 | 5-21 39 |
| Wash M.T. | 2 15.6 | 2 17.9 | 2 36.3 | 2 40.3 | 3 26.1 | 3 28.3 |
| | +2.26 | +2.30 | +2.60 | +2.67 | +3.44 | +3.47 |
| S | -2 34 52 | 34 50 | 34 32 | 34 28 | 33 42 | 33 41 |
| S | 16 7 | | | | | |
| π | 8.9 | | | | | |
| Eg. g Time | 9 25.2 | 25.2 | 25.0 | 24.9 | 24.4 | 24.4 |
| 2 Alt | 96 45 0 | 96 45 0 | 87 10 0 | 86 20 0 | 63 40 0 | 63 40 0 |
| Index Corr. | +22 | +22 | +22 | +22 | +22 | +22 |
| Σ | | | | | | |
| h | 48 22 41 | 48 22 41 | 43 35 11 | 43 10 14 | 31 50 11 | 31 50 11 |
| Z | 41 37 19 | 41 37 19 | 46 24 49 | 46 49 49 | 58 9 49 | 58 9 49 |
| b table | +31 | +31 | +37 | +37 | +56 | +56 |
| p | -6 | -6 | -6 | -6 | -6 | -6 |
| l | -16 7 | +16 7 | -16 7 | +16 7 | -16 7 | +16 7 |
| q | 41 21 37 | 41 53 51 | 46 9 13 | 47 6 27 | 57 54 32 | 58 26 48 |
| δ | -16 33 30 | -16 33 30 | -16 33 30 | -16 33 30 | -16 33 30 | -16 33 30 |
| S | -2 34 52 | -2 34 50 | -2 34 32 | -2 34 28 | -2 33 42 | -2 33 41 |
| Σ | 22 13 15 | 22 45 31 | 27 1 11 | 28 58 29 | 38 47 29 | 39 19 35 |
| s | 11 6 38 | 11 22 46 | 13 30 36 | 13 59 14 | 19 28 40 | 19 39 48 |
| s-q | -5 26 52 | -5 10 44 | -3 2 54 | -2 34 16 | +2 50 10 | 3 6 18 |
| s-d | 27 40 8 | 27 56 16 | 30 4 6 | 30 32 44 | 35 57 10 | 36 13 17 |
| s-l | 13 41 30 | 13 57 35 | 16 5 6 | 16 33 42 | 21 57 22 | 22 13 28 |
| s-l | -30 14 59 | -30 31 5 | -32 38 37 | -33 7 13 | -38 30 51 | -38 46 58 |
| log sin(s-q) | 9.66685 | 9.67072 | 9.69986 | 9.70606 | 9.76873 | 9.77152 |
| " "(s-d) | 9.37419 | 9.38246 | 9.44259 | 9.45491 | 9.57275 | 9.57777 |
| " sec s | 822 | 862 | 1219 | 1307 | 2537 | 2609 |
| " sec(s-l) | 6357 | 6476 | 7465 | 7700 | 10655 | 10817 |
| Σ | 9.11283 | 9.12656 | 9.22929 | 9.25104 | 9.47340 | 9.48355 |
| " tan $\frac{1}{2}t$ | 9.55642 | 9.56328 | 9.61464 | 9.62552 | 9.73670 | 9.74178 |
| $\frac{1}{2}t$ | 19 48.22 | 20 5.62 | 22 22.78 | 22 53.37 | 28 36.43 | 28 53.40 |
| t | 39 36.44 | 40 11.24 | 44 45.56 | 45 46.74 | 57 12.86 | 57 46.80 |
| | 264 | 144 | 33.6 | 44.4 | 51.6 | 48.0 |
| App. t | 2 38 25.8 | 2 40.45.0 | 2 59 42.2 | 3 3 7.0 | 3 48 51.4 | 3 51 7.2 |
| M.T. approx | 12 9 25.2 | 9 25.2 | 9 25.0 | 9 24.9 | 9 24.4 | 9 24.4 |
| Mean t. | 2 24 56.0 | 2 31 19.8 | 2 48 37.2 | 2 53 42.1 | 3 39 27.8 | 3 41 42.8 |
| Chron. | 7 24 9.6 | 7 26 28.9 | 7 44 48.3 | 7 48 51.2 | 8 34 36.7 | 8 36 50.5 |
| Corr. | -4 55 9.0 | -4 11 18.7 | 21.1 | 193 | 20.9 | 18.9 |
| | 18.6 | | 20.2 | | 19.9 | |

a.m.
Mar. 14 ~~pm~~

| | | | | | | |
|----------------------|--|--------------------|------------------------|--------------------|---------------------------|-----------------------|
| Mean Chrm. | 1 0 27.5 | 1 4 7.8 | 1 48 35.0 | 2 7 39.0 | 2 10 14.3 | 2 12 32.8 |
| Appr. Corr. Wash. T. | ^{1.132} -5 ⁸ 36 | -5 ⁸ 36 | -5 ⁸ 36 | -5 ⁸ 36 | -5 ⁸ 36 | -5 ⁸ 36 |
| Wash M. T. | 19 51.9 | 19 55.5 | 20 40.0 | 20 59.0 | 21 1.6 | 21 3.9 |
| | -4.14 | -4.08 | -3.33 | -3.02 | -2.97 | -2.94 |
| 2 Act. | 66 20 0 | 67 0 0 | 87 54 30 | 96 45 0 | 99 0 0 | 99 0 0 |
| Index | ⁺¹⁴ | | | | | |
| h | 33 10 7 | 33 30 7 | 43 57 22 | 48 22 37 | 49 30 7 | 49 30 7 |
| z | 56 49 53 | 56 29 53 | 46 2 38 | 41 37 23 | 40 29 53 | 40 29 53 |
| r | ⁺⁵³ | ⁺⁵³ | ⁺³⁶ | ⁺³¹ | ⁺³⁰ | ⁺³⁰ |
| p | - 7 | - 7 | - 6 | - 6 | - 6 | - 6 |
| s | +16 7 | -16 7 | +16 7 | -16 7 | +16 7 | -16 7 |
| l | 57 6 46 | 56 14 32 | 46 19 15 | 41 21 41 | 40 46 24 | 40 14 10 |
| q | -16 33 30 | -16 33 30 | -16 33 30 | -16 33 30 | -16 33 30 | -16 33 30 |
| δ | -2 17 22 | -2 17 18 | -2 16 34 | -2 16 16 | -2 16 13 | -2 16 13 |
| Σ | 38 15 54 | 37 23 44 | 27 29 11 | 22 31 55 | 21 56 41 | 21 34 29 |
| S | 19 7 58 | 18 41 52 | 13 44 36 | 11 15 58 | 10 58 20 | 10 42 14 |
| s-q | 35 41 27 | 35 15 22 | 30 18 6 | 27 49 28 | 27 31 50 | 27 15 44 |
| s-δ | 21 25 19 | 20 59 10 | 16 1 10 | 13 32 14 | 13 14 33 | 12 58 25 |
| s-l | -37 58 ⁴⁹ 32 | -37 32 40 | -32 34 39 | -30 5 43 | -29 ^{48 4} 35 10 | -29 31 56 |
| log sin(s-q) | 9.76598 | 9.76135 | 9.70290 | 9.66910 | 9.66485 | 9.66093 |
| " (s-δ) | 9.56254 | 9.55406 | 9.4408 ⁵ | 9.36937 | 9.35998 | 9.35122 |
| " sec A | 2468 | 2354 | 1262 | 845 | 801 | 762 |
| " sec(s-l) | 10335 | 10079 | 7434 | 6289 | 6160 | 6045 |
| Σ | 9.45655 | 9.43974 | 9.2308 ¹ | 9.10981 | 9.09444 | 9.08022 |
| " tan ¹ t | 9.72828 | 9.71987 | 9.61536 | 9.55490 | 9.54722 | 9.54011 |
| ¹ t | 28 8.57 | 27 41.03 | 22 24.7 ⁸ | 19 44.40 | 19 25.20 | 19 7.66 |
| t | 56 17.14 | 55 22.06 | 44 49.44 ⁵⁶ | 39 28.80 | 38 50.40 | 38 15.32 |
| | ^{8.4} | ^{3.6} | ^{26.433.6} | ^{48.0} | ^{24.0} | ^{19.2} |
| App t | 3 45 8.6 | 3 41 28.2 | 2 59 18.2 ² | 2 37 55.2 | 2 35 21.3 ^{21.6} | 2 35 1.3 ³ |
| M. T. approm | 12 9 12.8 | 12 9 12.7 | 12 9 12.2 | 12 9 12.0 | 12 9 11.9 | 12 9 11.9 |
| Mean t | 20 24 4.2 | 20 27 44.5 | 21 9 54.4 ⁰ | 21 31 16.8 | 21 33 50.3 | 21 36 10.6 |
| Chrm | 1 0 27.5 | 1 4 7.8 | 1 48 35.0 | 2 7 39.0 | 2 10 14.3 | 2 12 32.8 |
| corr. | 4 36 23.3 | 23.3 | 38 41.0 | 4 36 22.2 | 36 24.0 | 22.2 |
| Meanst corresp. | 23.3 | | | | 23.2 | |
| corr. prec. from | 19.9 | | | 18.6 | 18.6 | |
| | 21.6 | | | 20.4 | 20.4 | |

Adopt for Corr. Mar. 13 app Midnight = 13^d 12^h 9^m -4 36 21.0

+55.7
-93.1
-37.4
-9.4
+ .86
+ .35
- .51

Mar. 17/97

8 30
β Can Min 34.7 58.4 32.7 2 Can Min 30.5 31
32.3 31.9 30.5 31
43 56.2 51.2 54.3
53.2 8.5 1.6 6.2
3.7 20.7 12 18
7 25 14.3 33 22.5 29.7
45.2 32.8 41.4
32 9.6 37 53.7 43 5

7 24 53.30 31 20.73 37 12.04 42 17.94
Red 58.00 5.77 4.71 3.74 2.91
7 24 47.53 31 16.02 37 8.30 42 15.03
7 21 35.99 28 4.29 33 56.72 39 3.31
0 3 11.54 3 11.63 11.58 11.72
.46 -.39 -.46 -.40
.92 .78 .93 .81

| | Δa | C_c | Σ | ΔT |
|---|------------|-------|----------|-------------|
| 0 = 3 11.08 + ΔT + .43a + 1.01c | - .17 | - .02 | - .19 | - 3 10.89 |
| 11.24 + .88 + 1.18 | - .34 | - .02 | - .36 | .88 |
| 11.12 + .37 + 1.00 | - .14 | - .02 | - .16 | .96 10.93 |
| 11.32 + .80 + 1.14 | - .31 | - .02 | - .33 | .99 |
| 11.11 + .77 - 1.12 | - .30 | + .02 | - .28 | .83 |
| 11.16 + .59 - 1.05 | - .23 | + .02 | - .21 | 10.95 |
| 11.19 + .44 - 1.01 | - .17 | + .02 | - .15 | 11.04 10.97 |
| 9.30 - 3.92 - 4.50 | + 1.53 | + .09 | + 1.62 | 10.92 |
| 11.13 + .22 - 1.00 | - .29 | + .02 | - .07 | 11.06 |

- 3^m 10.95

cl 2.

+90.8
-55.4
+35.4
+ 8.8
+.80
-.35
+.45

+ .45
+.31
+ .38 adopt

-60.1
+89.0
+28.9
+ .72 +.66
- .35 - .35
+ .37 + .31

131

57.8 33.0

15.2 40.2
q Σ 27 2

40.2

3.4

14.8

26.5

38.2

49.7

7 51 13.0

50 26.54

-1.57

50 24.97

47 14.17

3 10.80

+.31

.82

w' Cameri

17 57
4' Cameri

46.5

8.2

19.2

30.2

40.8

51.7

rej. 8 10 13.3

8 9 79.99

+1.56

8 9 31.55
~~28.43~~

6 20.72

10.83

+.33

.87

9 30
 β Cameri

24.5

45.7

56

6.7

17.2

27.5

14 48.3

14 6.56

2.32

8 8.88
~~4.24~~

10 58.04

10.84

+.35

.91

17.1 43.0

57.5 31.5

-77.9

D Cham.

49.3

49.2

49.2

49.4

49.3

48.7

49.1

49.6

49.1

49.0

26 49.19

23 45.12

8.47

2.19

-3 34

30 Howe

58.3

19

29.3

39.7

50

0.5

26.5 24 21.3

30 58 23 39.73

28.54

59.55

20 32.96

10.66

+.37

.98

$$0 = 11.19 + \Delta T + .62a + 1.08c$$

$$8 \ 0 \ 0 \quad 8 \ 3 \ 44.5 \quad 8 \ 5 \ 49.25$$

$$= 11.15 + \Delta T + .60a - 1.06c$$

$$-3 \ 10.95 \quad 13 \ 24.29 \quad 13 \ 24.29$$

$$= 9.30 + \Delta T - 3.92a - 4.50c$$

$$7 \ 56 \ 49.05 \quad 8 \ 17 \ 8.79 \quad 8 \ 19 \ 13.54$$

$$0 = 0.04 + .02a + 2.14c$$

$$23 \ 42 \ 3.71 \quad 1 \ 21.67 \quad 13 \ 6 \ 0$$

$$c = -.02$$

$$8 \ 14 \ 45.34 \quad 23 \ 42 \ 3.71 \quad -4 \ 46 \ 46.46$$

$$0 = 1.85 + 4.52a + 3.44c$$

$$1 \ 21.05 \quad 8 \ 0 \ 34.17 \quad \text{Chrom. 4026}$$

$$4.52a = -1.78$$

$$8 \ 13 \ 24.29 \quad 7 \ 57 \ 25$$

$$a = -.39$$

$$+13 \ 24.29 \quad +3 \ 9.17$$

$$\text{Chrom 1131} \quad \text{Bid. clock}$$

Chronometer Parkinson & Fodsham 4026

Taken from Desaguadero Bolivia March 14/97 at request of John Bergelund, for regulation on Greenwich Time, and to determine longitude of Desaguadero.

Mar. 8/97 Started chronometer by pocket watch, assuming the watch to be nearly on Arequipa local mean time.
Comparisons with watch.

| | Chron 4026 | | | | Watch. | | | | Δ | | |
|--------|------------|----|----|---|--------|----|----|--|----------|----|----|
| | h. | m. | s. | = | h. | m. | s. | | h. | m. | s. |
| Mar. 8 | 2 | 49 | 0 | | 10 | 4 | 9 | | 4 | 44 | 51 |
| 8 | 12 | 19 | 0 | | 7 | 34 | 6 | | 54 | | |
| 8 | 23 | 17 | 0 | | 18 | 32 | 4 | | 56 | | |
| 12 | 9 | 9 | 0 | | 4 | 24 | 2 | | 58 | | |
| 12 | 3 | 56 | 0 | | 22 | 11 | 4 | | 56 | | |
| 14 | 1 | 18 | 0 | | 20 | 33 | 1 | | 59 | | |
| 15 | 1 | 42 | 0 | | 20 | 57 | 3 | | 57 | | |

Watch is

about 2^m fast

of Arequipa city

time, and long.

of city is about

$$\begin{array}{r} \text{h.} \quad \text{m.} \quad \text{s.} \\ 4 \quad 46 \quad 12 \end{array}$$

17 12 24

17 Chron 1131 $\begin{array}{r} \text{h.} \quad \text{m.} \quad \text{s.} \\ 12 \quad 44 \quad 0 \end{array} = 12 \quad 59 \quad 4$
 $+ 13 \quad 24$
 12 57 24

Watch 1^m 40^s fast.

19 Chron 1131 $\begin{array}{r} \text{h.} \quad \text{m.} \quad \text{s.} \\ 8 \quad 59 \quad 0 \end{array} = 9 \quad 14 \quad 9$
 $+ 13 \quad 27$
 9 12 27

1 42 "

on Wash. Time

\therefore approx corr. of chron Mar. 13 pm on Areq. M. 7. is $-4 \quad 46 \quad 33 = \begin{array}{r} \text{h.} \quad \text{m.} \quad \text{s.} \\ 4 \quad 46 \quad 33 \end{array}$

14 am. " " " $-4 \quad 46 \quad 36 = \begin{array}{r} \text{h.} \quad \text{m.} \quad \text{s.} \\ 4 \quad 46 \quad 36 \end{array}$

Correction + Rate at Arequipa Obs.

| 1897 | Local Time | ΔT | | |
|---------|------------|------------|-------|-------------------------|
| Mar. 17 | 8.13 pm | -4 | 46 | 46.46 Transit obs. |
| 18 | 8.57 am. | | 49.1 | Comp. with Chron. 1131. |
| 20 | 11.54 am. | | 58.0 | |
| 22 | 2.07 pm | 47 | 11.7 | |
| 23 | 9.26 p.m. | | 18.48 | Transit obs. |
| 30 | 12.32 p.m. | | 50.90 | " " |
| Apr. 5 | 10.06 pm. | 48 | 20.58 | -5.03 |
| 6 | 8.16 p.m. | | 25.31 | -5.14 |
| 7 | 11.32 p.m. | | 31.19 | -5.20 |

| | | | | | |
|--------|----------|----|----|------|-------|
| May 10 | 9.53 pm. | -5 | 16 | 51.5 | |
| 13 | 7.50 " | | | 43.9 | +2.60 |
| 14 | 7.50 " | | | 41.0 | +2.9 |
| 15 | 8.00 " | | | 37.9 | +3.1 |
| 18 | 8.31 " | | | 28.2 | +3.2 |

Mar. 22/97

Sextant for June

Chm 4026

A

| | | | |
|---|--------------|----------------|-------|
| | 35.5 | $7\frac{0}{8}$ | 0 |
| | 18 | | 20 |
| | 1.5 | | 40 |
| 1 | <u>22 44</u> | $7\frac{1}{8}$ | 0 |
| 1 | 21 | | 39.75 |

B

| | | | |
|---|----------------|----------------|-------|
| | 18.5 | $7\frac{6}{8}$ | 40 |
| | 2.5 | | 0 |
| | 44.5 | | 20 |
| 1 | <u>26 28.5</u> | $7\frac{1}{8}$ | 40 |
| 1 | 25 | | 23.50 |

A

| | | | |
|----|----------------|----|----|
| | 3 | 71 | 20 |
| | 45 | | 0 |
| 23 | 28 | 70 | 40 |
| 8 | <u>24 10.5</u> | | 20 |
| 23 | 6.62 | | |
| | -42.92 | | |
| 22 | 23.70 | | |

partly cloudy

B

| | | | |
|---|----------------|----|------|
| | 3.5 | 71 | 0 |
| | 44.5 | 70 | 40 |
| 8 | <u>27 28.5</u> | | 20 |
| | 9 | 70 | 0 |
| 8 | 26 | | 6.38 |

Reduction

135

| | | | | | | | |
|----------------|-------------------------------|----|-------|-------------------------------|----|-------|------------------------------|
| T' | 8 | 22 | 23.70 | 8 | 26 | 6.38 | $\delta + 0.55.51 = 33.51''$ |
| T | 1 | 25 | 23.50 | 1 | 21 | 39.75 | $\Delta\delta + 59.12$ |
| Δ | 6 | 57 | 0.20 | 7 | 4 | 26.63 | $\phi - 16.22.28$ |
| T ₀ | ⁴ 12 | 53 | 53.60 | ⁴ 12 | 53 | 53.06 | |

| | | | | | | |
|--------------------|-------------------------------|-------|---------------------------|--|----|-------|
| log A | 9.4676 | n | n | 9.4699 | n | n |
| " tan ϕ | 9.46810 | n | | ^{9.46} 8.94810 | n | |
| " $\Delta\delta$ | 1.77173 | | | 1.77173 | | |
| " tan δ | 3.52517 | | | 3.52517 | | |
| | 4.68555 | | | 4.68555 | | |
| " B | 9.2557 | | | 9.2488 | | |
| Σ | 0.7074 | | | ⁷⁰ 0.1897 | | |
| Σ | 9.2382 | | | 9.2313 | | |
| N ₁ | +5.09 | | | +5.12 | | |
| N ₂ | + .17 | | | + .17 | | |
| ΔT_0 | | +5.26 | | +5.29 | | |
| Chron. t. app. nom | ⁴ 12 | 53 | 58.86 | ⁴ 12 | 53 | 58.35 |
| Meant " " | 12 | 6 | ^{58.60} 48.57 | | | |
| Chron Corr. | 4 | 47 | 11.73 | Mar. 22 app. nom | | |
| | | 46 | 44.34 | 17 " " | | |
| | | | 27.39 | Δ | | |
| | | | 5.48 | Daily rate | | |
| | | | 19.22 | Red. to Mar. 13 app. Mid. Desaguadero Time | | |
| 4 | 46 | 25.1 | | { Corr. of Chron. on | | |
| | | | | Reg. time Mar. 13. " " | | |
| 4 | 36 | 20.9 | | Corr. on Des. J. " " | | |
| | 10 | 4.2 | | Δ Long | | |
| 4 | 46 | 12 | | Measured Long. Acquila City | | |
| 4 | 36 | 8 | | Approx " Desaguadero | | |

Mar. 23/97

Drafer Transit

| | | | | | | | | | | |
|-------|----------------|-------------------|------------------|-----------------|------------------|-------|-------|------|------|-------|
| 33.3 | 1.8 | 33.6 | 1.9 | 1.7 | 33.3 | -38.0 | -5.07 | 1.9 | 33.7 | -35.6 |
| 1.0 | 32.6 | 0.7 | 32.3 | 32.8 | 1.2 | +34.0 | -0.09 | 23.1 | 1.2 | +34.3 |
| | | | | | | -1.22 | -0.08 | 6 | 48 | -1.3 |
| Cl. W | β Cancri | θ Chamaele | ϵ Hydne | γ Cancri | ϵ Hydne | | | | | |
| 48.9 | 7 | 58 | 44 | 5.3 | 48.9 | 58.7 | 0.5 | | | |
| 4 | 59 | 51.5 | | | 15 | 15.7 | | | | |
| 18.7 | 80 | 56.5 | 35 | 50.2 | 30.5 | 30.3 | | | | |
| 34 | 2 | 3.5 | 49.5 | 49.8 | 46.7 | 45.3 | | | | |
| 48.9 | 3 | 8 | 9.4 | 4.7 | 50.1 | 2.8? | 0.4 | | | |
| 4.3 | 4 | 15 | 9.3 | 19.7 | 50.1 | 18.8 | 15.3 | | | |
| 7 | 51 | 20 | 5 | 22.3 | 9.1 | 13 | 35.5 | 50.1 | 17 | 36 |
| | 6 | 33 | 8.7 | | | | 21 | 31.2 | | |

Ruler 8.30

| | | | | | | | | |
|----|----|-------|----|-------|----|-------|----|-------|
| 8 | 3 | 9.12 | 12 | 50.03 | 16 | 46.93 | 20 | 45.53 |
| | | -4.41 | | -2.82 | | -2.17 | | -1.52 |
| 8 | 3 | 4.71 | 12 | 47.21 | 16 | 44.76 | 20 | 44.01 |
| 8 | 23 | 44.59 | 33 | 24.83 | 37 | 22.13 | 41 | 21.64 |
| 23 | 39 | 20.12 | | 22.38 | | 22.63 | | 22.37 |
| | | -1.18 | | -0.08 | | -0.07 | | -0.07 |
| | | 2.20 | | .94 | | .85 | | .93 |

Aa Cc Σ ΔT

| | | | | | | | |
|-----------|--------------|---------|---------|--------|-------|--------|-----------|
| 0 = 19.94 | + ΔT | - 3.93a | + 4.50c | + 1.77 | + .58 | + 2.35 | 22.29] |
| 22.30 | | + .34 | + 1.00 | - .15 | + .13 | - .02 | .28 |
| 22.56 | | + .66 | + 1.08 | - .30 | + .14 | - .16 | .40 22.31 |
| 22.30 | | + .40 | + 1.01 | - .18 | + .13 | - .05 | .25 |
| 22.16 | | - 2.26 | - 2.83 | + 1.02 | - .37 | + .65 | .81 22.82 |
| 23.01 | | + .14 | - 1.01 | - .06 | - .13 | - .19 | .82 |
| | | | | | | | 22.56 |

$$0 = 22.39 + \Delta T + .47a + 1.03c$$

$$\begin{aligned}
 0 &= 2.45 + 4.40a - 3.47c \\
 &= 0.85 + 2.40a + 1.82c \\
 &= 1.53 + 4.32a + 3.28c \\
 &= 1.56 + 4.41a + 3.35c \\
 &= 0.89 - 6.82c \quad c = +.13 \\
 4.40a &= -2.00 \quad a = -.45
 \end{aligned}$$

| | | | | | | | | |
|--------------------|--------|-------|----------|-------|-------|--------------|------------|--|
| 1.5 | 33.8 | -35.3 | 1.6 | 33.5 | -35.1 | -0.06 | | |
| | | +34.6 | | | +34.6 | -0.03 | | |
| 33.3 | 1.3 | -0.7 | 33.3 | 1.3 | -0.5 | -0.04 adft. | | |
| | -69 | 18 | | -8 | 13 | 1131 | WBC | |
| cl 2 β Hygro | | | 2 Hydrae | | | | 4026 | |
| 49 | 15.5 | | 5.2 | 51.1 | | 9 12 20 = 2 | [13] 6.9 | |
| 50 | 0.5 | | - | | | 50 = | 36.9 | |
| 50 | 43 | | 36.2 | 50.9 | | 9 17 39 | 9 34-55 | |
| 51 | 25.5 | | 51 | 50.7 | | | | |
| 52 | 8 | | 6 | 50.6 | | | | |
| 52 | 49 | | 20.8 | 50.9 | | 8 30 0 | 9 17 39 | |
| 53 | 31.5 | | 9 7 | 35.8 | 50.8 | -23 39 22.56 | 13 28.42 | |
| | | | | | | 8 50 37.44 | 9 31 7.42 | |
| 51 | 24.71 | | 6 | 50.83 | | 0 5 43.03 | 1 33.82 | |
| | + 3.52 | | | 6.05 | | 8 44 54.41 | 0 5 43.03 | |
| 51 | 28.23 | | 6 | 56.88 | | 1 25.99 | 9 38 24.27 | |
| 12 | 6.00 | | 22 | 33.83 | | 43 28.42 | 34 55 | |
| | 22.23 | | | 23.05 | | 13 28.42 | 3 29.27 | |
| | -0.07 | | | -0.04 | | | | |
| 1.71 | | | 1.00 | | | | | |
| | | | | | | 9 12 20 | | |
| | | | | | | 9 25 48.42 | | |
| | | | | | | 2 8 6.9 | | |
| | | | | | | 4 [47] | | |
| | | | | | | 42 18.48 | | |

Drafer Transit

Mar. 30/97

Cl. E

$\begin{matrix} +37.0 & +.27 & -33.8 \\ 35.0 & 2.0 & -33.5 & +.15 & 0.3 & 33.5 & +35.8 \\ & +3.5 & & +.21 = 6 & & & +2.0 \\ & +.9 & & & & & +.5 \end{matrix}$
 $\begin{matrix} (1.3) & 34.5 \\ 0.8 & 33.8 \end{matrix}$

0.2 33.3

34.5 1.3

cl W

\vee Urs. Maj. τ Leonis ξ Hydrae β Leonis π Uing

24.2

19.7

6.2

43

35.9

21.4

1

59.7 16.8

51.4

36.2

19

17.3 16.9

7

51

37

15.3 0.1

34.5 16.7

22.4

6.2

54.3

29.8 0.2

51.7 17.1

37.3

21.2

10 25 12.3

34 44.7 0.1

40 9.2 17.0 55

52.9

36.5

10 24 18.69

34 0.13

39 16.90

55 6.66

6 51.29

Rel. to 11.30 -10.79

-9.20

-8.33

-5.73

-3.80

24 7.90

33 50.93

39 8.57

55 0.93

6 47.49

11 12 58.42

22 41.12

27 58.65

43 51.26

55 38.44

23 11 49.48

9.81

9.92

9.67

9.05

+.16

+.20

+.24

+.18

+.08

.77

.94

1.13

.88

.92

 γ Virginis 25.7

52.4

26.7

by signals of

36

2.4

26.4

8.9.13 observing

on Rogers Transit

46.5

12.7

26.2

to be compared

with WBC on

57

23.1

26.1

clm 4026

17.3

43.6

26.3

I

48 31.2

57.7

26.5

Aa

Ca

 Σ ΔT

$0 = 9.64 + \Delta T + .92a - 1.20c + 3.22 - .80 + 2.42 \quad 12.06$

$10.01 \quad +.34 \quad -1.00 \quad +1.19 \quad -.67 \quad +.42 \quad 10.43$

$10.16 \quad -.30 \quad -1.17 \quad -1.05 \quad -.78 \quad -1.87 \quad 8.29 \quad 10.46$

$9.85 \quad +.54 \quad -1.04 \quad +1.89 \quad -.70 \quad +1.19 \quad 11.04$

$9.13 \quad +.40 \quad +1.01 \quad +1.40 \quad +.68 \quad +2.08 \quad 11.21$

$9.01 \quad +.44 \quad +1.01 \quad +1.54 \quad +.68 \quad +2.22 \quad 11.23$

$10.38 \quad -.11 \quad +1.08 \quad -.38 \quad +.72 \quad +.34 \quad 10.72 \quad 10.01$

$23.72 \quad -4.55 \quad +5.13 \quad -15.92 \quad +3.44 \quad -12.58 \quad 11.14$

$10.13 \quad +.01 \quad +1.04 \quad +.04 \quad +.70 \quad +.74 \quad 10.87 \quad 9.40$

$9.37 \quad +.20 \quad -1.00 \quad +.70 \quad -.67 \quad +.03 \quad 9.40 \quad 10.29$

$$12 \ 22 \ 32.5 = 13 \ 8 \ 40 \mid 12 \ 17 \ 30 = 17 \ 18 \ 56.4 \quad 139$$

$$18 \ 13.7 \quad 19 \ 40$$
[illegible]

| | | | | | | | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|---------------------------------|-----|-------|----|------|-------|
| 11 | 12.58 | 16 | 47.84 | 23 | 48.43 | 35 | 4 ⁴ 3 .00 | 15 | 41.50 | 12 | 22 | 32.5 |
| -3.09 | -2.29 | -1.02 | +0.94 | +7.51 | 12 | 36 | 7.95 | +13 | 35.45 | | | |
| 11 | 9.49 | 16 | 2.55 | 23 | 47.41 | 35 | 44.94 | 15 | 49.01 | 2 | 4.21 | |
| 0 | 0.56 | 4 | 52.27 | 12 | 23.90 | 24 | 34.90 | 4 | 39.70 | 0 | 33 | 18.90 |
| 8.93 | 10.28 | 23.51 | 10.04 | 9.31 | 13 | 11 | 31.06 | | | | | |
| +0.08 | +2.2 | +2.2 | +2.2 | +0.06 | 8 | 40 | | | | | | |
| .94 | 1.07 | 2.38 | 1.04 | .98 | 2 | 51.06 | | | | | | |
| S. Hines | | | | | [3] | | | | | | | |

| δ <i>muscae</i> | | | Δ | | | Π | | | |
|------------------------|-------------------|--------------|----------|--|--|-------|--|-------------|-----|
| 1131 by signals | 9 ⁵⁹ B | ch. w. b. c. | | | | | | | [3] |
| 13.8 | 6 | 40.2 | 26.4 | $0 = 0.52 \Delta T + 0.22a + 0.3c$ $0 = 10.08 + \Delta T + 0.22a - 1.08c$ $= 10.38 + \Delta T - 0.55a + 1.06c$ $= 0.18 - 0.07a + 2.14c$ | | | | | |
| 5 45.5 | 7 | 11.6 | 26.1 | $c = +0.08$ 10 Mar. 23d $a = +.45$ $a' = +3.03$ | | | | 12 17 30 | |
| 6 17.7 | 7 | 44.0 | 26.3 | | | | | 13 35.45 | |
| 49.2 | 8 | 15.8 | 26.6 | | | | | 12 31 5.45 | |
| | | | | | | | | 17 18 56.4 | |
| | | | | | | | | 4 47 50.95 | |
| 7 21 | 8 | 47.6 | 26.6 | $\Delta a \quad \Delta c \quad \Sigma \quad \Delta T$ | | | | 12 18 13.7 | |
| 25 | 9 | 51.2 | 26.2 | $+41 \quad -12 \quad +29 \quad 9.93$ $+15 \quad -10 \quad +05 \quad 10.06$ | | | | 13 35.45 | |
| | | | | | | | | 12 31 49.15 | |
| | | | | | | | | 17 19 40 | |
| | | | | | | | | 4 47 50.85 | |

$$\begin{array}{r}
 97.1 \\
 0 = 9.83 + \Delta T + .60a - 1.08c \\
 9.83 + .42a + 1.01c \\
 23.72 \\
 0 = 14.58 - 4.97a + 4.12c \\
 = 0.76 + .18a - 2.09c \\
 \text{If } a = +3.4 \quad c = +.66 \\
 \qquad \qquad \qquad a = +3.50 \\
 \qquad \qquad \qquad c = +.67 \\
 \qquad \qquad \qquad a = +3.50
 \end{array}$$

April 1/97

Levels.

Level trees on east pier in Transit building
 Micron. screw on brass plate at W end

New level for Draper transit

10.30 am.

| Micr. | W | E | | W | E | Mean | 1 div. = |
|-------|------|------|-----------|-----------|-----------|-----------|-----------|
| 0.25 | 4.2 | 41.3 | \bar{n} | \bar{d} | \bar{d} | \bar{d} | \bar{r} |
| .60 | 53.8 | 91.0 | 0.35 = | 49.6 | 49.7 | 49.65 | 0.00705 |
| .55 | 48.7 | 85.7 | | | | | |
| .25 | 4.2 | 41.0 | 0.30 = | 44.5 | 44.7 | 44.6 | .00673 |

10.45 am.

11.30 am.

| | | | |
|------|-----|------|--------------------------|
| 0.25 | 5.7 | 41.9 | |
| .35 | 7.8 | — | bubble must be struck in |
| .45 | 8.2 | — | tube |
| .55 | 9.3 | — | |

Moved to upper end

| | | | |
|-----|-----------------------|------|--------------------------------|
| .55 | 50.2 | 86.3 | |
| .45 | 31.3 | 67.5 | 0.10 = 18.9 18.8 18.85 0.00530 |
| .35 | 15 44.0 | 51.3 | 0.10 = 16.3 16.2 16.25 .00615 |
| .25 | 4.2 | 40.4 | 0.10 = 10.8 10.9 10.85 .00922 |
| | | | .00689 |
| | | | 0.30 = 46.0 45.9 45.95 .00653 |

| Mic. | W | E | | |
|------|------|------|------------------------|----------------|
| 0.25 | 5.1 | 41.5 | 0.10 = 12.1 12.3 12.2 | 0.00819 |
| .35 | 17.2 | 53.8 | 0.10 = 12.8 12.9 12.85 | 778 |
| .45 | 30.0 | 66.7 | 0.10 = 18.0 18.3 18.3 | 546 |
| .55 | 48.3 | 85.0 | 0.30 = 43.2 43.5 43.35 | <u>0.00714</u> |
| | | | | 0.00692 |

| | | | | |
|------|------|------|-----------------------|---------|
| 0.55 | 50.3 | 87.2 | 0.30 = 46.2 46.0 46.1 | 0.00651 |
| 0.25 | 4.1 | 41.2 | | |
| 0.25 | 4.7 | 41.9 | 0.30 = 43.3 43.1 43.2 | 0.00694 |
| 0.55 | 48.0 | 85.0 | | |

12.45 pm

0.00705

673

653

692

651

694

0.00678

log 7.83123

"1" 1.98447

9.81570

"div" = 0.654

= 0.044

Level is very sluggish, requiring many minutes to come into position.

142

Daper level

| Mean | W | E | W | E | Mean | 12.50 fm |
|------|------|------|---------------|------|-------|--------------------|
| 0.32 | 45.0 | 47.7 | n | d | d | d |
| 1.32 | 22.4 | -5.0 | $1.00 = 22.6$ | 22.7 | 22.75 | $1 \text{ div.} =$ |
| | | | | | | n |
| | | | | | | 0.0440 |
| 1.30 | 22.8 | -4.7 | | | | |
| 0.35 | 43.2 | 15.7 | $0.95 = 20.4$ | 20.4 | 20.4 | 0.0466 |
| 0.35 | 43.2 | 15.7 | | | | |
| 1.25 | 22.6 | -4.0 | $0.90 = 19.6$ | 19.7 | 19.65 | 0.0458 |
| 1.30 | 22.9 | -4.9 | | | | |
| .35 | 43.2 | 15.4 | $0.95 = 20.3$ | 20.3 | 20.3 | 0.0468 |
| | | | | | | |
| | | | | | | 0.04580 |

1.00 fm

$\log 0.0458$ 8.66087
 " $\frac{1}{\text{div}}$ 1.98447 p. 144
 " $\frac{1}{\text{div}}$ 0.84534
 " $\frac{1}{\text{div}}$ 4.4192
 " 0.295

| Results to date | V | VV |
|-----------------|--------------------|---------------|
| Aug. 12/96 | 0.292 | 7 15 225 |
| " 13 | 0.300 | 6 65 4225 |
| Sept 14 | 0.287 | 7 65 4225 |
| Apr. 1/97 | 0.295 | 7 15 225 |
| | 0.29 ³⁵ | 12) 900 |
| | | 742 |
| | | $\sqrt{= 27}$ |
| | | $p.1 = 18$ |

Rogers level

| Mean | W | E | W | E | Mean | h. or fm |
|------|------|------|------------------|------------------|-------------------|--------------------|
| 0.95 | 0.3 | 22.2 | $\bar{w} = 46.8$ | $\bar{e} = 46.7$ | $\bar{m} = 46.75$ | $\bar{h} = 0.0150$ |
| 1.65 | 47.1 | 68.9 | | | | |

| | | | | | | |
|------|------|------|---------------|--------|--------|----------|
| 1.65 | 47.3 | 69.1 | $0.70 = 46.9$ | 46.9 | 46.9 | 0.0149 |
| 0.95 | 0.4 | 22.2 | | | | |

| | | | | | | |
|------|------|------|---------------|--------|---------|----------|
| 6.00 | 3.3 | 25.1 | $0.60 = 40.3$ | 40.2 | 40.25 | 0.0149 |
| 1.60 | 43.6 | 65.3 | | | | |

| | | | | | | |
|------|------|------|---------------|--------|--------|----------|
| 1.60 | 43.7 | 65.3 | $0.60 = 40.0$ | 40.0 | 40.0 | 0.0150 |
| 6.00 | 3.7 | 25.3 | | | | |

0.01495

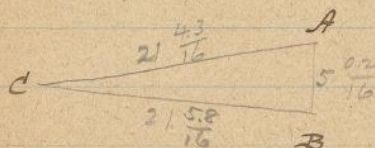
1.15 pm

| | | |
|-------------|---------|--------|
| log 0.01495 | 8.17464 | |
| " , rev. | 1.98447 | p. 144 |
| " , div | 0.15911 | |
| " , div | 1.4425 | |
| | 0.096 | |

| | \bar{w} | \bar{e} | \bar{m} | \bar{h} |
|------------|-----------|------------|-----------|-----------|
| Aug. 12/96 | 0.0911 | 16 | 256 | |
| " 13 | 0.0927 | 10 | 100 | |
| Sept. 14 | 0.0919 | 8 | 64 | |
| Apr. 1/97 | 0.0962 | 35 | 1225 | |
| | 0.0937 | 12) | 1645 | |
| | | | 137 | |
| | | $\sqrt{=}$ | 12 | |
| | | p. 2 = | 08 | |

Level Tri

After above observations, paper was placed under level tri and positions of legs marked, giving following dimensions of triangle.



$$\tan \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$$

| | | | | | |
|-----|---------|------------------------|-------------|-----------------|------------|
| b | 21.2698 | log (s-b) | 0.40715 | s-a | 0.39092 |
| a | 21.3625 | " (s-c) | 1.27439 | | 1.27439 |
| c | 5.0125 | " $\frac{1}{s-a}$ | 9.60908 | s-b | 9.59285 |
| 2s | 47.6448 | " $\frac{1}{s}$ | 8.62302 | | 8.62302 |
| s | 23.8224 | Σ | 9.91364 | | 9.88118 |
| s-a | 2.4599 | " $\tan \frac{1}{2} A$ | 9.95682 | | 9.94059 |
| s-b | 2.5536 | $\frac{1}{2} A$ | 42° 9' 38.5 | $\frac{1}{2} B$ | 41° 5' 6.0 |
| s-c | 18.8099 | A | 84 18.77 | B | 82 11.2 |

| | | | |
|---------|------------------------|---------|------------------------|
| " sin A | 9.99786 | " sin B | 9.99595 |
| " b | 1.32965 ⁷⁷⁴ | a | 1.32774 ⁹⁶⁵ |
| " R | 1.32751 ⁵⁶⁰ | | 1.32369 ⁵⁶⁰ |

| | |
|---------------------|---------|
| " 0.0099 | 7.99564 |
| " tan A | 6.67004 |
| " " 1" | 4.68557 |
| " 1 ^{rev} | 1.98447 |
| " 1 ^{rev.} | 96.4875 |

April 5/97

Draper Transit

| | | | | | | | | | |
|--------------------|-------|--------|-----------|---------------|-------|-------|--------|-----------|------|
| 0.7 | 32.3 | -33.0 | | 34.3 | 2.7 | +37.0 | -32.7 | 0.4 | 32.3 |
| cl. 2 | 34.1 | 2.2 | +36.3 | | 0.4 | 32.3 | +37.0 | 34.4 | 2.6 |
| | | | +3.3 | | | | +4.3 | | |
| | | | +1.82 | +2.24 | | | +1.08 | | |
| | | | | | | | +3.2 | | |
| a Cancri | | | 16 Cancri | β Aquas | | | Hydra | 10 Lemkin | |
| 39.2 | | | 45.1 | 57 57 | 5.5 | | 47.4 | 0.3 | |
| 55.2 | | | 45.3 | 15.5 58 41.2 | 5.0 | | 3.2 | 20 | |
| 10.3 | | | 0.5 | 18.4 59 23.5 | 4.8 | | 18.4 | 38.5 | |
| 25.7 | | | 15.8 | 15.5 0 6 | 5.2 | | 33.3 | 57.3 | |
| 40.8 | | | 30.8 | 15.3 0 47.2 | 4.2 | | 48.2 | 15.8 | |
| 58.7 | | | 50 45.7 | 15.5 26 ? | 2.2 | rej. | 2.9 | 33.7 | |
| 7 39 11.2 | | | - | 8 2 11.5 | 5.3 | 11 | 18.1 | 16 52.5 | |
| 7 38 25.44 | | | 50 15.62 | 0 5.00 | | 10 | 33.06 | 15 56.87 | |
| Red. 5 8.50 -11.76 | | | - 9.82 | - 8.20 | | | - 6.48 | - 5.59 | |
| 7 38 13.68 | | | 50 5.62 | 59 56.80 | | 10 | 26.58 | 15 51.28 | |
| 8 52 53.51 | | | 2 12.47 | 12 5.36 | | 22 | 33.69 | 27 57.91 | |
| 22 45 20.17 | | | 47 53.15 | 51.44 | | | 52.89 | 53.37 | |
| Wrong * | | | + .21 | + .55 | | | + .32 | + .24 | |
| | | | .90 | 1.71 | | | 1.00 | .75 | |
| 0 = 47 53.36 | +DT | + .47a | -1.02c | - .28 | - .15 | - .43 | 52.93 | | |
| 51.99 | -2.27 | -2.83 | +1.36 | - .42 | + .94 | .93] | 52.93 | | |
| 53.21 | + .14 | -1.01 | - .13 | - .15 | - .28 | .93 | | | |
| 53.61 | +1.00 | -1.25 | - .92 | - .19 | -1.11 | .50 | | | |
| 48.65 | -5.44 | -6.05 | + 5.00 | - .91 | +4.09 | .74] | 52.77 | | |
| 53.43 | + .43 | -1.01 | - .40 | - .15 | - .55 | .88 | | | |
| 53.46 | + .59 | -1.05 | - .54 | - .16 | - .80 | .76 | | | |
| 53.13 | + .71 | +1.09 | - .65 | + .16 | - .49 | 52.64 | | | |
| 52.99 | | | | | | | | | |
| 53.03 | .00 | +1.04 | .00 | + .16 | + .16 | 53.65 | | | |
| 53.23 | + .95 | +1.22 | - .87 | + .18 | - .69 | 52.54 | 52.77 | | |
| 53.07 | + .65 | +1.07 | - .60 | + .16 | - .44 | .63 | | | |
| 53.00 | + .04 | +1.03 | - .04 | + .15 | + .11 | .89 | | | |

Adopt $\Delta T = -22$ 47 52.79

| | | | | | | | | |
|---------------|-------|--------------|-----------------|---------------------|--------|--------------------|-------------------|-------------------------|
| 33.7 | 1.8 | +35.5 | 0.3 | 32.6 | -32.9 | +37.0 | 34.7 | 2.3 |
| | | -32.9 | | | +36.8 | -32.6 | | |
| 0.5 | 32.4 | +2.6 | 34.5 | 23 | +3.9 | +4.4 | 0.1 | 32.5 |
| | | +1.65 | | | +1.98 | +1.1 | | |
| | | +1.19 | | | +2.9 | +3.2 | | |
| ζ Cham. | | π Leonis | γ Leonis | Cl W ζ Leonis | | μ Hydra | | |
| - | | 57.3 | 51.7 | - | | 12 | 58.4 | |
| 21 | 50.5 | 49.6 | 13.2 | 8.2 | 19.2 | 51.5 | 27.6 | 58.5 |
| 23 | 21 | 49.3 | 28.2 | 23.6 | 35.3 | 51.9 | 42.7 | 58.5 |
| 24 | 51 | 49.2 | 43.3 | 39.3 | 57.8 | 52.1 | 58 | 58.3 |
| 26 | 21 | 49.0 | 58.4 | 54.9 | 59 | 8.2 | 52.3 | 14 ? ²⁹ 58.8 |
| 27 | 48 | 48.9 | 13 | 10.2 | - | | 29.3 | 58.5 |
| 29 | 19 | 49.2 | 43 28.2 | 50 25.7 | clouds | | 9 | 45.6 58.3 |
| 24 | 49.20 | 42 43.09 | 49 39.09 | 58 51.95 | | 8 | 58.4 ² | |
| -4.14 | | -1.20 | -0.6 | +1.46 | | +3.12 | | |
| 24 | 45.06 | 42 41.89 | 49 39.03 | 58 53.41 | | 9 | 1.58 ⁴ | |
| 36 | 56.91 | 54 48.73 | 1 45.82 | 11 0.55 | | 21 | 8.88 | |
| 48.15 | | 53.16 | 53.21 | 52.86 | | 52.7 ⁶⁶ | | |
| +5.50 | | +2.27 | +2.25 | +2.27 | | +3.3 | | |
| 2.64 | | .92 | .87 | .83 | | 1.04 | | |

$$0 = 53.43 + \Delta T + .54a - 1.08c$$

$$51.99 \quad -2.27 \quad -2.83$$

$$48.65 \quad -5.44 \quad -6.05$$

$$= 53.10 \quad +.55a + 1.11c$$

$$0 = 0.33 - 2.19c \quad c = +.15$$

$$0 = 1.44 + 2.81a + 1.75c$$

$$= 4.78 + 5.98a + 4.97c$$

$$2.81a = -1.70 \quad a = -.60 \quad \text{1st 2 * 5 only}$$

$$5.98a = -5.53 \quad = -.92$$

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[9]

10 51 39.8 = 14 53 40

| | | | | | | | | | |
|------|------|-------|-------|------|------|----|------|----|--------|
| -0.4 | 32.0 | -31.6 | -31.4 | -0.6 | 32.0 | 52 | 24.8 | 54 | 30 |
| | | +37.0 | +38.0 | | | | | | |
| | | +5.4 | +6.6 | | | | | | |
| 34.8 | 2.2 | +1.35 | +1.65 | 35.3 | 2 | 10 | 53 | 0 | 55 0.3 |
| | | +4.0 | +4.9 | | | | | | |

| | | | | | | | | | |
|----|---------|---|--------|---|----------|----|----|----|------|
| 46 | Lem Min | 8 | Lennis | 8 | Crateris | 53 | 45 | 55 | 45.3 |
|----|---------|---|--------|---|----------|----|----|----|------|

27.5

34.9

8.6

45.8

50.7

24.2

10 ¹⁰ 18 4

34

63

39

11 18 15

21.5

22.2

54.3

39.7

38.2

10

58

54.3

25.3

9 36 17

9 57 11.3

2 41.4

9 35 21.84

56 22.56

1 54.69

+ 7.45
+ 10.74+ 10.90
+ 14.19

+ 11.81

9 35 29.29

56 33.46

2 6.50

47 36.86

8 40.81

14 14.00

22 47 52.93

52.65

52.50

+ 3.30

+ 4.2

+ 5.0

.76

.85

1.03

Chamaeleon

| | | | |
|--------------------------|----------|--------------|-------------|
| δ | -80 28.9 | 8 50 0 | 10 10 4 |
| ϕ | -16 22.5 | -22 47 52.79 | 13 39.72 |
| $\phi-\delta$ | -64 6.4 | 10 2 7.21 | 10 23 43.72 |
| $\log \sin(\phi-\delta)$ | 9.95405 | 0 56 58.22 | 1 42.46 |
| " $\sec \delta$ | 0.78156 | 9 5 8.99 | 0 56 58.22 |
| " $\cos(\phi-\delta)$ | 9.64018 | 1 29.31 | 11 22 24.40 |
| " A | 0.73561 | 9 3 39.68 | 11 18 15 |
| " B | 0.42174 | +13 39.68 | +4 9.40 |
| " A | -5.440 | Chrm 1131 | Sid. Clock |
| " B | 2.641 | | |
| " C | 6.047 | 9 53 0 | |
| | | 13 39.72 | |
| | | 10 6 39.72 | |
| | | 14 55 0.3 | |
| | | -4 48 20.58 | |
| | | Chrm 4026 | |

89B + WBC 4 48 20.79

 Δ

-0.21

wa to 89B
WBC

150

$$b = +1.52$$

$$+ .45$$

$$+1.08$$

$$+ .32$$

$$+1.25$$

$$+ .37$$

$$b = +34$$

April 6/97 Draper Transit

| | | | | | | | | |
|----------------|---------|-------|-----------------|------|----------------|------|---------------|-------|
| 34.7 | 3.3 | +38.0 | 0.4 | 32.0 | \bar{x} 32.4 | 34.5 | 2.8 | +37.3 |
| | | -31.9 | | | +36.9 | | | -32.3 |
| 0.2 | 31.7 | +6.1 | 34.2 | 2.7 | +4.3 | 0.3 | 32.0 | +5.0 |
| cl W | $+9$ 30 | | -77 9 | | $+3$ 42 | | $+6$ 20 | |
| β Cancri | | | θ Chamae | | σ Hydra | | ζ Hydra | |
| 26.2 | | | 4 44.5 | | 49.6 | | 21.2 | |
| 41.4 | | | 5 52 | | 4.5 | | 36.2 | |
| 56.0 | | | 6 56.8 | | 19 | | 50.8 | |
| 11 | | | 8 4 | | 338 | | 5.7 | |
| 26.3 | | | 9 11.5 | | 49 | | 20.7 | |
| 41.3 | | | 10 18.5 | | 4 | | 35.8 | |
| 6 55 | 57.2 | | 11 29 | | 18 19.5 | | 34 51.5 | |
| 6 55 | 11.34 | | 8 5.19 | | 17 34.20 | | 34 5.99 | |
| Red. to 8.00 | -10.65 | | -8.53 | | -6.97 | | -4.26 | |
| 6 55 | 0.69 | | 7 7 56.66 | | 17 27.23 | | 34 1.73 | |
| 8 10 | 57.77 | | 23 43.26 | | 33 24.63 | | 49 59.12 | |
| 22 44 | 2.92 | | 13.40 | | 2.60 | | 2.61 | |
| | + .41 | | + .75 | | + .32 | | + .32 | |
| Mean. | -.02 | | -.10 | | -.02 | | -.02 | |

| | | | | | | | | | | |
|------------|------|-------|-------|--------|------------|-------|--|------------|------|------|
| Δ | 91 | | 2.20 | | Δ | 94 | | Σ | 93 | |
| ΔT | | | | | ΔT | | | ΔT | | |
| Δ | 3.31 | + .44 | +1.01 | + 1.16 | + .10 | +1.26 | | 4.57 | rej. | |
| 14.05 | | -3.93 | +4.50 | -10.38 | + .45 | -9.93 | | 4.12 | | |
| 2.90 | | + .34 | +1.00 | + .89 | + .10 | + .99 | | 3.89 | | |
| 2.91 | | + .39 | +1.01 | + 1.03 | + .10 | +1.13 | | 4.04 | | 3.96 |
| 2.74 | | + .47 | -1.02 | + 1.24 | - .10 | +1.14 | | 3.88 | | |
| 10.07 | | -2.27 | -2.84 | - 5.99 | - .28 | -6.27 | | 3.80 | | |
| 3.68 | | + .14 | -1.01 | + .37 | - .10 | + .27 | | 3.95 | | 3.90 |
| 2.91 | | + .46 | -1.02 | + 1.21 | - .10 | +1.11 | | 4.02 | | |
| 1.99 | | + .71 | -1.10 | + 1.87 | - .11 | +1.76 | | 3.75 | | |

$$\Delta T = -22.44 \quad 3.93$$

$$b = +.37$$

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| | | | | | | | | | | |
|---------------|---------------|----------------|---------------|-----------|------|-------|---------------|-------|---|------|
| | 0.0 | 32.0 | -32.0 | 35.0 | 3.0 | 8 | 2 | 9.5 = | 4 | 15 |
| cl ϵ | 34.4 | 2.6 | +37.0 +5.0 | | | | 2 | 35 | 4 | 40.6 |
| +11 5 | -69 18 | -8 13 | +10 22 | | | | | | | |
| 1c Cancri | β Argus | α Hydra | α Leo | 45 +24 15 | 4 | 50.6 | | | | |
| 31 | 54 7 | 50.2 | 55 | 11.2 | 34.5 | 2.5 | +37.0 +5.0 | | | |
| 47? | 51.3 | 6 | 10.8 | 28.4 | | | | | | |
| 2.3 | 55 33.7 | 21.2 | 26.2 | 44.7 | 8 | 32 | 40 | | | |
| 17.4 | 56 16.5 | 36.2 | 41.3 | 1 | 9 | 48 | 30 | | | |
| 32.5 | 58.2 | 57.2 | 56.4 | 17.3 | | | | | | |
| 47.3 | 57 39.3 | 5.8 | 11 | 33.3 | | | | | | |
| 47 2.5 | 58 22 | 7 20.9 | 20 26.4 | 24 49.7 | 8 | 32 | 40 | | | |
| 46 17.14 | 56 15.43 | 6 35.93 | 19 41.01 | 24 0.80 | +13 | 40.20 | | | | |
| -2.25 | -0.62 | +1.08 | +3.23 | +3.94 | 8 | 46 | 20.20 | | | |
| 46 14.89 | 56 14.81 | 6 37.01 | 19 44.24 | 24 4.74 | 1 | 26.46 | | | | |
| 2 12.46 | 12 5.31 | 22 33.68 | 35 41.65 | 40 3.04 | 8 | 47 | 46.66 | | | |
| 2.43 | 9.50 | 3.33 | 2.59 | 1.70 | 1 | 0 | 54.78 | | | |
| +3.3 | +6.3 | .37 | +3.4 | +3.31 | 9 | 48 | 41.44 | | | |
| -0.2 | -0.6 | -0.2 | -0.2 | -0.2 | | | 30 | | | |
| .90 | 1.71 | 1.00 | .91 | .83 | | | +11.44 | | | |

8 0 0

Sid. Clock

$$0 = 2.90 + .36a + 1.00c$$

$$-22 \ 44 \ 3.93$$

$$= 3.11 + .36a - 1.02c$$

$$9 \ 15 \ 56.07$$

$$0 = 0.21 - 2.02c/c = +.10$$

$$1 \ 0 \ 54.78$$

$$0 = 11.15 - 4.29a + 3.50c$$

$$8 \ 15 \ 1.29$$

$$0 = 6.96 - 2.63a' - 1.81c$$

$$1 \ 21.10$$

$$4.29a = +11.50 \quad a = +2.68 \quad 8 \ 13 \ 40.19$$

$$2.63a' = +6.78 \quad a' = +2.58 \quad +13 \ 40.19$$

Adgr

2.64

Chrom. 1131

$$8 \ 1 \ 54.5$$

$$8 \ 15 \ 34.69$$

$$13 \ 4 \ 0$$

$$-4 \ 48 \ 25.31$$

Chrom 4026

Diurnal Aberration at Arica

$$\phi = -16^\circ 22'5''$$

$$\text{Aberr.} = +0.0207 \cos \phi \sec \delta \quad \begin{matrix} \text{(Chauvnet)} \\ \text{(Doolittle)} \end{matrix}$$

$$\cos \phi = 0.9594$$

$$\text{Aberr.} = +0.0199 \sec \delta$$

$$\log 0.0199 = \begin{matrix} 8.29885 \\ 204 \quad 30963 \end{matrix}$$

| δ | $\log \sec \delta$ | $\log \text{Aberr.}$ | Aberr. | At Arica |
|----------|--------------------|-------------------------------|-----------------|--|
| 10 | 0.00665 | 8.30550 | 0.020 | $\phi = -18^\circ 29'$ |
| 20 | 0.02701 | 8.32586 | .021 | Constant = 0.0196 262 |
| 30 | 0.06247 | 8.36132 | .023 | $\log = 8.29226$ 30535 |
| 40 | 0.11575 | 8.41460 | .026 | |
| 50 | 0.19193 | 8.49078 | .031 | At Arica |
| 60 | 0.30103 | ⁶¹⁰⁶⁶ 8.59988 | .040 .041 | ⁶⁰⁶³⁸ 8.59329 .039 .040 |
| 70 | 0.46595 | ⁷⁷⁵⁵⁸ 8.76480 | .058 .060 | ⁷⁷¹³⁰ 8.75821 .057 .059 |
| 80 | 0.76033 | ⁰⁶⁹⁹³ 9.05918 | .115 .117 | ⁰⁶⁵⁶⁸ 9.05259 .113 .116 |
| 55 | 0.24141 | 8.54026 | .035- | |
| 65 | 0.37405 | 8.67290 | .047 | |
| 72 | 0.51002 | 8.80887 | .064 | |
| 74 | 0.55966 | 8.85851 | .072 | |
| 76 | 0.61632 | 8.91517 | .082 | |
| 78 | 0.68212 | 8.98097 | .096 | |
| 81 | 0.80567 | 9.10452 | .127 | |
| 82 | 0.85644 | 9.15529 | .143 | |
| 83 | 0.91411 | 9.21296 | .163 | |
| 84 | 0.98077 | 9.27962 | .190 | |
| 85 | 1.05970 | ^{9.36933} 9.35855 | .228 .234 | ³⁶⁵⁰⁵ 9.35196 .225- 232 |

Table

Correction for Aberration at Arequipa + Arica

Corr. always -, when applied to observed

Time of Transit.

Arequipa

Arica

| δ | | |
|----------|---------------------------------|---------------------------------|
| 0 | ⁵ 0.02 | ⁵ 0.02 |
| 10 | .02 | .02 |
| 20 | .02 | .02 |
| 30 | .02 | .02 |
| 40 | .03 | .02 |
| 50 | .03 | .03 |
| 55 | ³ .02 | .03 |
| 60 | .04 | .04 |
| 65 | .05 | .05 |
| 70 | .06 | .06 |
| 72 | ⁷ .06 | .06 |
| 74 | ⁸ .06 | .07 |
| 76 | ⁹ .08 | .08 |
| 78 | .10 | ¹⁰ .09 |
| 80 | .12 | .12 |
| 81 | .13 | ¹³ .12 |
| 82 | ¹⁵ .14 | .14 |
| 83 | ¹⁷ .16 | .16 |
| 84 | ²⁰ .17 | .19 |
| 85 | 0.23 | ²³ 0.22 |

April 8/97

Mag. Power of new eyepiece of Draper
Transit

$$d \text{ of pencil of light} = \begin{cases} \frac{2}{64} \text{ in} & \text{wcu} \\ \frac{2.5}{64} \text{ "} & \text{WBC} \end{cases}$$

$$D \text{ of objective} = \begin{cases} 2 \frac{2}{64} & \text{WBC} \\ 2 \frac{1}{64} & \text{wcu} \end{cases}$$

$$\therefore \text{Mag Power} = \frac{52}{64} \text{ WBC}$$

$$\frac{64}{60} \text{ wcu}$$

$$\frac{64}{60} \text{ adopt}$$

$$\begin{array}{r} 2.5 \overline{)130} \\ 52 \end{array}$$

$$\begin{array}{r} 2 \overline{)129} \\ 64 \end{array}$$

~~39.7~~~~7.3~~~~50.4~~~~11.8~~~~54 22.6~~

cl. E

April 7/97

Drafer Transit

 $b = +.35$

34.7 3.0 +37.0 0.5 32.0 +32.5
 34.5 2.8 -32.6 +37.4
 0.4 32.1 +4.9 34.4 3.0 +4.9
 0.5 32.1 +1.2 +1.2

| π Virginis | α Virg | ϵ Corri | β Cham | δ Corri | β Com |
|----------------|---------------|------------------|--------------|----------------|-------------|
| 31.8 | 53 | 42.8 | 27 | 23.3 | 47.6 |
| 47.7 | 8.7 | 59.6 | 47.5 | 39.7 | 47 |
| 28 | 23.8 | 157 | 4 | 55.2 | 20.7 |
| 17.8 | 39 | 31.9 | 52 20.5 | 10.8 | 37 |
| 32.7 | 54 | 47.9 | 36.7 | 26.3 | 53.2 |
| 47.5 | 8.7 | 3.6 | 51 | 41.3 | 8.9 |

| | | | | | |
|---------------------|----------|----------|----------|---------|---------|
| 10 36 2.3 | 40 23.9 | 45 19.7 | 56 7.5 | 4 56.9 | 9 25.1 |
| 10 35 17.51 | 39 38.73 | 44 31.60 | 52 19.74 | 4 10.50 | 8 36.74 |
| Red. to 11 20 -7.34 | -6.63 | -5.83 | -4.55 | -2.60 | -1.87 |

| | | | | | |
|-------------|----------|----------|----------|----------|---------|
| 10 35 10.17 | 39 32.10 | 44 25.77 | 52 14.59 | 4 7.90 | 8 34.87 |
| 11 55 38.45 | 0 0.57 | 4 52.29 | 12 23.83 | 24 34.94 | 29 1.28 |
| 22 39 31.32 | 31.53 | 33.48 | 30.76 | 32.96 | 33.59 |
| +32 | +32 | +37 | +83 | +36 | +38 |
| -.02 | -.02 | -.02 | -.10 | -.02 | -.02 |

.92 .91 1.07 2.38 1.04 1.08

| Δ | Δ | Δ | Δ | Δ | Δ |
|--------------------------------------|----------|----------|----------|----------|----------|
| 0 = 32.04 + ΔT + .402 - 1.01 | + 1.54 | -.04 | +1.50 | 33.54 | |
| 31.83 | + .44 | - 1.01 | + 1.69 | -.04 | +1.65 |
| 33.83 | +.11 | - 1.08 | - .42 | -.04 | -.46 |
| 51.49 | -4.55 | -5.13 | + 17.52 | -.21 | -17.73 |
| 33.30 | + .01 | - 1.04 | + .04 | -.04 | -.00 |
| 33.95 | -.12 | - 1.09 | + .46 | -.04 | -.50 |
| 32.41 | + .27 | + 1.00 | + 1.04 | + .04 | +1.08 |
| 30.18 | + .79 | + 1.13 | + 3.04 | + .05 | +3.09 |
| 42.88 | -2.50 | +3.07 | + 9.62 | + .12 | -9.50 |
| 33.00 ? | + .20 | + 1.00 | + .08 | + .04 | +1.12 |
| 34.14 | -.12 | + 1.08 | + .46 | + .04 | -.42 |
| 33.27 | + .10 | + 1.02 | + .38 | + .04 | + .42 |

$\Delta T = -22$ 39 33.44

157
11 24 35.5
12 44 50

$b = +.58$

277

clw

54
58
+1.57

+39.5
-31.4
+8.1
+2.0

11 18 47.6
29 25
35.5 4.0
-0.2 31.6

= 16 21 0.0
22 37.3
-0.2 31.5 -31.3
35.2 3.5 +38.7

+39.0
-31.1
-0.2 31.3 +7.9
+2.0

γ Virginis 31 Comae δ Muscae θ Ursa
L. dicitur hunc hanc

γ Hydrae α Virginis

17.2 - 32 31.7 237 1.8 29.5

32.2 - - 38.6 18.1 44.8

46.5 - 34 9? 55.7 52.8 33.7 59.7

1.7 12 4 12.7 34 54.5 55.4 8 49.9 14.9

16.5 29.5 13.0 35 41.5 56.7 23 6 30

31.4 46.4 13.0 36 28.5 57.6 38.2 22.2 45.2

16 47 27 4.1 12.8 37 16 56.6 44 53.5 53 29.3 12 0 1

16 1.79 26 12.88 34 56.40 ? 44 8.26? 52 40.14 59 15.01

-0.65 +1.02 +2.45 +3.96 +5.40 +6.45

16 1.14 13.90 58.85 44 12.22 52 55.54 59 21.46

36 29.26 46 44.16 55 16.97 4 39.76 13 22.00 19 48.75

31.88 29.74 41.88 32.46 33.54 32.71

+5.5 +4.6 +1.01 +.56 +.62 +.58

-0.02 -0.02 -0.06 -0.02 -0.02 -0.02

.96 .81 1.78 .98 1.08 1.01

$0 = 31.94 + \Delta T + .42a - 1.01c$ 11 20 0 11 24 35.5

31.86 +.42a +1.04c -22 39 33.50 +13 41.21

$0 = 0.08 - 2.05c$ $c = +.04$ 12 40 26.50 11 38 16.71

$= 19.55 - 4.97a - 4.12c$ 1 4 51.33 1 54.71

$= 10.97 - 2.92a' + 2.03$ 11 35 35.17 1 4 51.33

33.83 4.97a = +19.39 a = +3.90 1 53.96 12 45 2.75

33.30 2.92a' = +11.05 a' = 3.79 11 32 41.21 44 50

33.98 33.69 - .07a Adopt a = +3.85 +13 41.21 +12.75

33.42 32.41 11 18 47.6 Sid. Clock

33.00 11 32 28.81

34.14 16 21 0

33.27 -4 48 31.19

33.23 +.11a 4026

33.65 Mean 33.54 Instrument taken at Arica Chile

Anica.

April 11/97

Sextant for time
on balcony east
side of Hotel Americans

1131

2 Alt

| | | | | |
|---|----|------|----|----|
| 9 | 31 | 46 | 96 | 40 |
| A | 32 | 38.5 | 97 | 0 |
| | 33 | 31.5 | | 20 |
| | 34 | 23.5 | | 40 |
| 9 | 33 | 4.9 | | |

am.

| | | | | |
|---|----|------|----|----|
| | 35 | 27.5 | 97 | 0 |
| B | 36 | 21.5 | | 20 |
| | 37 | 15.5 | | 40 |
| | 38 | 10.5 | 98 | 0 |
| 9 | 36 | 48.8 | | |

| | | | | |
|--------------------------|----------------------|------------------------|-----------------|--------------------|
| $t = \frac{1}{2} \Delta$ | 2 5 16.7 | 2 9 0.5 | ϕ | -18 28.7 |
| | 2.088 | 2.150 | L from Berlin | 5 34 55 |
| | 31° 19' | 32° 15' | δ | +8 35.4 |
| | | | | +8 42.7 |
| by tan ϕ | 9.52397 ^m | 9.52397 ^m | E | +0 53.67 |
| " $\sin t$ | 9.71581 | 9.72723 | $\Delta \delta$ | +54.8 ¹ |
| " Δ | 9.80816 ^m | 9.79674 ^m | | |
| | 17914 | 17914 | | |
| " $\tan \delta$ | 9.18835 | 9.18835 | | |
| " $\tan E$ | 9.784194 | 9.800004 | | |
| | 39415 | 37914 | | |
| " Δ | 9.40116 | 9.38585 ^m | | |
| K_1 | -.64294 | -.62624 | | |
| | 4783 | 23941 | | |
| K_2 | + .25128 | + .24286 | | |
| | 89477 | 86565 | | |
| Δ | -.29866 | -.28338 | | |
| | 94976 | 93734 | | |
| " Δ | 9.59290 ^m | 9.58363 ^m | | |
| " t | 0.31973 | 0.33041 | | |
| " $\Delta \delta$ | 1.73886 | 1.73886 ^{1/4} | | |
| " $\frac{1}{15}$ | 8.82391 | 8.82391 | | |
| " δt | 0.47587 ^m | 0.47728 ^m | | |
| | 83226 | 83052 | | |

1 46 1 98.0
 46 55.5 40
 47 50 20
 48 42.5 97 0
 47 22.2

1 49 45.5 97 40
 50 39 20
 51 33 0
 52 26 96 40
 1 51 5.9

T' 1 47 22.2 1 51 5.9
 T 9 36 48.8 9 33 4.9
 Δ 4 10 33.4 4 18 1.0
 T₀ 11 42 5.5 11 42 5.4
 - 56 + 6.8 + 6.8
 11 42. ~~8.5~~ 12.2 ~~8.4~~ 12.2
~~8.45~~
~~12.25~~
 12 0 53.67
 18 48.42
~~57.2~~

Non 12 0 53.67

Corr. 18 48.42

13 49.7

40 57.5

41 20

4 41 20

4 46 21

4 46 21

4 46 21

4 46 21

4 46 21

4 46 21

4 46 21

Using rate 0.8
 7th 11.20 pm - 9th
 7.30 am, and rate
 4.0 9th 7.30 am -
 11th noon. we have:

13. 41.21

1.0

8.8

13 51.0

Arica 18 41.4

Δ Long 4 50.4

Adapt.

Arquipa Time

Apr. 7 11.20 pm 13 41.21

6 8.00 40.19¹⁰²

5 8.50 39.72⁴⁷

Δ 2.1 1.49

Daily rate 0.71

3 1/2 days 2.5

Corr Apr. 11 noon 13 43.7

of daily rate 2.0, assum-

ing that change of rate (deep.
174) began between Arq. & Ar.

Corr. Apr. 11 noon = 13 48.2

on Arica local M-Time 18 41.4

Δ Long = 4 53

41 20

4 46 21 = Long Arquipa Obs. = 4 46 13

If rate changed during ride on donkey to
 RR station Apr. 9 7.30-8.30 am, ~~was~~ 1.5 before + 4.5 after
 Corr. is 13 51.2 and Δ Long 4 50

Hence approx Long is 4 46 13 sec.

Arica - Star Constants.

| | θ Cham. | β Argus | ζ Cham. | θ Argus | δ^2 Cham. | γ Octantis |
|----------------------------|----------------|---------------|---------------|----------------|------------------|-------------------|
| δ | -77 9 | -69 18 | -80 29 | -63 51 | -80 0 | -84 2 |
| $\phi - \delta$ | -58 40 | -50 49 | -62 0 | -45 22 | -61 31 | -65 33 |
| $\log \sin(\phi - \delta)$ | 9.93154 | 9.88937 | 9.94593 | 9.85225 | 9.94397 | 9.95920 |
| " $\sec \delta$ | 0.65287 | 0.45164 | 0.78164 | 0.35583 | 0.76033 | 0.90318 |
| " $\cos(\phi - \delta)$ | 9.71602 | 9.80058 | 9.77161 | 9.84669 | 9.67843 | 9.61689 |
| " A | 0.58441 | 0.34101 | 0.72757 | 0.30808 | 0.70430 | 0.94238 |
| " B | 0.36889 | 0.25222 | 0.45325 | 0.20252 | 0.43876 | 0.60007 |
| A | 3.84 | 2.19 | 5.34 | 1.61 | 5.06 | 8.76 |
| B | 2.34 | 1.79 | 2.84 | 1.59 | 2.75 | 3.98 |
| C | 4.50 | 2.83 | 6.05 | 2.27 | 5.76 | 9.62 |

| | β Cham. | α Crucis | β Crucis | δ Musca | κ Octantis | θ Apodis |
|----------------------------|---------------|-----------------|----------------|----------------|-------------------|-----------------|
| δ | -78 44 | -62 32 | -59 8 | -71 0 | -85 15 | -76 18 |
| $\phi - \delta$ | -60 15 | -44 3 | -40 39 | -52 31 | -66 46 | -57 49 |
| $\log \sin(\phi - \delta)$ | 9.93862 | 9.84216 | 9.81387 | 9.89956 | 9.96327 | 9.92755 |
| " $\sec \delta$ | 0.70913 | 0.33608 | 0.28985 | 0.48736 | 1.08193 | 0.62555 |
| " $\cos(\phi - \delta)$ | 9.69567 | 9.85657 | 9.88007 | 9.78428 | 9.59602 | 9.72643 |
| " A | 0.64775 | 0.17824 | 0.10372 | 0.38692 | 1.04520 | 0.55310 |
| " B | 0.40480 | 0.19265 | 0.16992 | 0.27164 | 0.67795 | 0.35198 |
| A | 4.44 | 1.51 | 1.27 | 2.44 | 11.10 | 3.57 |
| B | 2.54 | 1.56 | 1.48 | 1.87 | 4.76 | 2.25 |
| C | 5.12 | 2.17 | 1.95 | 3.07 | 12.08 | 4.72 |

2 Argus May 5

 δ -52 38.5

9.966392

161

 ϕ -18 28.7

0.13474

 $\phi-\delta$ -34 9.8

A -0.93

9.749392

B 1.36

0.21700

C 1.65

9.91774

| δ | -32 | -24 | -16 | -8 | 0 |
|--------------------|----------|---------|---------|----------|----------|
| $\phi-\delta$ | -13 31.3 | -5 31.3 | +2 28.7 | +10 28.7 | +18 28.7 |
| $\log \sin(\cdot)$ | 9.36887 | 8.98327 | 8.63590 | 9.25975 | 9.50099 |
| $\cos \delta$ | 0.07158 | 0.03927 | 0.01716 | 0.00425 | 0.00000 |
| $\cos(\cdot)$ | 9.98779 | 9.99798 | 9.99959 | 9.99270 | 9.97701 |
| A | 9.44045 | 9.02254 | 8.65306 | 9.26400 | 9.50099 |
| B | 0.05937 | 0.03725 | 0.01675 | 9.99695 | 9.97701 |
| A | 0.276 | 0.105 | 0.045 | 0.183 | 0.317 |
| B | 1.146 | 1.090 | 1.039 | 0.993 | 0.948 |
| C | 1.179 | 1.095 | 1.040 | 1.010 | 1.000 |

| δ | +8 | 16 | 24 24 | 32 32 | 40 | 48 |
|--------------------|----------|----------|----------|------------------------------------|---------------------------------|----------|
| $\phi-\delta$ | +26 28.7 | +34 28.7 | +42 28.7 | +50 28.7 | +58 28.7 | +66 28.7 |
| $\log \sin(\cdot)$ | 9.64920 | 9.75289 | 9.82951 | 9.88727 | 9.93067 | 9.96233 |
| $\cos \delta$ | 0.00425 | 0.01716 | 0.03927 | 0.07158 | 0.11575 | 0.17449 |
| $\cos(\cdot)$ | 9.95187 | 9.91611 | 9.86778 | 9.80371 | 9.71835 | 9.60108 |
| A | 9.65345 | 9.77005 | 9.86878 | 9.95885 | 0.04642 | 0.13682 |
| B | 9.95612 | 9.93327 | 9.90705 | 9.87529 | 9.83410 | 9.77557 |
| A | 0.450 | 0.589 | 0.739 | ⁹¹⁰ 0.836 | 1.11 ³ ₂₈ | 1.3703 |
| B | 0.904 | 0.858 | 0.807 | 0.750 | 0.682 | 0.596 |
| C | 1.010 | 1.040 | 1.095 | 1.179 | 1.305 | 1.494 |

| | | | | | | | |
|---------------|----------|--------------------------|---------|----------|---------|---|-------|
| δ | +50 | $\log \sin(\phi-\delta)$ | 9.96862 | $\log A$ | 0.16055 | A | 1.447 |
| $\phi-\delta$ | +68 28.7 | $\cos \delta$ | 0.19193 | $\cos B$ | 9.75643 | B | 0.571 |
| | | $\cos(\cdot)$ | 9.56450 | | | C | 1.556 |

Anica.

| δ | A | B | C | | A | B | C |
|---------------|----------------------|--------------------|---------------------|-----|---------------------|--------------------|--------------------|
| -32 | -0.276 | 1.146 | 1.179 | -10 | 0.149 | 1.004 | 1.015 |
| 31 | .253 ²³ | 1.138 ⁸ | 1.167 ¹² | 9 | .166 ¹⁷ | .998 ⁶ | 1.012 ³ |
| 30 | .231 ²² | 1.131 ⁷ | 1.155 ¹² | 8 | 0.183 ¹⁷ | 0.993 ⁵ | 1.010 ² |
| 29 | .209 ²² | 1.124 ⁷ | 1.143 ¹⁰ | 7 | .200 ¹⁷ | .987 ⁶ | 1.008 ² |
| 28 | .187 ²² | 1.117 ⁷ | 1.133 ¹¹ | 6 | .217 ¹⁷ | .981 ⁶ | 1.006 ² |
| 27 | .166 ²¹ | 1.110 ⁷ | 1.122 ⁹ | 5 | .234 ¹⁶ | .975 ⁵ | 1.004 ² |
| 26 | .145 ²⁰ | 1.103 ⁷ | 1.113 ¹⁰ | 4 | .250 ¹⁷ | 0.970 ⁶ | 1.002 ¹ |
| 25 | .125 ²⁰ | 1.096 ⁶ | 1.103 ⁸ | 3 | .267 ¹⁷ | .964 ⁵ | 1.001 ⁰ |
| 24 | -0.105 ²⁰ | 1.090 ⁷ | 1.095 ⁹ | 2 | .284 ¹⁷ | .959 ⁶ | 1.001 ¹ |
| 23 | .085 ¹⁹ | 1.083 ⁶ | 1.086 ⁷ | -1 | .301 ¹⁶ | .953 ⁵ | 1.000 ⁰ |
| 22 | .066 ¹⁹ | 1.077 ⁷ | 1.079 ⁸ | 0 | 0.317 ¹⁷ | 0.948 ⁶ | 1.000 ⁰ |
| 21 | .047 ¹⁹ | 1.070 ⁶ | 1.071 ⁷ | +1 | .334 ¹⁶ | .942 ⁵ | 1.000 ¹ |
| 20 | - .028 ¹⁹ | 1.064 ⁷ | 1.064 ⁶ | 2 | .350 ¹⁷ | .937 ⁶ | 1.001 ⁰ |
| 19 | - .009 ¹⁸ | 1.057 ⁶ | 1.058 ⁷ | 3 | .367 ¹⁶ | .931 ⁵ | 1.001 ¹ |
| 18 | + .009 ¹⁸ | 1.051 ⁶ | 1.051 ⁵ | 4 | .383 ¹⁷ | 0.926 ⁶ | 1.002 ² |
| 17 | + .027 ¹⁸ | 1.045 ⁶ | 1.046 ⁶ | 5 | .400 ¹⁶ | .920 ⁵ | 1.004 ² |
| 16 | +0.045 ¹⁸ | 1.039 ⁶ | 1.040 ⁵ | 6 | .416 ¹⁷ | .915 ⁵ | 1.006 ² |
| 15 | -.063 ¹⁷ | 1.033 ⁶ | 1.035 ⁴ | 7 | .433 ¹⁷ | .910 ⁶ | 1.008 ² |
| 14 | .080 ¹⁷ | 1.027 ⁶ | 1.031 ⁵ | 8 | 0.450 ¹⁷ | 0.904 ⁵ | 1.010 ² |
| 13 | .097 ¹⁸ | 1.021 ⁵ | 1.026 ⁴ | 9 | .467 ¹⁷ | .889 ⁶ | 1.012 ³ |
| 12 | .115 ¹³² | 1.016 ⁶ | 1.022 ³ | +10 | 0.484 ¹⁷ | 0.893 ⁵ | 1.015 ³ |
| 11 | .145 ¹⁷ | 1.010 ⁶ | 1.019 ⁴ | | | | |
| 10 | +0.149 | 1.004 | 1.015 | | | | |

Arica.

| S | A | B | C | S | A | B | C |
|-----|-------|-------|-------|-----|-------|-------|-------|
| +10 | 0.484 | 0.893 | 1.015 | +30 | 0.865 | 0.765 | 1.155 |
| | | 17 | 6 | | | 21 | 7 |
| 11 | .501 | .887 | 1.019 | 31 | .887 | .758 | 1.167 |
| | | 18 | 6 | | | 23 | 8 |
| 12 | .519 | .881 | 1.022 | 32 | 0.910 | 0.750 | 1.179 |
| | | 17 | 5 | | | 23 | 8 |
| 13 | .536 | .876 | 1.026 | 33 | .933 | .742 | 1.192 |
| | | 18 | 6 | | | 24 | 8 |
| 14 | .554 | .870 | 1.031 | 34 | .957 | .734 | 1.206 |
| | | 17 | 6 | | | 24 | 8 |
| 15 | .571 | .864 | 1.035 | 35 | .981 | .726 | 1.221 |
| | | 18 | 6 | | | 25 | 8 |
| 16 | 0.589 | 0.858 | 1.040 | 36 | 1.006 | .718 | 1.236 |
| | | 18 | 6 | | | 26 | 9 |
| 17 | .607 | .852 | 1.046 | 37 | 1.032 | .709 | 1.252 |
| | | 18 | 6 | | | 26 | 9 |
| 18 | .625 | .846 | 1.051 | 38 | 1.058 | .700 | 1.269 |
| | | 18 | 6 | | | 27 | 9 |
| 19 | .643 | .840 | 1.058 | 39 | 1.085 | .691 | 1.287 |
| | | 19 | 7 | | | 28 | 9 |
| 20 | .662 | .833 | 1.064 | 40 | 1.113 | 0.682 | 1.305 |
| | | 19 | 6 | | | 29 | 9 |
| 21 | .681 | .827 | 1.071 | 41 | 1.142 | .673 | 1.325 |
| | | 19 | 7 | | | 29 | 10 |
| 22 | .700 | .820 | 1.079 | 42 | 1.171 | .663 | 1.346 |
| | | 19 | 6 | | | 31 | 10 |
| 23 | .719 | .814 | 1.086 | 43 | 1.202 | .653 | 1.367 |
| | | 20 | 7 | | | 31 | 11 |
| 24 | 0.739 | 0.807 | 1.095 | 44 | 1.233 | .642 | 1.390 |
| | | 20 | 6 | | | 33 | 11 |
| 25 | .759 | .801 | 1.103 | 45 | 1.266 | .631 | 1.414 |
| | | 20 | 7 | | | 33 | 11 |
| 26 | .779 | .794 | 1.113 | 46 | 1.299 | .620 | 1.440 |
| | | 21 | 7 | | | 35 | 12 |
| 27 | .800 | .787 | 1.122 | 47 | 1.334 | .608 | 1.466 |
| | | 21 | 7 | | | 36 | 12 |
| 28 | .821 | .780 | 1.133 | 48 | 1.370 | 0.596 | 1.494 |
| | | 22 | 7 | | | 38 | 12 |
| 29 | .843 | .773 | 1.143 | 49 | 1.408 | .584 | 1.524 |
| | | 22 | 8 | | | 39 | 13 |
| +30 | 0.865 | .765 | 1.155 | +50 | 1.447 | 0.571 | 1.556 |

164

$$b = -.05$$

Arica

$$\begin{aligned} & -38.1 \\ & +37.5 \\ & - .6 \\ & - .15 \\ & - .04 \end{aligned}$$

33.3 4.3

$$\begin{aligned} & +37.6 \\ & -39.0 \\ & -1.4 \\ & - .35 \\ & - .10 \end{aligned}$$

April 14/97

Draher Transit

5.0 34.0

34.1 50.0

-22.16

+16.0

4.7 33.4

 δ^2 Chama \times Lennis β Crateris δ Lennis δ Crateris

18.4

8 48 18.5 8.5

11.2 43.2

34

49 42 9.6

26.9 43.3

49.1

51 7.5 9.2

56.7 57.0

43 43.3

4.8

19.4 19.7

52 33.5 9.4

11.7 57.0

59.2 43.4

20

34.7 19.7

54 0 9.5

26.8 56.9

15.3 43.3

35.8

50.2 19.7

55 29.5 8.0

7 42.7 56.7

32.1 43.1

16 52

22 6.3 19.5

8 51 9.03

6 56.90

13 43.27

16 4.87

21 19.65

Red k 9 30 - 6.38

- 3.78

- 2.68

- 2.29

- 1.43

8 51 2.65

6 53.12

13 40.59

16 2.58

21 18.22

10 44 51.38

59 44.84

6 37.86

8 52.89

14 13.87

22 6 11.27

7 8.28

7 2.73

7 9.69

7 4.35

- .14

- .04

- .05

- .04

- .04

- .12

- .02

- .02

- .02

- .02

2.75

.91

1.08

.86

1.03

$$0 = 6 \ 11.01 + \Delta T - 5.062a + 5.76c + 53.40$$

$$68.22 + .448 + 1.01 - 4.73$$

$$62.66 - .071 + 1.08 + .78$$

$$69.63 + .589 + 1.04 - 6.71$$

$$64.29 + .077 + 1.03 - .80$$

$$60.37 - .260 - 1.17 + 2.84$$

$$66.75 + .313 - 1.00 - 3.42$$

$$69.51 + .574 - 1.04 - 6.28$$

$$62.37 - .067 - 1.08 + 7.73$$

$$14.62 - 4.444 - 5.12 + 48.57$$

$$7 \ 11.94 - 4.444 - 5.12 - 8.71$$

$$7 \ 3.12 + .046 - 1.04 + .09$$

Cc

Σ

$$\begin{aligned} & 63.63 \\ & 64.41 \end{aligned}$$

$$\begin{aligned} & 57 \\ & 63.49 \end{aligned}$$

$$\begin{aligned} & .40 \\ & .52 \end{aligned}$$

$$\begin{aligned} & .42 \\ & .48 \end{aligned}$$

$$\begin{aligned} & .21 \\ & .33 \end{aligned}$$

$$\begin{aligned} & .23 \\ & .11 \end{aligned}$$

$$\begin{aligned} & .19 \\ & 63.23 \end{aligned}$$

$$\begin{aligned} & .21 \\ & 63.21 \end{aligned}$$

$$\text{Adopt } \Delta T = -22 \ 7 \ 3.30$$

April 17/97

Sextant for Mini

am

9 18 37 89 40
 19 33
 A 20 24.5
21 16.5 90 40
 19 57.75

Somewhat disturbed by
 thin clouds and powder cracks
 fired nearby.

δ $+10^{\circ} 44' 22''$
 $\Delta\delta$ 52.40

25 2 91 0
 25 56.5

E -0 36.21

B 26 52.5
27 45 92 0
 26 24.00

$$t = \frac{1}{2} \Delta \quad 2 \quad 13 \quad 50.8 \quad 2 \quad 20 \quad 15.94$$

2.231

2.340

33 28

35 4

| | | | | | |
|-----------------|----------|----------|------------------|----------|----------|
| by $\tan \phi$ | 9.52397~ | 9.52397~ | by Δ | 9.95076~ | 9.93033~ |
| " $\sin t$ | 9.74151 | 9.75931 | " t | 0.34850 | 0.369222 |
| " Δ | 9.78246~ | 9.76466~ | " $\Delta\delta$ | 1.71933 | 1.71933 |
| " $\tan \delta$ | 9.27787 | 9.27787 | " $\frac{1}{15}$ | 8.82391 | 8.82391 |
| " $\tan t$ | 9.82023 | 9.84630~ | " δt | 0.84250~ | 0.84279~ |
| Δ | 9.45764 | 9.43157 | | | |
| \mathcal{K}_1 | -.60599 | -.58165 | | | |
| \mathcal{K}_2 | + 28684 | .27013 | | | |
| Δ | -.89283 | -.85178 | | | |

pm

1 52 45.5 92 0
 53 37.5
 A 54 31.5
 55 28
 1 54 5.62 91 0

Thin clouds but
images good.

B 59 10.5 90 40
 0 2.5
 0 56
 2 1 49.5 89 40
 2 0 29.62

| | | | | | | | | | | |
|----------|----|----|-------|----|----|-------|----|-------|----|-------|
| T' | 1 | 54 | 5.62 | 2 | 0 | 29.62 | 0 | 3.00 | 53 | 38.17 |
| T | 9 | 26 | 24.00 | 9 | 19 | 57.75 | 20 | 24.67 | 26 | 51.33 |
| Δ | 4 | 27 | 41.62 | 4 | 40 | 31.87 | 39 | 38.33 | 26 | 46.84 |
| T_0 | 11 | 40 | 14.81 | 11 | 40 | 23.68 | 40 | 13.83 | 40 | 14.75 |

\overline{St} 14.24

14.29

\overline{St} + 6.96

6.96

11 40 21.2

Sum 11 59 23.8

19 2.6 17th noon

18 41.4 11th noon

21.2 Δ

3.5 Daily rate

18 53.6 14th 9.30 pm

9.0 in 2^d 14.5 = 2.24

4.0 Daily rate

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Arica

April 17/97

33.3 6.0
6.3 33.7

9 cham.

cloudy

6 18 12?

clouds -

$$0 = 0.52 + 0.5a - 2.26c$$

$$= 0.87 + 4.42a + 2.14c$$

$$= 2.97 + 1.03a$$

$$a = -2.88 \text{ Apr. 19 adjusted}$$

$$c = +.17 \text{ in azimuth}$$

5 0 0

-21 51 46.25

7 8 13.75

1 48 12.62

5 20 1.13

52.43

5 19 8.70

+19 8.70 18th at 5 pm.

| | | | | | |
|-------|-------|-------|-------|-------|-------|
| +41.7 | +42.1 | +41.4 | -39.0 | +41.0 | +39.5 |
| -38.0 | -38.6 | -38.8 | +40.7 | -39.7 | -39.0 |
| +3.7 | +3.5 | +2.6 | +1.7 | +1.3 | +1.5 |
| + .92 | + .88 | + .65 | + .42 | + .32 | + .12 |
| + .27 | + .26 | + .19 | + .12 | + .09 | + .04 |

169

April 1897

| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| cl. W | 33.5 | 8.2 | 33.8 | 8.3 | 33.8 | 8.1 | 6.7 | 32.3 | 33.7 | 7.3 | 32.9 | 6.6 |
| | 6.3 | 31.7 | 6.6 | 32.0 | 6.8 | 32.0 | 33.3 | 7.4 | 6.7 | 33.0 | 6.3 | 32.7 |

-16 35

-28 50

-26 14

+5 29

+28 16

a Can. Maj. 8 Can. cl. 8 Can a Can. Min cl. W 8 Can.

| | | | | |
|------|------|------|------|------|
| 41.7 | 32.3 | 9.1 | 54.1 | 55.5 |
| 57.5 | 49.3 | 26.5 | 59.7 | 12.4 |
| 12.5 | 5.7 | 43.3 | 24.7 | 28.8 |
| 28 | 22.7 | 59.8 | 39.8 | 45.8 |
| 43.5 | 39.7 | 16.5 | 54.7 | 2.8 |
| 59.2 | 57.2 | 32.5 | 9.3 | 19.7 |

| | | | | | | | | | | |
|---|----|------|----|------|----|------|----|------|----|------|
| 4 | 33 | 15.5 | 47 | 14.8 | 56 | 49.3 | 26 | 24.3 | 31 | 37.6 |
|---|----|------|----|------|----|------|----|------|----|------|

| | | | | | | | | | | |
|---|----|-------|----|-------|----|-------|----|-------|----|-------|
| 4 | 32 | 28.27 | 46 | 23.10 | 55 | 59.57 | 25 | 39.51 | 30 | 46.09 |
|---|----|-------|----|-------|----|-------|----|-------|----|-------|

| | | | | | |
|-----------|--------|--------|--------|--------|--------|
| Red 65.00 | - 4.52 | - 2.44 | - 0.66 | + 4.21 | + 5.06 |
|-----------|--------|--------|--------|--------|--------|

| | | | | | | | | | | |
|---|----|-------|----|-------|----|-------|----|-------|----|-------|
| 4 | 32 | 23.75 | 46 | 20.66 | 55 | 58.91 | 25 | 43.72 | 30 | 51.15 |
|---|----|-------|----|-------|----|-------|----|-------|----|-------|

| | | | | | | | | | | |
|---|----|-------|----|-------|---|-------|----|-------|----|------|
| 6 | 40 | 37.53 | 54 | 35.42 | 4 | 13.02 | 33 | 56.23 | 39 | 2.73 |
|---|----|-------|----|-------|---|-------|----|-------|----|------|

| | | | | | | | | | | |
|----|----|-------|----|----|----|----|----|----|----|----|
| 21 | 51 | 46.22 | 45 | 26 | 45 | 87 | 47 | 50 | 48 | 42 |
|----|----|-------|----|----|----|----|----|----|----|----|

| | | | | |
|-----|-----|-----|-----|-----|
| +28 | +22 | +13 | +08 | +03 |
|-----|-----|-----|-----|-----|

| | | | | |
|-----|-----|-----|-----|-----|
| -02 | -02 | -02 | -02 | -02 |
|-----|-----|-----|-----|-----|

| | | | | |
|------|------|------|-----|-----|
| 1.04 | 1.12 | 1.11 | .92 | .78 |
|------|------|------|-----|-----|

La Ca E DT

$$0 = 46.48 + \Delta T + .03a + 1.04c - .09 + .18 + .09 = 46.57$$

$$45.46 - .20 + 1.14 + .58 + .19 + .77 = .23$$

$$45.98 - .15 - 1.12 + .43 - .19 + .24 = .22$$

$$47.56 + .41 - 1.00 - 1.18 - .17 - 1.35 = .21$$

$$48.43 + .83 + 1.14 - 2.39 + .19 - 2.20 = .23$$

46.29

$$0 = 46.37 + .02a = 46.31$$

Adopt 46.25

Arca

April 18/17

Sextant

am.

For midnight - 17/18

$$\delta t = -\frac{\Delta \delta t \tan \phi}{15 \sin t} + \frac{\Delta \delta t \tan \delta}{15 \tan t}$$

[9]

19 31.5 89 40

20 26

21 19.5

22 13.5 90 40

90 40

23 15 90 0

24 10.5 20

25 4.5 90 40

25 57.5 91 0

26 52 20

27 48.5 91 40

28 43 92 0

Moon

$$t = 2 \ 14 \ 52 = 2.25 = 33 \ 43$$

$$2 \ 19 \ 3 = 2.32 = 34 \ 46$$

$$\delta = +11 \ 5.1 \quad \Delta \delta + 51.96$$

$$\log \tan \phi \ 9.52397 \quad 9.52397$$

$$\sin t \ 9.74455 \quad 9.75605$$

$$\Delta_1 \ 9.77942 \quad 9.76792$$

$$\tan \delta \ 9.29208 \quad 9.29208$$

$$\tan t \ 9.82462 \quad 9.84146$$

$$\Delta_2 \ 9.46746 \quad 9.45062$$

$$\mu_1 \ -.60176 \quad -.58603$$

$$\mu_2 \ +.29340 \quad +.28224$$

$$\Delta \ -.89516 \quad -.86827$$

$$t = 9 \ 40 \ 11.5 = 9.670 = 145^\circ 2'$$

$$9 \ 46 \ 37.3 = 9.787 = 146^\circ 39'$$

$$\delta + 10 \ 54.7 \quad \Delta \delta + 52.21$$

$$\log \tan \phi \ 9.52397 \quad 9.52397$$

$$\sin t \ 9.75823 \quad 9.74017$$

$$\Delta_1 \ 9.76574 \quad 9.78380$$

$$\tan \delta \ 9.28507 \quad 9.28507$$

$$\tan t \ 9.84469 \quad 9.81831$$

$$\Delta_2 \ 9.44038 \quad 9.46676$$

$$\mu_1 \ -.58310 \quad -.60786$$

$$\mu_2 \ -.27566 \quad -.29293$$

$$\Sigma \ -.85876 \quad -.90079$$

$$\Sigma \ 9.93387 \quad 9.95462$$

$$t \ 0.98543 \quad 0.99034$$

$$\Delta \delta \ 1.71775 \quad 1.71775$$

$$\frac{1}{15} \ 8.82391 \quad 8.82391$$

$$\delta t \ 1.46096 \quad 1.48662$$

$$28.9 \quad 30.7$$

Moon

$$\Delta \ 9.95190 \quad 9.93866$$

$$t \ 0.35218 \quad 0.36549$$

$$\Delta \delta \ 1.71567 \quad 1.71567$$

$$\frac{1}{15} \ 8.82391 \quad 8.82391$$

$$\delta t \ 0.84366 \quad 0.84373$$

pm.

A

| | | | | |
|---|----|------|----|---------------|
| 1 | 52 | 59 | 91 | 20 |
| | 53 | 53 | 91 | 40 |
| | 54 | 46.5 | 90 | 40 |
| | 55 | 41.5 | 90 | 20 |
| | 56 | 35.5 | 90 | 0 |

B

| | | | | |
|---|----|------|----|----|
| | 57 | 38 | 90 | 40 |
| | 58 | 32 | 90 | 20 |
| | 59 | 26 | 90 | 0 |
| 2 | 0 | 19.5 | 89 | 40 |

17th Midnight

18th noon

T' 9 20 52.6 9 27 20.2

1 54 47.1

1 58 58.9

T 2 0 29.6 1 54 5.6

~~8~~ 25 3.9

~~9~~ 20 52.6

Δ 19 20 23.0 19 33 14.6

4 29 43.2

4 38 6.3

T₀ 11 40 41.1 11 40 42.9

¹¹~~12~~ 39 55.5

11 39 55.8

42.0

55.6

$\pm 8t$

-29.8

+7.0

40 12.2

11 40 2.6

Mid. 11 59 16.9

Ann 11 59 ^{10.1}~~49.9~~

ΔT +19 4.7

+19 ^{7.5}~~44.5~~

Apr. 19/97

Sextant

am

Midnight 18/19

9 20 28 89 40
21 21.5 90 0

$t \ 9 \ 41 \ 25 = 9.690$ $145^{\circ} 21.2$
 $45 \ 11 = 9.753 = 146^{\circ} 17.8$
 $\delta_2 + 11 \ 15.4 \quad \Delta\delta + 51.75$

A

22 16.5 20
23 12 40

log tan ϕ 9.52397 μ 9.52397 μ

" sin ϵ 9.75474 9.74421

Δ_1 9.76923 μ 9.77976 μ

" tan δ 9.29892 9.29892

9.83952 9.82413

" tan ϵ ~~0.16048~~ μ ~~0.17587~~ μ

9.45940 9.47479

Δ_2 ~~9.13844~~ μ 9.12305 μ

B

24 13 90 0

25 8 20

26 25 40

26 58 91 0

\mathcal{N}_1 - .58780 - .60223

28801 29839

\mathcal{N}_2 - .14403 - .13276

87581 90062

Σ - .73183 - .73498

94240 95454

" Σ 9.86441 μ 9.86628 μ

" ϵ 0.98632 0.98914

" $\Delta\delta$ 1.71391 1.71391

" $\frac{1}{15}$ 8.82391 8.82391

1.46654 1.48150

" $\delta\epsilon$ ~~+38855~~ μ ~~+39324~~ μ

29.28 30.30

$\delta\epsilon$ - ~~24.47~~ - ~~24.73~~

✓

✓

pm

cloudy at corresp. altitude
to am. obs.

| | | | | | | |
|--------|---|----|------|----|----|-----------------------|
| A app. | 2 | 9 | 18 | 84 | 40 | thin' clouds and with |
| | | 10 | 10.5 | | 20 | light shades |
| | | 11 | 7 | | 0 | " " |
| | | 11 | 52.5 | 83 | 40 | " " |

from

| | | | | | | |
|--------|----|------|---|----|----|-------------|
| B exp. | 12 | 55 | | 84 | 20 | " " |
| | 13 | 46.5 | | | 0 | " " |
| | 14 | 39 | ✓ | 40 | | dark shades |
| | 15 | 30.5 | | 20 | | " " |
| | 16 | 23 | | 84 | 0 | " " |

Midnight 18/19

Int reduced

| | | | | | | |
|----------|----|---------------|---------------|----|---------------|-----------------|
| T' | 9 | 21 | 49.5 | 9 | 25 | 35.4 |
| | | 58 | 58.9 | | 55 | 47.1 |
| T | 1 | 54 | 47.1 | 1 | 58 | 68.9 |
| Δ | 19 | 22 | 50.6 | 19 | 30 | 21.3 |
| T. | 11 | 40 | 24.2 | 11 | 40 | 24.8 |
| | | | 24.5 | | | |
| | | | - 29.8 | | | |
| +85 | | | 24.6 | | | |
| | | 39 | | | | |
| T | 11 | 40 | 54.7 | | | |
| | | | 3.4 | | | |
| Mid. | 11 | 59 | 56 | | | |
| | | 19 | 8.7 | ✓ | | |

Chron. 1131 at Arica.

(Provisional)

| Date | Chron. t. | Corr. | Daily rate | Sextant | Transit |
|------------|-----------|--------------------|-----------------|---------|---------|
| Apr. 11/97 | 11.42 am. | +18 41.4 | | | |
| 14 | 9.30 pm | 18 53.56 | 3.96 | | |
| 17 | 11.40 am. | 19 2.6 | | " | |
| 17 | 11.40 pm. | 4.7 ^{2.1} | | " | |
| 18 | 11.40 am. | 7.5 ^{2.8} | | " | |
| 18 | 5.00 pm | 8.70 | 3.87 | | |
| 18 | 11.40 pm. | 8.7 | | " | |
| 19 | 5.00 pm. | 12.18 | 4.33 | | |
| 19 | 7.30 pm. | 12.63 | | " | |
| 20 | 5.00 pm | 16.51 | 4.47 | | |
| 20 | 7.30 pm. | 17.10 | | " | |
| 22 | 7.30 pm. | 25.48 | 4.19 | 4.42 | |
| 23 | 7.30 pm. | 30.37 | 4.89 | | |
| 26 | 7.30 pm. | 43.55 | 4.39 | | |
| 27 | 4.30 pm | 47.47 | 4.41 | 28g. | |
| 27 | 7.30 pm. | 47.97 47.96 | | | |
| 27 | 10.00 pm. | 48.53 48.57 | 4.45 | 4.34 | |
| 28 | 5.00 | 52.09 | 4.46 | | |
| 28 | 7.30 | 52.42 52.42 | 3.85 | | |
| 28 | 10.00 | 52.77 52.79 | 4.61 | 4.66 | |
| 29 | 7.30 | 57.03 56.98 | 4.72 | | |
| 29 | 10.00 | 57.49 57.52 | 5.27 | 5.19 | |
| 30 | 7.30 | 2.18 12.25 | 5.23 | | |
| 30 | 10.00 | 20 17.30 | 5.02 | | |
| May 3 | 7.30 | 2.72 2.71 | 5.02 | | |
| 3 | 10.00 | 17.67 17.66 | 4.98 | | |
| 5 | 4.00 | 26.87 26.83 | 5.24 | | |
| 6 | 3.00 | 32.0 | 5.39 | | |
| 7 | 2.20 | 35.8 | 3.91 | | |

Adopted for longitude reductions.

| | | | Hourly rate |
|----------|-----------|-------------------------------------|-------------|
| April 27 | 7.30 p.m. | +19 ^m 47.96 ^s | |
| | 10.00 " | 48.51 | 0.220 |
| 28 | 7.30 " | 52.43 | |
| | 10.00 " | 52.79 | .144 |
| 29 | 7.30 " | 57.00 | |
| | 10.00 " | 57.48 | .192 |
| 30 | 7.30 " | 20 2.19 | |
| | 10.00 " | 2.70 | .204 |
| May 3 | 7.30 " | 17.24 | } .2075 |
| | 10.00 " | 17.64 | |
| | | | .160 |
| 5 | 4.00 " | 26.92 | .221 |

At comparisons with Hollendo.

| | | |
|---------|------|-------------------------------------|
| Apr. 27 | 9 02 | 19 48.7 ³⁰ 72 |
| 28 | 9 06 | 52.66 |
| 29 | 9 03 | 57.30 |
| 30 | 9 17 | 20 2.50 |
| May 1 | 9 01 | 7.48 |
| 3 | 8 57 | 17.47 |
| 4 | 9 04 | 22.74 |
| 5 | 8 01 | 27.81 |

Revised in 3d book p. 162

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April 19 pm Sextant

after sun had come out
of clouds.

2 17 56 81 20

45 ?

B app

36.5

28

80 20

22 17 80 40

A cep.

7

57.5

24 47.5 79 40

Comp. obs. Apr. 20 am lost from clouds

Not reduced

178

$$\begin{array}{r} +38.6 \\ -39.6 \\ -1.0 \\ -1.25 \\ -0.07 \end{array}$$

32.2 6.4

6.9 32.7

a Can May

-40.2

+39.9

-4

-1

-0.03

7.1 33.2

33.0 6.9

s Can May

Apr. 19/97

+38.8

-39.9

-1.1

-0.3

32.8 6.0

cl E 6.7 33.2

a Can Min

54.1

9.7

24.7

39.8

54.8

9.3

4-29-16.5-47.2 52 50.9 60.1 22 24.3?

4 28 29.3 52 0.0 21 39.53

Red 5.00 -5.18 -1.31 +3.56

4 28 24.12 51 58.69 21 43.09

6 40 37.51 4 13.03 33 56.21

21 47 46.61 45.66 47 46.88

-0.7 -0.3 -0.8

-0.2 -0.2 -0.2

1.04 1.11 .92

| Δa | C_c | Σ | ΔT |
|------------------|-------|----------|------------|
| -0.4 | +1.1 | +0.7 | 46.59 |
| +0.21 | +1.2 | +0.33 | 45.94 |
| -0.57 | -0.11 | -0.68 | 46.10 |
| $\Delta T = -21$ | | | 46.21 |
| 5 | 0 | 0 | |
| 7 | 12 | | 13.79 |
| 1 | 52 | | 9.17 |
| 5 | 20 | | 4.62 |
| | | | 52.44 |
| ΔT | | | 19 12.18 |

$$0 = 46.52 + \Delta T + 0.03a + 1.04c$$

$$45.61 \quad -0.15 \quad +1.12 \quad +0.21 \quad +1.2 \quad +0.33 \quad 45.94$$

$$46.78 \quad +0.41 \quad -1.00 \quad -0.57 \quad -0.11 \quad -0.68 \quad 46.10$$

$$\Delta T = -21 \quad 47 \quad 46.21$$

$$0 = 1.17 + .56a + 2.12c$$

$$.56a = -.81$$

adjusted in az.

Assume $a = -1.4$ $c = +.11$

$$\Delta T \quad 19 \quad 12.18$$

-40.3
+37.9
-2.4
-.6

+37.7
-40.6
-2.9
-.7

$b = -.20$

+37.4
-40.2
-2.8
-.7

179

cl &

| | | | | | | |
|----------------|------|----------|--------|---------------|------|----------------|
| 6.3 | 34.0 | 32.7 | 50 | 32.6 | 48 | |
| 32.7 | 5.2 | 6.4 | 34.2 | 62 | 34.0 | |
| +6 20 | | +11 5 | | -69 18 | | -8 13 |
| g Hydrae | | K Cancri | PIX 13 | β Argus | | α Hydra |
| 43.4 | | 54.3 | 56.7 | | | 12.4 58.3 |
| 59.3 | | 10 | 13.2 | - | | 28.3 58.2 |
| 14.2 | | 25.4 | 29.3? | 50.8 32.1 | | 43.3 58.1 |
| 29.2 | | 40.6 | 45 | 59 33.3 32.5 | | 58.6 58.3 |
| 44.3 | | 55.7 | 0.5 | 15.3 32.3 | | - |
| 58.7 | | 10.3 | 55 16 | 56.5 32.7 | | clouds - |
| 6 38 13.7 | | 50 25.7 | - | - | | 10 43.3 58.3 |
| 37 28.97 | | 49 40.29 | | 59 32.40 | | 9 58.24 |
| Red 7.30 -8.63 | | -6.63 | | -5.00 | | -3.29 |
| 6 37 20.34 | | 33.66 | | 59 27.40 | | 9 54.95 |
| 8 49 58.93 | | | | 12 4.62 | | 22 33.49 |
| 21 47 21.41 | | | | 47 22.78 | | 21.46 |
| -.18 | | | | -.36 | | -.20 |
| -.02 | | | | -.06 | | -.02 |
| .91 | | | | 1.79 | | .99 |

180

-39.4
+37.2
- 2.2
- .55

-39.8
+36.8
- 3.0
- .75

+38.0
-39.5
- 1.5
- .4

+38.8
-39.5
- .7
- .2

6 = -19

clw

E cont.

5.9 33.5

6.0 33.8

33.0 5.0

33.3 5.5

32.5 4.7

32.3 4.5

5.8 33.7

5.8 33.7

10 ^{36 51} ~~Lemis~~ ^{mi}4 ^{-80 29} ~~Cham~~4 ^{-80 29} ~~Cham~~μ ^{+26 30} ~~Lemis~~μ ^{+17 16} ~~Lemis~~

24.2 21.0

19 46

-

16.7

-

21 20.5

-

32.5?

21.4

-

47.4

21.4 21.0

Reversed

24 17? 18.8

16.9 17.2

32

40.2? 21.2

24 ^{20.7} ~~18.8~~

25 48 19.7

-

18.7

58? 21.0

19.6

27 18.5 19.4 34

50.2 17.0

34.4

7 16 16.7? 20.9

28 52? 17.3

-

49 50.8

7 15 21.02

24 20.15

24 18.80

34 17.10

49 3.39

Red 7.30 -2.41

-.93

-.93

+ .70

+ 3.13

7 15 18.61

24 19.22

24 17.87

34 17.80

49 6.52

9 27 57.67

36 55.34

36 55.34

1 48.66

21 47 20.94

23.88

22.53

20.86

-.13

-.54

-.31

-.09

-.02

-.12

-.12

-.02

.71

2.84

2.84

.85

0 = 21.21 + ΔT +.42 a - 1.01 c

+ .13 - .11

+ .02

21.23

22.36 - 2.19 - 2.83

- .70 - .33

- 1.03

33]

21.24 + .18 - 1.01

+ .06 - .11

- .05

21.19

21.13

20.79 + 1.03 - 1.25

+ .33 - .14

+ .19

20.98

23.22 - 5.34 - 6.05

- 1.71 - .67

- 2.38

20.84

22.10 - 5.34 + 6.05

- 1.71 + .67

- 1.04

21.06

20.75 + .61 + 1.05

+ .20 + .12

+ .32

21.07

20.98 + .12 + 1.02

+ .04 + .11

+ .15

21.13

21.12

21.03 + .04 + 1.04

+ .01 + .11

+ .12

21.15

ΔT = -21 47 21.12

$$b = \begin{array}{r} -.12 \\ -.06 \\ -.14 \\ \hline -.11 \end{array}$$

$$\begin{array}{r} -40.0 \\ +38.2 \\ -1.8 \\ \hline -.45 \end{array}$$

181

| | | | |
|-----------------|------------------------|--------------|--------------|
| | 6.0 | 34.0 | |
| | +20.22 | 33.0 | 5.2 |
| -11.51 | γ Lennis | -16.19 | |
| δ Hydrae | 2 Uss. Maj. | μ Hydrae | |
| 7.8 | 48.5? | 37.1 | 7 30 0 |
| 23.2 | 4.3 | 52.7 | -21 47 21.12 |
| 38 | - | 7.7 | 9 42 38.88 |
| 53.3 | - | 23.2 | 1 52 49.17 |
| 8.5 | 1 51.6 | 38.8 | 7 50 29.71 |
| 23.8 | - | 54.5 | 1 17.08 |
| 53 39.7 | — | 8 9 10.7 | 7 49 12.63 |
| 52 53.47 | | 8 23.53 | 19 12.63 |
| +3.76 | | +6.31 | |
| 52 57.23 | | 8 29.84 | |
| 5 36.12 | | 21 8.68 | |
| 21.11 | | 21.16 | |
| -.11 | | -.11 | |
| -.02 | | -.02 | |
| 1.02 | | 1.04 | |

$$0 = 1.12 - 12.1c \quad c = +.09$$

$$= 21.22 + .30a - 1.01c$$

$$= 20.89 + .32a + 1.04c$$

$$= 0.33 - 2.05c \quad c = +.16$$

$$\text{Adopt } c = +.11$$

$$0 = 1.57 - 3.22a - 1.58c$$

$$= 2.43 - 6.37a - 4.80c$$

$$0 = 1.35 - 5.97a' + 5.00c$$

$$3.22a = +1.40 \quad +.43$$

$$a = +.30$$

$$6.37a = +1.90$$

$$5.97a' = +1.80 \quad a' = +.30$$

$$\text{Adopt } a = +.32$$

$b = -2.3$

183

Cl ~~11~~

-40.4
+37.7
-2.7
-1.7
-1.21

-40.9
+37.8
-3.1
-1.8
-1.24
+36.9
-39.7
-2.8
-1.7
-1.21

6.0 34.4

6.2 34.7

32.7 4.2

33.0 4.7

33.0 4.8

51.6 34.1

16 Canari Pix 13

13 Argus

2 Hydra

10 Lem. Min

53.7

-

53.24

11.9

24

9.7

13

8.5

28

43.5

25

very faint

28.8

51

out of focus

43

2.6

40.2

44.5?

33.3

58.2

21.2

55.3

0.3

15.3

13.2

39.6

10

15.5

16.3

27.8

57.7

6 46 25.3

51 31.7

57 38.5

6 43

12 16.5?

6 55

32.41

7 5

57.87

11 20.73

⁶⁶
-5.58

-3.95

-3.07

-1.09

-1.06

-1.05

6 55

26.82

5

53.86

11 17.61

9 12

4.56

22

33.48

27 57.66

21 ⁴³
44

22.26

43

20.38

43 19.95

-1.41

-1.23

-1.6

-1.06

-1.02

-1.02

1.79

.99

.71

Red. + 7.30

| | | | |
|------------------------------|--------------|----------------------|-------------------|
| 184 | +37.1 | -39.6 | -39.9 |
| | -40.6 | +37.7 | +37.4 |
| | -3.5 | -1.9 | -2.5 |
| | -.9 | -.5 | -.6 |
| cl E | -2.27 | -.15 | -.18 |
| 6-23 | | | |
| 32.8 4.3 | 5.6 34.0 | | 57.342 |
| 6.0 34.6 | 33.0 4.7 | -3 46 | 330 4.4 |
| 1/2 Cham | 1/2 Cham | 6 Sext. 19 Lemis Mri | 11 Lemis +8 32 |
| 7 15 44.5 | | 40.3 24.9 | 44.7 22 |
| 17 21 | | 55.2 24.8 | 48 37.2 |
| 18 51.5 | | 9.7? 24.9 | 24.2 51.9 |
| 20 | | 24.7 25.0 | 43.8 7 |
| 19 | | | 4 22 |
| 19.2 | 21 48.5 | | |
| 20.1 | 23 19.5 20.4 | 54.5 24.9 | 238 37 |
| 19.8 | 24 54 19.3 | 30 10.2 24.8 | 35 45 38 53.1 |
| 7 19 19.70 | 19 19.97 | 29 24.88 | 38 7.17 |
| Rel. 57.30 -1.75 | -1.75 | - .07 | +1.33 |
| 7 19 18.08 | 19 18.79 | 29 24.81 | + .02 38 8.52 |
| 9 36 55.22 | 36 55.22 | 46 4.76 | 54 48.55 |
| 21 43 22.70 | 42 23.13 | 43 20.05 | 43 19.97 |
| -6.5 | -4.8 | -1.6 | -17 |
| -12 | -12 | -0.2 | -02 |
| 2.84 | 2.84 | .93 | .99 |
| 0 = 21.63 + ΔT - 2.19 - 2.83 | -.92 | -.28 | -1.20 20.43 |
| 20.13 | + .18 -1.01 | + .08 -1.10 | -1.02 20.11 |
| 19.77 | + 1.03 -1.25 | + .43 -1.12 | + .31 20.08 |
| 22.09 | - 5.34 -6.05 | - 2.24 -1.60 | -2.84 19.25 |
| 22.53 | - 5.34 +6.05 | - 2.24 +1.60 | -1.64 20.89 |
| 19.87 | + .38 +1.00 | + .16 +1.10 | + .26 20.13 |
| 19.78 | + .46 +1.01 | + .19 +1.10 | + .29 20.07 |
| 20.02 | + .12 +1.02 | + .05 +1.10 | + .15 20.17 |
| 19.29 | + 1.21 +1.37 | + .51 +1.14 | + .64 19.93 |
| 19.61 | + 1.17 -1.35 | + .49 -1.14 | + .35 19.96 |
| 20.23 | + .04 -1.04 | + .02 -1.10 | -0.8 20.15 |
| | | | 20.06 |
| | | | ΔT = -21 43 20.08 |

$$\begin{array}{r}
 +37.1 \\
 -39.7 \\
 -2.6 \\
 -1.65 \\
 -1.19
 \end{array}$$

$$\begin{array}{r}
 -40.5 \quad +37.1 \\
 +37.0 \quad -39.4 \quad 185 \\
 -3.5 \quad -2.3 \\
 -.9 \quad -.6 \\
 -1.27 \quad -1.18 \\
 62 \quad -1.22
 \end{array}$$

$$32.8 \ 4.3$$

$$5.7 \ 34.0$$

cle

$$60 \ 34.5 \quad 32.9 \ 4.2$$

$$32.8 \ 4.2 \quad 54 \ 34.0$$

10^2 Hydrae Δ Hydrae Δ Urs. Maj. μ Urs. Maj. μ Hydrae f Leonis

| | | | | | |
|------|------|------|------|------|------|
| | 7.6 | 10.5 | 28.8 | 36.1 | 53.2 |
| | 23 | 31 | 49.7 | 52.6 | 9 |
| 26.1 | 37.7 | 50.8 | 9.9 | 8.2 | 24.2 |
| 41.3 | 52.9 | 11.3 | 30 | 23.7 | 39.4 |
| 56.8 | 8.2 | 31.8 | 50.2 | 39.2 | 54.5 |
| 4413 | 23.3 | 52.5 | 9.4 | 54.3 | 9.2 |

$$49 \ 39.5 \quad 55 \ 14.2 \quad 80 \ 29.7 \quad 5 \ 9.8 \quad 11 \ 24.3$$

$$48 \ 53.17 \quad 54 \ 11.73 \quad 59 \ 29.67 \quad 4 \ 23.41$$

$$\begin{array}{r}
 +3.10 \quad +3.98 \quad +4.85 \quad +5.65 \\
 +.05 \quad +.07 \quad +.08 \quad +.09 \\
 48 \ 56.32 \quad 54 \ 15.78 \quad 59 \ 34.60 \quad 4 \ 29.15
 \end{array}$$

$$5 \ 36.11 \quad 10 \ 56.36 \quad 16 \ 14.82 \quad 21 \ 8.67$$

$$20.21 \quad 19.42 \quad 19.78 \quad 20.48$$

$$-.17 \quad -.11 \quad -.15 \quad -.23$$

$$-.02 \quad -.02 \quad -.02 \quad -.02$$

$$1.02 \quad .65 \quad .66 \quad 1.04$$

$$0 = 0.44 + 12.1c \quad c = -.04$$

$$0 = 19.95 + .60a - 1.13c + \Delta T$$

$$= 19.94 + .60a - 1.20c$$

$$19.65 + .68a + 1.13c$$

$$a = .30 - .08a - 2.26c \quad c = +.12$$

$$0 = 1.68 - 2.79a - 1.70c \quad \text{Adopt } c = +.10$$

$$2.14 - 5.94a - 4.92c$$

$$0 = 2.88 - 6.02a' + 4.92c \quad +.56$$

$$0 = 5.02 - 11.96a \quad a = +.42 \text{ adopt}$$

$$7 \ 30 \ 0$$

$$-21 \ 43 \ 20.08$$

$$9 \ 46 \ 39.92$$

$$1 \ 56 \ 5.73$$

$$7 \ 50 \ 34.19$$

$$1 \ 17.09$$

$$\Delta T + 19 \ 17.10$$

186

-38.1
+38.8
+.7
+.2
+.06

+38.7
-37.9
+.8
+.2
+.06

+38.0
-38.3
-.3
-.1
-.03

+37.5
-38.0
-.5
-.1
-.03

clw

Apr 22/97

clz

5.0 33.1

33.7 5.0
~~6.3 35.0~~

33.2 4.8

33.1 4.4

33.5 5.3

4.7 33.2

5.0 33.3

4.7 33.3

B Argus

α Hydrea

10 Lem Mi 1/2 Chan

1/2 Chan

| | | | | | | | | |
|--------|------|-------|-----------------|-------|------|-------|------|----------------|
| [6] 46 | 6.8 | 30.6 | 12.2 | 57.2 | 24.3 | 50 | 19.8 | - |
| 47.7 | 30.7 | - | | 43 | 9 | 20.5 | 19.6 | - |
| 29.5 | 30.3 | 41.7 | 57.1 | 1.2 | 10 | 48 | 20.0 | - |
| 12.2 | 30.9 | 57 | 57.3 | 19.8 | - | 12 | 22.7 | 20.2 |
| 54.5 | 30.7 | 12 | 57.2 | 38.4 | - | 13 | 50.5 | 18.5 |
| 49 | 38.8 | 30.3 | 27.2 | 57.3 | 57.3 | - | 15 | 18.5 19.4 |
| | | 58.43 | 57.1 | 7.4 | 16.7 | - | 16 | 48 18.2 |
| 6 | 47 | 30.75 | 57 | 57.20 | 3 | 20.10 | 12 | 19.80 12 18.70 |

| | | | | | | | | | | |
|------------|-------|-------|-------|-------|-------|-------|----|-------|----|-------|
| Red k 7.30 | -6.98 | -5.26 | -4.38 | -2.90 | -2.90 | | | | | |
| | -12 | -.09 | -.07 | -.05 | -.05 | | | | | |
| 6 | 47 | 23.65 | 57 | 51.85 | 3 | 15.65 | 12 | 16.85 | 12 | 15.75 |
| 9 | 12 | 44.5 | 22 | 33.45 | 27 | 57.62 | 36 | 54.98 | 36 | 54.98 |
| 21 | 35 | 19.20 | | 18.40 | | 18.03 | | 21.87 | | 20.77 |
| | | +11 | | +0.6 | | +0.4 | | -0.9 | | -0.9 |

| | | | | | | |
|-----------|---------------------|--------|-------|--------|-------|-------|
| 1.79 | .99 | .71 | 2.84 | 2.84 | 2.84 | |
| 0 = 19.31 | +ΔT - 2.19a + 2.83c | -1.10 | -1.25 | -1.35 | 17.96 | |
| 18.46 | + .18 + 1.01 | + .09 | - .09 | .00 | 18.46 | |
| 18.07 | +1.03 + 1.25 | + .52 | - .11 | + .41 | .48 | 18.47 |
| 21.78 | - 5.34 + 6.05 | - 2.67 | - .54 | - 3.21 | .57 | } |
| 20.68 | - 5.34 - 6.05 | - 2.67 | + .54 | - 2.13 | .55 | |
| 18.46 | + .38 - 1.00 | + .19 | + .09 | + .28 | .74 | from |
| 18.35 | + .46 - 1.02 | + .23 | + .09 | + .32 | .67 | |
| 18.15 | + .61 - 1.05 | + .30 | + .09 | + .39 | .54 | 18.66 |
| 18.55 | + .12 - 1.02 | + .06 | + .09 | + .15 | .70 | 2 min |
| 17.91 | + 1.21 - 1.37 | + .60 | + .12 | + .72 | .63 | |

ΔT = - 21 35 18.56

+37.7
-38.8
-1.1
-.3
-.09

-39.1
+38.0
-1.1
-.3
-.09

187

332 4.5

5.2 83.9

5.0 83.8

838 4.7

6 Sept π Lem. η Lemis λ Hydrae δ Urs. Maj.

- 21.1 31.7 2.8 9.2

- 37 31.7 2.8 30.7

very faint
near obj.

10 ?24.6 52.2 47.3 2.6 51.4

24.8 24.5 7.2 43.2 2.9 12

40 24.8 22.2 18.4 2.4 32.6

54.4 24.8 36.8 33.7 2.6 23 52.8 52.4

22 9.3 24.7 30 52.1 49.5 2.7 41 38.5 53.0 47 12.8

21 24.68 30 6.94 37 2.67 40 52.90 46 11.59

-1.41 +.02 +1.16 +1.79 +2.66
-.02 .00 +.02 +.03 +.04

21 23.25 30 6.96 37 3.85 40 54.72 46 14.29

46 4.73 54 48.52 1 45.62 5 36.08 10 56.32

18.52 18.44 18.23 18.64 17.97

-.06 -.09 -.08 -.09 -.06

.93 .99 .85 1.02 .65

$0 = 1.10 + 12.1c \quad c = -.09 \text{ adpt.}$

$= 1.24 - 3.22a + 1.58c \quad a = +.34 \quad 7 \quad 30 \quad 0$

$= 3.71 - 6.37a + 4.80c \quad +.51 \quad -21 \quad 35 \quad 18.56$

$= 2.77 - 6.55a' - 4.68c \quad a' = +.49 \quad 9 \quad 54 \quad 41.44$

$= 18.26 + 0.60a + 1.13c \quad \text{Adpt} + 50 \quad 2 \quad 3 \quad 58.84$

$18.22 + .66a - 1.11c \quad 7 \quad 50 \quad 42.60$

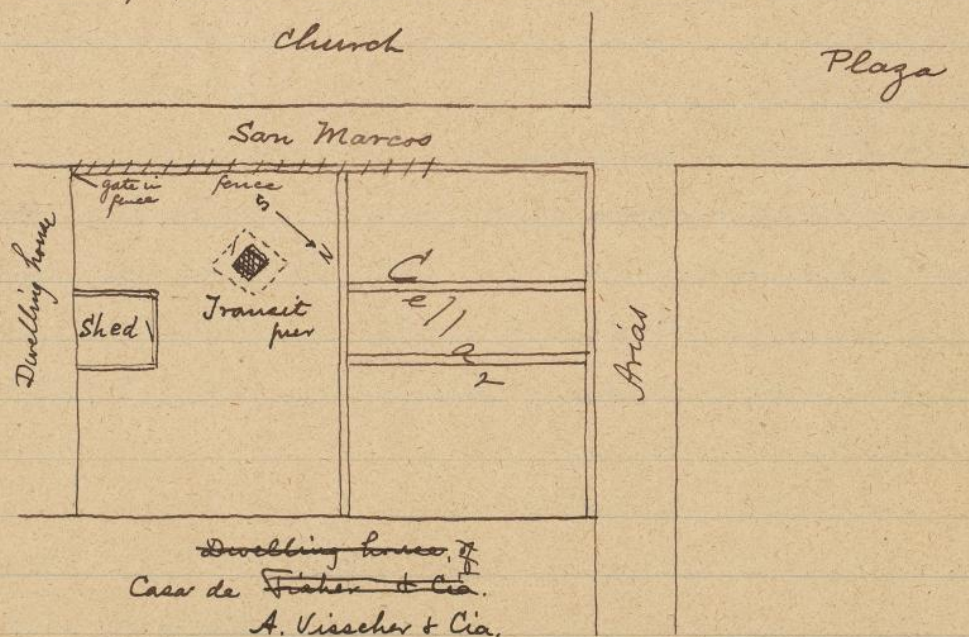
$= .04 - .06a + 2.24c \quad c = -.02 \quad 1 \quad 17.12$

49 25.48

$\Delta T = +19 \quad 25.48$

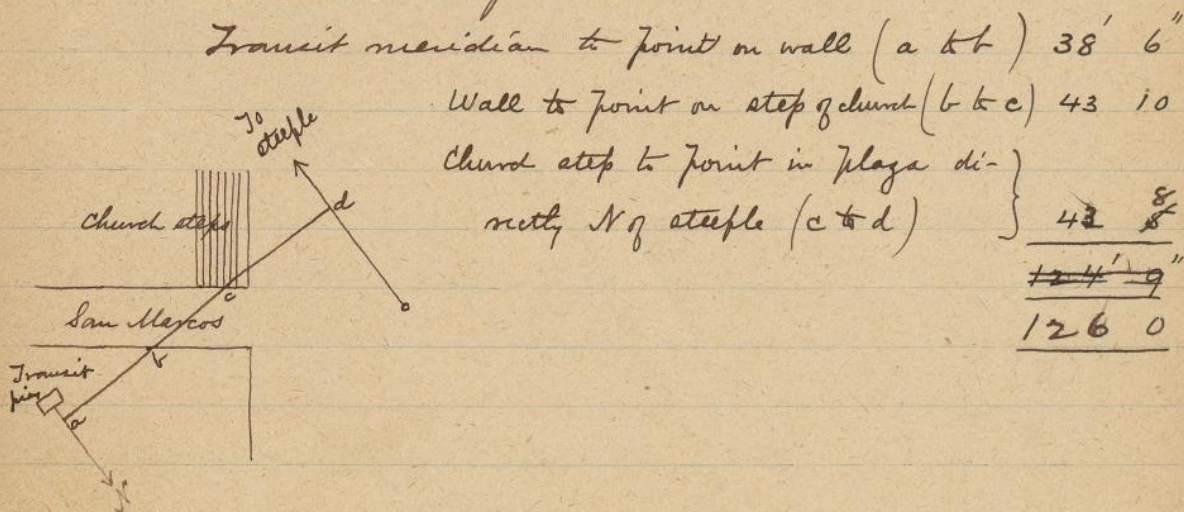
Station at Arica.

The pillar for the transit instrument was built of stones and cement in a vacant lot on the south~~west~~ corner of the Calle San Marcos and Calle de Arias, the lot belonging to Mrs. Nugent. The Calle San Marcos separates this lot from the Church, Iglesia Matriz. Cellar walls had been erected on the northwestern half of the lot, the top of the walls level with the ground on the southeastern end, on account of the slope of the ground towards the northwest. A fence of corrugated iron protected the lot for part of the distance on Calle San Marcos, from the S~~W~~ corner at the dwelling house adjoining to a distance where the wall of the lot was about 6 or 7 ft above the sidewalk.



The distance of the transit pier from the north-eastern edge of the wall on San Marcos street is 19 ft 9 in; and from the wall at the dwelling house on the south-east 36 ft. 0 in.

In the absence of surveying instruments in the town the distance ^{east} ~~south~~ of the steeple of the church (which is on the western corner of the church) was thus obtained:— The meridian line from the transit instrument towards the north was carefully laid out. Then a parallel line in the Plaza, the meridian of the steeple, was obtained by the shadow of a vertical string at apparent noon. The distance between these ~~two~~ meridians was obtained by a tape measuring on a perpendicular to the first meridian line. The distances are as follows:—



The transit pier was taken down May 6/97

Approx.

Eq. radius earth 3962.8025 miles Bessel

log π 3.59800" π 0.49715

" 2 0.30103

" 5280 3.72263

" 2 8.11881

" 86400 4.93651

" ft to 1st time Equator 3.18230

" era of 9.97701

" ft to 1st Arica 3.15931No ~~1443.1~~
~~14.43~~No ft transit Wg Steeple 126.0
~~124.8~~log " 10 037
2. 09621" Corr. long. 94106
8. ~~93670~~ = 0.0 ~~865~~ ⁸⁷³ -

Long. Steeple 4 41 19.991

" Arica transit 4 41 19.90 ⁴

192

Apr. 23

+39.0
-38.2
+1.2
+0.06

+37.3
-37.9
-.15
-.04

-38.1
+37.9
-.01

-37.8
+37.9
.00

Adrift -0.02

33.6 5.4 33.3 4.0

4.8 33.3

4.7 33.1

5.0 33.2

4.8 33.1

33.2 4.7

33.2 4.7

K Carai

 β Argus α Hydrae

10 Len. W.

 ξ Cham.

8

-

41 22.8

11.6

24.3

3 44

13.8

8.7

5.5

26.8

43.2

5 14.8

13.9

23.3

46.2

41.2

1.1

6 42.5

14.5

38.6

43 28.3

56.4

19.7

53.8

40.3

11.4

38.4

9.0

52.5

26.5

57.2

6 34 25.0

45 57.2

54 42.3

0 16.7

6 43 28.97

53 56.60

59 20.09

8 14.07

Red. 27.30

-7.64

-5.92

-5.04

-3.58

-.13

-.10

.08

-.06

6 43 21.20

53 50.58

59 14.97

8 10.43

9 12 4.40

22 33.44

27 57.60

36 54.86

21 31 16.80

17.14

17.37

15.57

-.04

-.02

-.01

-.06

-.06

-.02

-.02

-.12

1.79

.99

.71

2.84

$$0 = 16.70 + \Delta T - 2.19a + 2.83c + .55 - .06 + .49 \quad \Delta T \quad 17.19$$

$$17.10 \quad +.18 \quad +1.01 \quad -.04 \quad -.02 \quad -.06 \quad .04$$

$$17.34 \quad +1.03 \quad +1.25 \quad -.26 \quad -.03 \quad -.29 \quad .05 \quad 17.04$$

$$15.39 \quad -.534 \quad +6.05 \quad +1.34 \quad -.12 \quad +1.22 \quad 16.61$$

$$15.22 \quad -.534 \quad -6.05 \quad +1.34 \quad +.12 \quad +1.46 \quad 16.68$$

$$17.18 \quad +.46 \quad -1.01 \quad -.12 \quad +.02 \quad -.10 \quad 17.08$$

$$17.08 \quad +.12 \quad -1.02 \quad -.03 \quad +.02 \quad -.01 \quad .07 \quad 17.16$$

$$17.58 \quad +1.17 \quad -1.35 \quad -.29 \quad +.03 \quad -.26 \quad .32$$

$$17.14 \quad +.04 \quad +1.04 \quad -.01 \quad -.02 \quad +.03 \quad .11 \quad 17.11$$

$$16.61 \quad -.506 \quad +5.76 \quad +1.26 \quad -.12 \quad +1.14 \quad .75$$

$$16.29 \quad -.506 \quad -5.76 \quad +1.26 \quad +.12 \quad +1.38 \quad .67$$

$$\text{Adrift } \Delta T = -21.31 \quad 17.11$$

-38.8
+38.0
-.2
-.06

Adopt -.04

.00

+38.0 193
-39.0
-25
-.07

cl

5.0 33.8

4.7 33.3

33.3 4.7

33.3 4.7

33.3 4.7

5.0 34.0

h cham μ Lennis Lal 19433 π Lennis ν^2 Hydrea δ Hydrea μ Vn May'

33.3 20.5 39.2 5.8 28.3

43.2 49.8 36.5 55.2 21.7 49.4

59.7 5.7 51.7 10.4 37.2 9.6

16.4 21.5 6.7 25.7 52.4 29.5

9 44? ⁸ 12.0] 33.2 37.2 21.7 41.0 7.5 49.7

11 13 13.9 49.3 52.4 36.3 55.8 22.3 09.3

12 43.8 14.0 19 6.0 22 8.2 26 51.4 32 11.2 37 37.5 49 29.3

8 13.95 26 6.40 36 52.06 48 29.30

-3.58 -0.6 -0.64 -.01 +1.13 +3.04
+.02 +.05

8 10.31 26 5.75 36 53.21 48 32.39

36 54.86 54 48.51 5 36.07 16 14.76

15.45 17.24 17.14 17.63

-.11 -.04 -.04 -.03

-.12 -.02 -.02 -.02

2.84 .99 1.02 .66

$$\begin{aligned} 0 &= 0.17 + 12.1 c \quad c = -.01 \\ &= 0.32 + 11.5 c \quad c = -.035 \end{aligned} \quad \left. \vphantom{\begin{aligned} 0 &= 0.17 + 12.1 c \\ &= 0.32 + 11.5 c \end{aligned}} \right\} -.02$$

$$0 = 0.64 + 3.22 a - 1.58 c \quad a = -.21$$

$$= 1.95 + 6.37 a - 4.80 c \quad -.32$$

$$= 2.36 + 6.51 a' + 4.70 c \quad a' = -.35$$

$$\overset{53}{=} 0.97 + 5.10 a'' - 4.72 c \quad a'' = -.12$$

Adopt -.25

7 30 0

-21 31 17.11

9 58 42.89

2 7 55.39

7 50 47.50

1 17.13

 $\Delta T + 19 30.37$

194

Adopt +.05

cl w

+38.5
-37.3
+1.2
+.3
+.09

+38.4
-38.9
-.5
-.1
-.03

+37.9
-36.7
+1.2
+.3
+.09

4.8 33.7

33.7 4.7

33.3 4.6

33.1 4.2

5.0 33.9

44.323

p Hydraz

p Lemis

q Hydraz

4. Sen Min

5² Chan

35.5?

52.8

13.7

16

51.2

8

30.1

13 9.8 0.3

6.3

22.7

45.7?

14 32.5 ✓ 0.1

21.7

37.8

2.3

15 59.5 1.2

37.3

53.2

18.3

52.7

8.2

18.2

34.7

7 53 9.2

59 24.3 8 5 34.4

9 51.8

7 52 21.89

16 0.53

Red 47.30 +3.67

+7.56

+.13

7 52 25.72

16 8.22

10 21 8.61

57.63

21 31 17.11

16.59

+.05

+.14

-.02

-.12

1.04

2.75

cl

33.3 4.7 0.0

4.7 33.3

8 Chan

16

18 51 0.6

20 17 0.1

16 0.35

+7.56

+ .13

8 16 8.04

10 44 51.63

16.41

.00

-12

2.75

11.51 16

196

cl w

-38.3
+37.9
-.4
-.1
-.03

+37.3
-37.9
-.15
-.04

-37.6
+37.6
.00

Apr. 26/97 $(b = -.02)$

4.9 33.4

4.2 33.1

4.3 33.3

33.2 4.7

33.3 4.6

33.4 4.2

2 Hydral 10 km mi 4 cham 6 Sext. II Lennis γ Lennis

10.8 23.3 51 44 13.8 - 20.3 1.5 14.7

25.9 42.1 53 14.5 13.6 - 35.7 1.4 30.3

40.5 0.2 - 8.2 23.4 50.2 1.5 45.5

55.5 18.7 56 11.5 13.3 22.7 23.0 5.3 1.6 1.3

10.7 37.3 57 41.5 13.2 37.8 23.2 20.3 1.4 16.7

25.9 56.3 59 13 13.9 52.8 23.2 35.7 1.2 32.3

6 42 41.6 48 15.7 7 0 47.5 12.8 6 8.3 22.9 14 51.3 ^{1.0} 21 48.7

6 41 55.84 47 19.09 56 13.43 5 23.14 14 5.54/20 1.37 1.36

Rel. 1.7.30 -7.90 -7.01 -5.55 -4.04 -2.61 -1.48

6 41 47.81 47 14.96 56 7.79 5 ~~14.63~~ 14 3.89 20 59.87

9 22 33.40 27 57.55 36 54.48 46 4.68 54 48.47 1 45.57

21 19 14.41 14.41 13.31 14.35 14.42 14.30

-.02 -.01 -.06 -.02 -.02 -.02

-.02 -.02 -.12 -.02 -.02 -.02

.99 .71 2.84 .93 .99 .85

0 = 14.37 + ΔT +1.8a +1.01c - .05 - .05 - .10 14.27

14.38 +1.03 +1.25 -.29 -.06 -.35 .03

13.13 -5.34 +6.05 +1.50 -.30 +1.20 .33] 14.14

14.31 +.28 +1.00 -.11 -.05 -.16 .15

14.38 +.46 +1.01 -.13 -.05 -.18 .20

14.26 +.61 +1.05 -.17 -.05 -.22 .04

14.30 +.62 -1.02 -.03 +.05 +.02 .32

14.68 +1.21 -1.37 -.34 +.07 -.27 .41 14.35

14.65 +1.17 -1.35 -.33 +.07 -.26 .39

14.16 -.24 -1.16 +.07 +.06 +.13 .29

12.52 -5.06 -5.76 +1.42 +.29 +1.171 .23]

$\Delta T = -21$ 19 14.24

+37.1
-37.7
-.04

.00

+37.0
-38.5
-.4
-.12

197

cel

b = -.05

| | | | | | |
|-----------------|--------------------|-----------------|-------------------|--------------|------------------|
| 33.1 | 4.0 | 4.2 | 33.3 | 33.0 | 4.0 |
| 4.3 | 33.4 | 33.3 | 4.2 | 4.7 | 33.8 |
| δ Hydrae | δ Umi. Maj. | μ Umi. Maj. | α Antellae | μ Hydrae | δ^2 Cham. |
| 5 | 8.5 | 27.5 | - | 59 | 37.5 |
| 21 | 30.2 | 48.5 | 6 | 40.3 | 1 8.2 |
| 36.3 | 50.8 | 8.9 | 23.5 | 40.4 | 2 3.4 |
| 51.3 | 11.2 | 28.9 | 40.8 | 40.5 | 4 0 |
| 6.8 | 31.9 | 48.9 | 58.1 | 40.5 | 5 25.3 |
| 21.7 | 51.7 | 8.3 | 15 | 40.7 | 6 48.7 |
| 25 | 36.7 | 31 | 12.3 | 36 | 28.4 |
| 24 | 51.26 | 30 | 10.94 | 35 | 28.49 |
| -0.85 | +0.3 | +0.90 | +1.92 | +5.58 | |
| 24 | 50.40 | 30 | 10.97 | 35 | 29.41 |
| 5 | 36.03 | 10 | 56.24 | 16 | 14.71 |
| 14.37 | 14.73 | 14.70 | 14.24 | 12.78 | |
| -0.05 | -0.03 | -0.03 | -0.06 | -0.14 | |
| -0.02 | -0.02 | -0.02 | -0.02 | -0.12 | |
| 1.02 | .65 | .66 | 1.14 | 2.75 | |

$$0 = 0.61 + .28a + 12.8c$$

$$c = -.05 \text{ adopt}$$

$$7 \quad 30 \quad 0$$

$$= 14.33 + \Delta T + .62a + 1.08c$$

$$-21 \quad 19 \quad 14.24$$

$$14.48 + \Delta T + .64a - 2.37c$$

$$c = +.04$$

$$10 \quad 10 \quad 45.76$$

$$= 1.20 + 5.96a - 4.97c$$

$$a = -.24$$

$$2 \quad 19 \quad 45.05$$

$$= 2.14 + 6.25a' + 4.40c$$

$$\begin{aligned} &-.31 \\ &-.28 \text{ adopt} \end{aligned}$$

$$7 \quad 51 \quad 0.71$$

$$1 \quad 17.16$$

$$\Delta T + 19 \quad 43.55$$

198

$+38.7$ -40.0 -39.6 -39.6
 -38.3 $+41.5$ $+40.0$ $+39.2$
 $+1.03$ $+1.12$ $+1.03$ -1.03

cl W

April 27/97

32.7 6.0 6.9 33.1 cl 6.6 33.0 6.3 33.3 clw 5.8 33.1

5.9 32.4 33.8 7.7 33.2 6.8 33.1 6.1 33.1 5.8

α β γ δ ϵ ζ η θ ι κ λ μ ν ξ \omicron π ρ σ τ υ ϕ χ ψ ω

40 31 7.2 50.7 51.6
 55.5 48 24.7 6.3 8.5
 10.7 4.3 41.5 21.4 25
 26.2 21.6 58 36.5 41.8
 41.7 38.4 14.7 51.3 58.7
 57.3 55.8 30.5 5.8 15.7

57 13.7 11 13.4 20 47.3 50 21 55 33.5

3 56 26.44 10 21.79 19 57.70 49 36.14 54 42.11

Red 5 4.30 5.51 -3.22 -1.65 $+3.22$ $+4.06$

56 20.93 10 18.57 19 56.05 49 39.36 54 46.17

6 40 37.40 54 35.23 4 12.89 33 56.09 39 2.58

21 15 43.53 43.34 43.16 43.27 43.59

$+0.3$ $+0.3$ $+0.3$ -0.3 $.00$

-0.2 -0.2 -0.2 -0.2 -0.2

1.04 1.12 1.11 $.92$ $.78$

$0 = 43.54 + \Delta T + 0.03a + 1.04$ Δa C_a Σ ΔT

43.35 -20 $+1.14$ $+1.04$ -0.9 -0.5 $.30$

43.17 -15 -1.12 $+1.04$ $+0.9$ $+1.3$ $.30$

43.22 $+41$ -1.00 -0.9 $+0.8$ -0.1 $.21$

43.57 $+83$ $+1.14$ -1.7 -0.9 -2.6 $.31$

$\Delta T - 21$ 15 43.31

$c = -0.8$ $0 = .22 + 1.03a$

$a = -.21$

+38.0
-39.6
- .4

-39.7
+36.9
- .7

-38.8
+36.6
- .55

- .56
6 = - .16

-39.0
+36.9
- .5

199

olw

| | | | | | | |
|-------------------|-------------------|----------------------|-----------|--------------|-----------------------|--------|
| 33.0 | 5.0 | 5.2 33.6 5.7 34.0 | | | 5.0 34.0 | |
| 5.8 | 33.8 | 32.6 4.3 32.4 4.2 | | -18.31 | 32.9 4.0 | -12.34 |
| 10 Lem Min | 4 Chan | 6 Sect | Lal 19433 | π Lemnis | 0 ²⁴ Hydru | |
| 23.8 | 47 44 13.8 | 38.3 | 33.3 | 20.2 | 38.8 | |
| 42.4 | 49 16.5 15.6 | 53.3 | 48.8 | 35.6 | 54.2 | |
| 0.4 | 50 42 14.0 | 8 | 4.1 | 50.2 | 9 | |
| 19 | 52 12.5 14.3 | 22.7 | 19.7 | 5.2 | 24.2 | |
| 37.8 | 53 42 13.7 | 37.7 | 35.5 | 20.2 | 39.5 | |
| 56.6 | 55 13.2 14.1 | 52.5 | 51.4 | 35.3 | 55 | |
| 6 44 16.2 | 56 48.5 13.8 | 2 8.4 | 6 7.9 | 10 51.2 | 16 10.8 | |
| 6 43 19.46 | 52 15.53 13.95 | 1 23.99 | 5 20.10 | 10 5.41 | 15 24.50 | |
| R. 1.6 7.30 -7.67 | -6.20 | -4.70 | -4.05 | -3.27 | -2.40 | |
| 6 43 11.79 | 52 7.75 | 1 18.29 | 5 16.05 | 10 2.14 | 15 22.10 | |
| 9 27 57.53 | 36 54.36 | 46 4.67 | 50 2.60 | 54 48.46 | 0 8.52 | |
| 21 15 14.26 | 13.39 | 13.62 | 13.45 | 13.68 | 13.58 | |
| - .11 | - .45 | - .15 | - .17 | - .16 | - .16 | |
| - .02 | - .12 | - .02 | - .02 | - .02 | - .02 | |
| .71 | 2.84 | .93 | 1.05 | .98 | 1.02 | |

(a) Additional Equations to those p. 200

| | | | | | | |
|-----------------|----|-------|-----------|---------|----------|-------------------|
| 4 | 30 | 0 | 0 = 13.26 | + .00 a | + 1.05 c | .00 - .03 - .03 |
| - 21 | 15 | 43.31 | 13.40 | + .10 | + 1.02 | - .04 - .03 - .07 |
| 7 | 14 | 16.69 | 13.02 | - .09 | - 1.09 | + .04 + .03 + .07 |
| 2 | 23 | 41.61 | 13.22 | + .04 | - 1.04 | - .02 + .03 + .01 |
| 4 | 50 | 35.08 | 13.20 | + .29 | - 1.00 | - .11 + .03 - .08 |
| | | 47.77 | | | | |
| $\Delta T + 19$ | | 47.47 | | | | |

13.23
13.33
13.09
13.23
13.12

200

+ 37.0
- 39.5
- .6

62 - .16

- 39.6
+ 36.7
- .7

- 39.6
+ 36.5
- .8

W

33.0 4.0

E

5.3 34.3

52 34.4

5.3 34.2

32.9 3.8

32.8 3.7

Hydra

Urs May

Urs May

Hydra

Hydra

Hydra

5.4

9.4

27.2

34

—

59.2

20.8

29.8

48.2

50.2

—

15.4

35.5

49.7

8.5

5.8

20.2

31.2

50.8

10.3

28.5

21.5

20.5

46.7

5.9

30.8

48.6

37

36.3

19.7

2

21.3

51.5

8.2

52.2

52.2

19.9

17.2

7 21 37.2

27 13.2

32 28.2

37 77

45 8.2

19.6

49.3

20 50.99

26 10.67

31 28.20

36 21.20

44 19.92

48 46.34

Red. 67.30 -1.50

-0.63

+ 0.24

+ 1.04

+ 2.36

+ 3.08

20 49.49

26 10.04

31 28.44

36 22.24

44 22.28

48 49.42

5 36.02

10 56.22

16 14.69

21 8.58

29 8.97

33 35.92

15 13.47

13.82

13.75

13.66

13.31

13.50

- .16

- .10

- .16

- .26

- .27

- .26

- .02

- .02

- .02

- .02

- .02

- .02

1.02

.65

.66

1.04

1.08

1.04

0 = 14.13

+ ΔT + 1.03 a + 1.25 c

- .39

- .04

- .43

13.70

12.82

- 5.34

+ 6.05

+ 2.03

- .18

+ 1.85

14.67

13.45

+ .35

+ 1.00

- .14

- .03

- .17

13.28

13.52

+ .46

+ 1.01

- .17

- .03

- .20

13.26

13.29

+ .12

+ 1.02

- .05

- .02

- .08

.21

13.70

+ 1.21

+ 1.38

- .46

- .04

- .50

.20

13.57

+ 1.17

- 1.35

- .44

+ .04

- .40

.17

13.38

+ .04

- 1.04

- .02

+ .03

+ .01

13.39

9.72

- 5.06

- 5.76

+ 1.92

+ .17

+ 2.09

11.81

13.24

13.57

+ 1.24

- 1.42

- .44

+ .04

- .43

13.14

13.28

+ .59

- 1.04

- .22

+ .03

- .19

13.09

Additional equations p. 199

 ΔT - 21 15 13.25

+36.0
-40.0
-1.0

-84
b = -25

+36.1
-39.2
-.8

-39.6
+35.9
-.9

201

32.7 3.3

32.8 3.3

51.0 34.6

 ΔT

5.3 3.47

4.9 3.4.3

32.7 3.2

crummenz with stars

8² Champ² Lennisp² Lennisp² Lennis

A

+3.38 13.28

55 36

58.2

21.3 5.8

10.3

+1.00 .23

57 58

13.7

23.6 5.6

26.7

+4.46 .30 13.27

58 32.3

28.7

44.7 5.4

42.3

+1.10 .33

59 58

43.8

5.8 5.4

57.7

+1.12 .21

1 24

58.7

- uny count

13.2

+0.04 .39

2 47.5

13

43.6 1.6

28.2

-0.09 .29

4 14.5

12.28

20 47 1.4

24 43.7

+0.04 .22 13.17

59 56.87

11 43.44

19 5.55

23 57.44

+0.29 .12

+4.92

+6.85

+8.06

+8.86

+0.59 .09

0 1.79

11 50.29

19 73.61

24 6.30

13.22

44 51.26

56 36.83

3 55.81

8 52.78

Rejecting A 725

10.53

13.48

13.75

13.52

13.26

-69

-24

-16

-22

.24

-12

-02

-02

-02

13.25

2.75

.96

.63

.86

L. 89.

$$0 = 0.88 + 6.55a - 4.68c$$

$$a = -.16$$

$$7 \ 30 \ 0$$

$$3.85 + 6.26a + 4.38c$$

$$a' = -.60$$

$$-21 \ 15 \ 13.25 \ 13.273$$

$$0 = 13.48 + \Delta T + .54a + 1.10c$$

$$-.38$$

$$10 \ 14 \ 46.75 \ 46.777$$

$$= 13.41 + \Delta T + .60a - 1.14c$$

$$2 \ 23 \ 41.61 \ 41.61$$

$$c = -.03$$

$$7 \ 51 \ 6.14 \ 5.167$$

$$1 \ 17.18 \ 17.176$$

$$49 \ 47.96 \ 47.971$$

$$\Delta T + 19 \ 47.96$$

Telegraph Signals with Mollendo

Arica Received Mollendo
 1131 4026 Δ
 28.4 = 0
 '8 59 28.35 = 14 32 0 = 5 32 31.65

Sent signals to Mollendo
 from 9 2 25 to 9 '6 0
 Telegrams.

Arica Diff 5 32 31.8

" Have you anything more?

Arica Is it clear at Arica?
 " Probably

" How does your plan work
 " Very well.

" Signals tomorrow night at same time.
 " Have you anything more?
 " Good night

Note - Flashes of mirror as observed at Arica were somewhat irregular and ran into each other, the vibrations of any second not ceasing before the next second caused them to play again. Signals having preceded the 0.5 beats of chronometer by a sensible difference at first estimated as 0.5 and finally decided upon as 0.15 as above.

April 27. Observation Equations.
First series.

203

Adopt $\Delta T = -21 \ 15 \ 13.25 \ a = -.38 \ c = -.03$ Wt.

| | | | |
|---------------------|----------------------|--|-----|
| 10 Leon Min. | -1.45 | $+\Delta T + 1.03a + 1.25c$ | .85 |
| ζ Cham. | -1.42 | $+\Delta T - 5.34a + 6.05c$ | .21 |
| 6 Sext. | $-\frac{.06}{.03}$ | $+\Delta T + \frac{.25}{.38}a + 1.00c$ | 1. |
| δ 19433 | +0.2 | $+\Delta T + .00a + 1.05c$ | .96 |
| π Leonis | $-\frac{.07}{.05}$ | $+\Delta T + .46a + 1.01c$ | 1. |
| ζ Hydra | -0.8 | $+\Delta T + .10a + 1.02c$ | .99 |
| λ " | +0.4 | $+\Delta T + .12a + 1.02c$ | .99 |
| λ Vir. Maj. | +0.5 | $+\Delta T + 1.21a + 1.38c$ | .81 |
| μ " " | +0.8 | $+\Delta T + 1.17a - 1.35c$ | .81 |
| μ Hydra | -1.4 | $+\Delta T + .04a - 1.04c$ | .98 |
| 44 " | +1.6 | $+\Delta T - .09a - 1.09c$ | .94 |
| ϕ " | +0.2 | $+\Delta T + .04a - 1.04c$ | .98 |
| δ^2 Cham. | +1.44 $-.35 = +1.09$ | $+\Delta T - 5.06a - 5.76c$ | .22 |
| β^2 Leonis | +1.3 | $+\Delta T + .29a - 1.00c$ | 1. |
| γ Vir. Maj. | $+\frac{.12}{.11}$ | $+\Delta T + 1.27a - 1.42c$ | .79 |
| δ Leonis | +1.6 | $+\Delta T + .59a - 1.04c$ | .98 |

Second series

Adopt $\Delta T = -28 \ 14 \ 48.06 \ a = -.40 \ c = -.05$

| | | | |
|------------------|----------------------|-----------------------------|-----|
| β Cham. | +0.5 $-.11 = -.06$ | $+\Delta T - 4.44a - 5.12c$ | .25 |
| 6 Can. Ven. | -1.2 | $+\Delta T + 1.10a - 1.30c$ | .83 |
| δ^2 Corvi | +0.4 | $+\Delta T + .05 - 1.04$ | .98 |
| β " | -1.1 $+0.06 = -.05$ | $+\Delta T - .08 - 1.08$ | .94 |
| χ Virg. | -1.8 | $+\Delta T + .19 - 1.01$ | 1. |
| 31 Comae | -0.2 | $+\Delta T + .82 - 1.13$ | .92 |
| δ Muscae | +0.92 $-1.30 = -.38$ | $+\Delta T - 2.44 + 3.07$ | .40 |
| δ Virg. | +0.3 | $+\Delta T + .23 + 1.00$ | 1. |
| δ^2 Comae | +1.1 | $+\Delta T + .83 + 1.14$ | .92 |
| γ Hydra | +0.9 $+0.06 = +.15$ | $+\Delta T - .08 + 1.08$ | .94 |
| ϵ Virg. | +1.26 | $+\Delta T + .14 + 1.02$ | 1. |
| γ^2 " | +0.8 | $+\Delta T + .01 + 1.05$ | .97 |
| ζ " | +1.20 | $+\Delta T + .32 + 1.00$ | 1. |

204

Adopt $b = -97$

$$\begin{array}{r} +35.9 \\ -40.5 \\ -1.65 \\ \hline 1.15 \end{array}$$

$$\begin{array}{r} +36.4 \\ -40.1 \\ -1.92 \end{array}$$

$$\begin{array}{r} -2.29 \\ \hline \text{adopt} \\ +39.7 \\ +36.2 \\ -3.5 \\ \hline -1.9 \end{array}$$

$$\begin{array}{r} +35.8 \\ -39.8 \\ \hline -1.0 \end{array}$$

cl E

| | | | | | | | | | |
|---------------|-------------|-------------------|----------------------|---------------|-------------------------|------------------|------------------|------------------|-------|
| 32.5 | 3.4 | 32.9 | 3.5 | | | 5.0 | 34.7 | 32.8 | 3.0 |
| 5.7 | 34.8 | 5.4 | 34.7 | -15.57 | -22.50 | 33.0 | 3.2 | 5.0 | 34.1 |
| β Cham. | 6 Can Ven | $\alpha^{+39} 35$ | 8 ¹ Corri | β Corri | χ Vir ^a | 7 ²⁶ | 31 Comae | $\alpha^{+28.6}$ | |
| - | 43.9 | - | 32 | 33 | 41.3 | | | | |
| - | 4.3 | - | 20.2 | 19 | 58.8 | | | | |
| 26 | 0.5 15.3 | 23.8 | 11.3 26.5 | 36.3 | 34.2 | 15.8 | | | |
| 27 | 16.5 15.0 | 43.2 | 26.8 26.5 | 52.5 | 49.3 | 32.8 | | | |
| 28 | 33.2 15.4 | 2.3 | 42.3 26.5 | 8.7 | 4.3 | 49.5 | | | |
| 29 | 47.5 15.9 | 21.3 | 57.4 26.6 | 24.3 | 18.8 | 6.2 | | | |
| 31 | 4 15.6 | 36 40.8 | 40 12.8 | 44 40.7 | 49 33.8 | 2 23.2 | | | |
| 9 | 27 15.44 | 35 42.80 | 39 26.50 | 43 52.27 | 48 48.96 | 1 32.51 | | | |
| Rd. k | 10.00 -5.38 | -3.99 | -3.38 | -2.65 | -1.84 | +0.25 | | | |
| 9 | 27 10.06 | 35 38.81 | 39 23.12 | 43 49.62 | 48 47.12 | 1 32.76 | | | |
| 12 | 12 23.23 | 20 50.02 | 24 34.81 | 29 1.20 | 33 58.54 | 46 44.16 | | | |
| 21 | 14 46.83 | 48.79 | 48.31 | 48.42 | 48.58 | 48.60 | | | |
| | -7.74 | -2.0 | -3.0 | -3.1 | -2.9 | -2.3 | | | |
| | -1.12 | -0.03 | -0.02 | -0.02 | -0.02 | -0.02 | | | |
| | 2.54 | .69 | 1.04 | 1.08 | .99 | .78 | | | |
| Δ | 45.97 | ΔT -4.44 | α -5.12 | c 1.78 | ΔT +2.31 | ΔT +2.26 | ΔT +2.57 | ΔT 2.04 | 48.54 |
| 47.99 | | + .05 | -1.04 | .02 | -.03 | + .05 | + .02 | .03 | 48.01 |
| 48.09 | | -.08 | -1.08 | .03 | +.04 | + .05 | + .09 | .08 | 48.18 |
| 46.31 | | -2.44 | +3.07 | .98 | +1.27 | -.15 | +1.12 | .83 | 47.43 |
| 48.17 | | +.23 | +1.00 | .09 | -.12 | -.05 | -.17 | .14 | 48.00 |
| 48.34 | | +.83 | +1.14 | .33 | -.43 | -.06 | -.49 | .39 | 47.85 |
| 47.99 | | -.08 | +1.08 | .03 | +.04 | -.05 | -.01 | .02 | 47.98 |
| 47.91 | | +.14 | +1.02 | .06 | -.07 | -.05 | -.12 | .11 | 47.79 |
| Additional | 48.04 | +.32 | +1.00 | .13 | -.17 | -.05 | -.22 | .18 | 47.82 |
| α | 48.56 | +1.10 | -1.30 | -.44 | +.06 | | | | |
| | 48.99 | +.19 | -1.01 | -.08 | +.05 | -.05 | 48.22 | | |
| | 48.35 | +.82 | -1.13 | -.33 | +.06 | | | | |
| | 48.03 | +.01 | +1.05 | -.01 | -.05 | -.06 | 47.97 | | |
| | | | | | | | $\Delta T = -21$ | 14 | 48.00 |

$b = -.29$

clw

+36.3
-39.8
-.9

+37.1
-37.9
-.2
neg.

33.0 3.3

33.6 3.5

5.0 348

-4 59

+28 24

-22 38

-10 37

-18 12 3.9 34.0
73 Virg. -0 4

8 Musca 9 Virg 43 Canes y Hydrea 2 Virg 73 Virg 4 Virg

7 45.3 2.2 40.3 1.7 17.6 - 27.2 26.2

8 31 1.9 55.3 18.5 33.7 - 42.7 41.2

- 9.9 34.9 49.3 - 58 55.7

10 1.2 2.1 24.8 51.8 5.4 31.2 31.5 13.7 10.6

47.3 2.5 39.8 8.7 21.7 46.3 31.4 29.7 25.3

11 33.5 2.6 54.8 26 38 1.6 31.4 45.2 40.5

12 21.3 1.9 20 10.7 22 43.7 38 54.8 35 17.5 31.2 42 1.6 44 56.1

10 2.20 19 25.09 21 52.19 38 5.79 34 31.38 41 14.01 43 10.80

+1.65 +3.19 +3.59 +4.62 +5.67 +6.77 +7.09

10 3.85 19 28.28 21 55.78 28 10.41 34 37.05 41 20.78 43 17.89

55 16.94 4 39.81 7 7.19 13 22.09 19 48.83 26 32.43 29 29.55

46.91 48.47 48.59 48.32 48.22 48.35 48.34

-.54 -.28 -.23 -.31 -.29 -.30 -.28

-.06 -.02 -.02 -.02 -.02 -.02 -.02

ΔT_2 1.87 .97 .78 1.08 1.01 1.05 .95

48.01

$0 = 2.02 + 4.49a + 4.08c \quad a = -.40 \quad 10 \quad 0 \quad 0 \quad 1.6$

$48.17 = 2.03 + 3.27a' - 1.93c \quad a' = -.65 \quad -21 \quad 14 \quad 48.00 \quad .06 \quad .026$

$47.14 \quad c = -.05 \quad -.52 \quad 12 \quad 45 \quad 12.00 \quad 11.94 \quad .974$

$48.03 \quad 2 \quad 23 \quad 41.61 \quad 41.61$

$47.95 \quad \Delta T \quad \text{Hourly Rate} \quad 4.30 \text{ pm} \quad +19 \quad 47.47 \quad 10 \quad 21 \quad 30.39 \quad 30.83 \quad 35.6$

$.97 \quad 7.30 \quad 47.96 \quad 1 \quad 41.82 \quad 41.82 \quad 52.9$

$.80 \quad 10.00 \quad 48.57 \quad \Delta T + 19 \quad 48.57 \quad 48.57 \quad 10.6$

Additional.

$47.86 \quad 0 = 48.46 + \Delta T + .96a - 1.22c \quad 47.96 \quad 7.30$

$48.18 \quad 0 = 2.49 + 5.40a + 3.90c \quad 0.55$

$.24 \quad 5.40a = -2.29 \quad 0.220$

$.08 \quad a = -.42 \quad \text{for hr.}$

$47.98 \quad \Delta T \text{ circumgenith} \quad +.05 \quad 48.02 \quad 47.96 \quad 7.30$

$-.08 \quad .1817 \quad 48.14 \quad 0.55$

$+.19 \quad .24 \quad 48.02 \quad 0.220$

$+.23 \quad 48.02 \quad 47.97 \quad \text{for hr.}$

$-.08 \quad 47.97 \quad 47.97$

$+.14 \quad 47.89 \quad 48.07$

$+.01 \quad 47.97 \quad 48.07$

206
+39.3
38.7
+ .15
+0.4

-39.5
+40.0
+0.3

+37.5
-39.3
- .45

+37.2
-39.2
- .5

+37.2
-38.6
- .35

| lw | clE | clE | Apr. 28/97 | | | | | |
|---------------|--------------|---------------|--------------|----------------|---------|-------------------|------------------|--|
| 3.0 6.3 | 6.3 33.2 | | 32.8 47 | 32.9 43 | | 33.0 42 | | |
| 6.0 32.7 | 33.5 6.5 | | 5.5 33.8 | 5.3 33.9 | | 4.9 33.7 | | |
| 2 Can Min | β Cen. | 2 Hydrae | 10 Leon | 4 Cham | 6 Lext. | Lab 19433 | π Lemin | |
| 51.3 | 50.2 | 9.2 | 22.1 | 43 365 | | 31.8 | 19.1 | |
| 6.4 | 8 | 25.2 | 41.7 | 45 11.2 | | 48.3 | 35 | |
| 20.7 | 25 | 40.5 | 0.4 | 46 42 | | 4.2 | 50.2 | |
| 35.8 | 41.7 | 55.5 | 18.9 | 48 12.2 | | 19.7 | 5.2 | |
| 50.7 | 58.8 | 10.4 | 37.7 | 49 42 | | 35.7 | 20.2 | |
| 5.7 | 15.2 | 25.2 | 55.7 | 51 10 | | 50.8 | 34.7 | |
| 4 46 21.5 | 5 32.3 | 6 34 40.2 | 40 14.5 | 52 40 | | 7 2 67 | 6 50.2 | |
| 45 36.01 | 50 41.60 | 33 55.17 | 39 18.71 | 48 10.56 | | 1 19.60 | 6 4.94 | |
| Red 5.00-2.36 | 1.53 | Red 7.30-9.21 | -8.33 | -6.87 | | -4.71 | -3.93 | |
| | | | - .14 | - .11 | | - .08 | - .07 | |
| 4 45 13.65 | 50 40.07 | 6 33 45.46 | 39 10.38 | 48 3.69 | | 1 14.84 | 6 0.94 | |
| | | | .81 | .24 | | .58 | | |
| 7 33 56.08 | 39 2.59 | 9 22 33.37 | 42 67.51 | 36 54.23 | | 50 2.58 | 54 48.45 | |
| 21 11 37.57 | 11 37.50 | 21 11 12.44 | 12.73 | 9.35 | | 12.23 | 12.49 | |
| +0.4 | +0.2 | - .12 | - .09 | - .34 | | - .13 | - .12 | |
| - .02 | - .02 | - .02 | - .02 | - .12 | | - .02 | - .02 | |
| 37.59 | | .99 | .71 | 2.84 | | 1.05 | .99 | |
| 37.50 | | 0 = 12.30 | + ΔT | + .18a - 1.01c | | - .09 + .08 - .01 | ΔT 12.29 | |
| 21 11 37.54 | | 12.62 | +1.03 | -1.25 | | - .53 + .10 - .43 | .19 | |
| - .32 + 62a | | 8.99 | -5.84 | -6.05 | | +2.72 + .48 +3.20 | .09 | |
| - .01 + 07c | | 12.35 | + .46 | -1.01 | | - .23 + .08 - .15 | .20 | |
| -21 11 37.21 | ΔT | 12.19 | + .12 | -1.02 | | - .06 + .08 + .02 | .21 | |
| | | 12.88 | +1.21 | -1.37 | | - .62 + .11 - .51 | .37 | |
| | | 12.83 | +1.17 | +1.35 | | - .60 - .11 - .71 | .12 | |
| | | 12.17 | - .24 | +1.16 | | + .12 - .09 + .03 | .20 | |
| | | 10.28 | -5.06 | +5.76 | | +2.58 - .46 +2.12 | .40 | |
| | | 13.03 | +1.24 | +1.42 | | - .63 - .11 - .74 | .29 | |
| | | 12.58 | + .59 | +1.04 | | - .30 - .08 - .38 | .20 | |

Additional Equations p. 208

$$\Delta T = -21 \quad 11 \quad 12.22$$

- .42

-38.6

+36.9

207

 $b = -.12$

+36.9

-37.8

- .4

- .2

4.7 33.9 cl W

330 3.9

33.0 3.9
4.3 33.5 12.34
Hydra

Hydra

Un. Mag.

Un. Mag.

a. h. t. i. a. e.

37.5

4.3

8.2

48.1

53.5

20.2

29.6

5.5

8.9

35.5

50.3

22.2

24.2

50.9

10.8

39.5

39.4

5.9

31.3

47.8 28.1

57

54.3

20.7

51.2

8.1 28.1

14.4

12 9.517 36.223 12.128 29.234 32.6

11 23.90

16 50.53

22 10.50

27 28.03

33 39.90

-3.06

-2.16

-1.29

-0.42

+0.60

-0.05

-0.04

-0.02

-0.01

+0.01

11 20.84

16 48.33

22 9.19

27 27.60

33 39.56

0 8.50

5 36.00

10 56.21

16 14.67

22 28.18

12.29

12.33

12.98

12.93

12.33

-0.12

-0.12

-0.08

-0.08

-0.14

-0.02

-0.02

-0.02

-0.02

-0.02

1.02

1.02

.65

.66

1.14

$$0 = 12.75 + \Delta T + 1.12a - 1.31c$$

$$5 \ 0 \ 0 \quad 7 \ 30 \ 0$$

$$12.93 + \Delta T + 1.20a + 1.38c$$

$$-21 \ 11 \ 37.21 \quad -21 \ 11 \ 12.22$$

$$0 = 3.86 + 6.46a + 4.74c$$

$$7 \ 48 \ 22.79 \quad 10 \ 18 \ 47.78$$

$$2.65 + 6.26a' - 4.38c$$

$$2 \ 27 \ 38.17 \quad 2 \ 27 \ 38.17$$

$$0 = 1.39 + 2.8a + 11.81c \quad \begin{matrix} a = -.50 \\ c = -.11 \end{matrix}$$

$$5 \ 20 \ 44.62 \quad 7 \ 51 \ 9.61$$

$$0 = 0.18 + .08a + 2.69c \quad -0.05$$

$$52.53 \quad 1 \ 17.19 \quad .188$$

$$\Delta T - .08$$

$$\Delta T + 19 \ 52.09 \quad + 19 \ 52.42 \quad .454$$

$$6.46a = -3.48 \quad a = -.54$$

$$6.26a' = -3.00 \quad a' = -.48$$

$$\Delta T - .51$$

208

 -35.4
 $+37.7$
 $-.2$
 -38.4
 $+36.7$
 $-.4$
 -38.0
 $+37.0$
 $-.25$
 $+36.7$
 $+37.9$
 $-.3$

cl w

 $t = -.12$

1897

| | | | | | |
|--|--|-----------------|---|----------------|----------------|
| | 4.6 33.8 | 4.5 33.9 | 4.3 33.7 | 33.1 3.6 | |
| | 33.5 4.2 | 33.0 3.7 | 33.2 3.8 | 4.2 33.7 | |
| 44 Hydras ^a _{-23 13} | ϕ Hydras ^a _{-16 20} | δ^2 Cham | δ^2 Lennu ^a _{-156 2} | ψ Un-Maj | δ Lennu |
| 31 | 59.3 | 51 40.7 | 58.4 | 58 | 10.7 |
| 47.2 | 15.2 | 53 7 | 13.3 | 19.5 | 26.3 |
| 3.2 | 30.2 | 54 30 | 28 | 40 | 41.4 |
| 19.2 | 45.7 | 55 56.2 | 42.8 | 1.2 | 57 |
| 35.5 | 1.2 | 57 22 | 57.7 | 22 | 12.3 |
| 52 | 16.8 | 58 48.5 | 12.8 | 43.4 | 28 |
| 7 41 9 | 45 33 | 0 18.5 | 8 28.4 | 16 5.7 | 20 44.2 |
| 7 40 19.59 | 44 45.96 | 55 57.56 | 7 43.06 | 15 1.40 | 19 57.13 |
| Red. 67.30 +1.70 +.03 | +2.43 +.04 | +4.27 +.07 | +6.20 +.10 | +7.40 +.12 | +8.21 +.14 |
| 7 40 21.29 .32 | 44 48.39 .43 | 56 1.83 1.90 | 7 49.26 .36 | 15 8.84 .92 | 20 5.34 48 |
| 29 8.97 | 33 35.90 | 44 51.17 | 56 36.81 | 3 55.79 | 8 52.78 |
| 12.35 | 12.53 | 11 10.73 | 12.55 | 13.13 | 12.70 |
| -.13 | -.12 | -.33 | -.12 | -.08 | -.10 |
| -.02 | -.02 | -.12 | -.02 | -.02 | -.02 |
| 1.08 | 1.04 | 2.75 | .96 | .63 | .86 |

 ΔT correction

Additional Equations (a)

| Aa | Cc | Z | ΔT | A |
|-------|-------|-------|------------|-----------|
| | | | | +18 12.29 |
| .00 | +0.08 | +0.08 | 12.16 | +12 .21 |
| | | | | .00 .16 |
| -0.05 | +0.08 | +0.03 | .18 | +10 .15 |
| | | | | -0.24 .20 |
| .05 | -0.09 | -0.04 | .16 | -0.09 .16 |
| | | | | +0.04 .29 |
| -0.02 | -0.08 | -0.10 | .29 | +0.29 .18 |
| | | | | |
| .15 | -0.08 | -0.23 | .18 | 12.21 |

April 28. Observation Equations.

First series.

Adopt $\Delta T = -21 \ 11 \ 12.21 \ a = -.51 \ c = -.08$

| | | | | |
|---------------------|--------|--|-----|----|
| α Hydra | $-.08$ | $+\Delta T + .18a - 1.01c$ | 1. | 9 |
| 10 Leon. Min. | $+.02$ | $+\Delta T + 1.03 - 1.25$ | .85 | 10 |
| ζ Cham. | $+.02$ | $+\Delta T - 5.34 - 6.05$ | .21 | 11 |
| Lal. 19433 | $+.05$ | $+\Delta T + .00 - 1.05$ | .96 | 14 |
| π Leonis | $+.01$ | $+\Delta T + .46 - 1.01$ | 1. | 15 |
| σ^2 Hydra | $+.03$ | $+\Delta T + .10 - 1.02$ | .99 | 16 |
| λ " | $.00$ | $+\Delta T + .12 - 1.02$ | .99 | 18 |
| λ Urs. Maj. | $-.16$ | $+\Delta T + 1.21 - 1.38$ | .81 | 19 |
| μ " " | $+.09$ | $+\Delta T + 1.17 + 1.35$ | .81 | 20 |
| α Antlia | $+.01$ | $+.01 = +.02 + \Delta T - .24 + 1.16$ | .90 | 22 |
| 44 Hydra | $+.05$ | $.00 + \Delta T - .09 + 1.09$ | .94 | 23 |
| ϕ " | $-.08$ | $+\Delta T + .04 + 1.04$ | .98 | 24 |
| δ^2 Cham. | $-.19$ | $-.35 = -.54 + \Delta T - 5.06 + 5.76$ | .22 | 25 |
| ρ^2 Leonis | $+.03$ | $+\Delta T + .29 + 1.00$ | 1. | 26 |
| ψ Urs. Maj. | $-.08$ | $+\Delta T + 1.27 + 1.42$ | .79 | 27 |
| θ Leonis | $+.01$ | $+\Delta T + .59 + 1.04$ | .98 | 29 |

Telegraph Signals with Mollenda

Received

Arica 1131 Mollenda 4026 Δ

27.6 = 0

27.5

Adopt 9 3 27.5 = 14 36 0 = 5 32 32.5

Sent signals

9 6 25 to 9 10 0

Inequipa difference 5 32 32.6

" When are you going to send level?

Arica Sent today.

" Who has it aboard?

" Goes to Golding.

" Nothing more

" Good night

April 28. Observation Equations
Second series.

Adopt $\Delta T = -21\ 10\ 47.23$ $a = -.32$ $c = -.03$

| | | | |
|--------------------|--|-------------------------------------|-----|
| β Cham. | -.01 ^{.01} -.11 | $= -.12 + \Delta T - 4.44a + 5.12c$ | .25 |
| δ Com. Ven. | -.19 | $+ \Delta T + 1.10 + 1.30$ | .83 |
| δ Corvi | +0.4 | $+ \Delta T + .05 + 1.04$ | .98 |
| β " | -.05 +0.6 | $= +.01 + \Delta T - .08 + 1.08$ | .94 |
| χ Virg. | -.01 | $+ \Delta T + .19 + 1.01$ | 1. |
| δ Comae | -.18 | $+ \Delta T + .82 + 1.13$ | .92 |
| δ Musca | +1.99 [✓] -1.30 | $= +.69 + \Delta T - 2.44 - 3.07$ | .40 |
| δ Virg. | -.11 | $+ \Delta T + .23 - 1.00$ | 1. |
| 43 Comae | ²⁹ -.32 | $+ \Delta T + .83 - 1.14$ | .92 |
| α Virg. | +0.5 | $+ \Delta T + .14 - 1.02$ | 1. |
| 73 " | +1.2 | $+ \Delta T + .01 - 1.05$ | .97 |
| ζ " | -.03 | $+ \Delta T + .32 - 1.00$ | 1. |

212

+37.3
-38.8
-.4

b = -.13

38.4
+36.7
-.4

-38.4
+36.3
-.5

cl W

33.0 4.2

5.0 33.8

4.6 33.8

4.4 34.0

B Chan

6 Cam Ven

8 Corni

β Corni

33.0 3.7

33.0 3.3

a 39.35

a 7.26

a 28.6

447 40

3.7

418

4.2 55.4

18.7

58.7

23.1 10.7

35.3 51.7 33.3

15.2

23 26.5 18.0

42.3 26.1

51.5 51.8 48.3

8 32.2

24 30.5 15.7

1.7 41.5

7.9 52.1 3.3

24.8 49.2

25 47.5 15.9

21.2 57.2

24.2 52.2 18.3

4.7 6

27 8 15.6 32 41.4 36 13.3

40 41.2 45 34.2

55 49.6 58 23.7

9 23 15.73

31 42.66 35 26.31

39 52.00 44 48.54

57 32.40

Red. 5 10.00 -5.87 6.03
- .09

- 4.65 - 4.04
-.08 -.07

- 3.31 - 2.49
-.06 -.04

- 0.41
-.01

9 23 9.77 9.61

31 37.93 35 22.20

39 48.63 44 46.01

57 31.98

12 12 23.19

20 50.00 24 34.80

29 1.19 33 58.53

46 44.16

21 10 46.58 42

47.93 47.40

47.44 47.48

47.82

-.33

-.09

-.14

-.14

-.13

-.10

-.12

-.03

-.02

-.02

-.02

-.02

2.54

.69

1.04

1.08

.99

.78

0 = 46.13 + ΔT - 4.44a + 5.12c + 2.84 - .15 + 2.69 + 1.27 48.82] 47.24

47.24 + .05 + 1.04 - .03 - .03 - .06 - .05 47.18

47.28 - .08 + 1.08 + .05 - .03 + .02 .00 47.30

44.37 - 2.44 - 3.07 + 1.56 + .09 + 1.65 + .87 46.02] 45.24

47.38 + .23 - 1.00 - .15 + .03 - .12 - .04 47.26

47.76 + .83 - 1.14 - .53 + .03 - .50 - .24 .26] 47.18

47.19 + .14 - 1.02 - .04 - .09 + .03 - .06 - .02 .13

Additional 47.33 + .32 - 1.00 - .10 .20 + .03 - .17 - .07 .16

47.81 + 1.10 + 1.30

47.33 + .19 + 1.01

47.70 + .82 + 1.13

47.08 + .01 - 1.05

ΔT circump.

ΔT = - 21 10 47.21

47.23 adopt

-39.0
+36.3
-.7

-38.8
+36.6
-.55

+36.7
-38.6
-.5

-39.3 2/3
+36.0
-.8

$b = -.19$

CE

47 343

4.6 34.2

33.2 35

4.7 34.6

33.0 3.3

33.2 3.4

44 34.2

33.0 3.0

8 Muscae

9 Virg

43 Crue

Hydrae

2 Virg

^a
73 Virg

4 Virg

41.5

39.2

0.5

45.2

25.7

29.5

55.2

19.5

1.1

42.4

15.8

10.1

35.5

16.2

58.2

6 1.5

25

52.4

31.3

13.7

25.7

47.3

40

9.3

46.5

29.5

↓ 10.5

31.7

54.5

26

1.2

44.7

39.8 10.2

8 17.7

16 9.6

18 42.7

31 16.5

38 0.4

40 55 10.4

6 0.71

15 24.80

17 52.13

30 31.14

27 13.51

40 10.37

+ .99

+2.55

+2.94

+5.01

+6.12

+6.60

+ .02

+ .04

+ .05

+ .08

+ .10

+ .11

6 1.72

15 27.39

17 55.12

30 36.23

37 19.73

40 17.08

55 16.93

4 39.81

7 7.19

19 48.83

26 32.43

29 29.55

44.79

47.58

47.93

47.40

47.30

47.53

-.36

-.18

-.15

-.19

-.20

-.18

-.06

-.02

-.02

-.02

-.02

-.02

1.87

.97

.78

1.01

1.05

.95

ΔT_2

47.24

47.19 $0 = 1.11 + 4.49a - 4.08c$

10 0 0

47.28 $3.39 + 3.27a' + 1.93c$

-21 10 47.21 .226

45.24 $0 = 47.26 - .02a + 1.06c + \Delta T$

12 49 12.79 .774

47.34 $47.29 + .18a - 1.01c + \Delta T$

2 27 38.17

47.52 $-.03 + .20a - 2.07c \quad c = -.03$

10 21 34.62 .604

47.18 $4.49a = -1.23 \quad a = -.27$

1 41.83 .830

47.26 $3.27a' = -3.33 \quad -1.02$

10.00 $\Delta T + 19$ 52.79 .746

47.42 $-.64$

7.30 52.42

47.24 $0 = 47.76 + \Delta T + .96 + 1.22c$

5.00 52.09 .113

47.41 $= 1.63 + 5.40a - 3.90c$

47.11 $5.40a = -1.75$

$a = -.32 \text{ adopt}$

214 level tag, adjusted before obs.

-38.8
 $+39.8$
 $+ .25$

-38.1
 $+39.5$
 $+ .35$

 $b = +.09$

-38.1
 $+38.9$
 $+ .2$

$+39.6$
 -37.5
 $+ .5$

cl. 2

April 29/97

| | | | |
|--------------------------------|--------------------------------|---|-----------------------|
| 5.8 33.0 | 5.3 33.1 | 4.9 33.2 | 34.0 5.6 |
| 33.6 6.2 | 33.7 5.8 | 33.7 5.2 | 4.5 33.0 |
| 10 Len M | 4 chain | 26 30 a | 33.7 5.2 +17.16 |
| | | 19433 | γ Lennis |
| | | | λ Hydrae |
| | | | 12.6 27.1 25.8 3 |
| 39 37 ? 11.7 | 23.2 14.0 | 31.3 | 12.6 |
| 41 12.5 11.6 | 40.8 14.0 | 47.8 | 28.9 |
| 43 42.5 10.8 | 57.4 13.7 | 03.6 | 44.7 |
| 44 23 14.5 | 14.2 13.9 | 19.3 | 0.3 |
| 45 58 { 28.0 | 30.8 13.8 | 44.9 | 16.1 |
| 54 47 13.8 | 50.4 | 31 | 20.2 |
| 26.8 6.8 | 26.6 | | |
| 6 36 13.4 | 48 41 11.2 | 58 46.1 | 9 46.8 1335.6 24 26.8 |
| 6 35 17.66 | 44 11.36 | 54 13.87 | 57 19.06 |
| 9 0.06 | 12 49.93 | 23 26.86 | |
| Rel. 17.30 - 8.99 | -7.53 | -5.88 | -5.37 |
| - .15 | - .13 | - .10 | - .09 |
| 6 35 8.52 | 44 3.70 | 54 7.89 | 57 13.60 |
| 8 56.55 | 12 47.06 | 23 25.76 | |
| 9 27 57.50 | 36 54.11 | 46 56.84 | 50 2.56 |
| 1 45.54 | 5 35.99 | 16 14.66 | |
| 21 7 11.02 | 9.59 | 11.05 | 11.04 |
| 11.01 | 11.07 | 11.10 | |
| + .06 | + .25 | + .07 | + .09 |
| + .08 | + .09 | + .06 | |
| - .02 | - .12 | - .02 | - .02 |
| - .02 | - .02 | - .02 | - .02 |
| .71 | 2.84 | .79 | 1.05 |
| .85 | 1.02 | .66 | |
| $a = 11.06$ | $+ \Delta T + 1.03 a - 1.25 c$ | | |
| 9.72 ? | -5.34 - 6.05 | $0 = 11.09 + .73 a - 1.17 c + \Delta T$ | |
| 11.07 | + .61 - 1.05 | $= 11.12 + .47 a + 1.22 c$ | " |
| 11.14 | + .12 - 1.02 | $0 = 11.11 + .60 a + .02 c$ | " |
| 11.14 | + .17 - 1.35 | | |
| 10.93 | - .24 + 1.16 | $0 = 11.14 + .12 a - 1.02 c$ | " |
| 11.16 | -5.06 + 5.76 | $= 11.02 - .16 a + 1.12 c$ | |
| 11.30 ? | + 1.24 + 1.42 | $= 11.08 - .02 a + .05 c$ | |
| 11.11 | - .07 + 1.08 | | |
| Addition 11.08 | + .95 + 1.20 | | |
| 11.10 | + .79 - 1.12 | | |
| 11.11 | + .00 - 1.05 | | |
| 10.86 | - .09 + 1.09 | | |
| 11.20 | + .29 + 1.00 | | |
| 11.06 | + .02 + 1.05 | | |
| Adopt $\Delta T = -21.7$ 11.10 | | | |

feruladi
clw

-38.7
+37.3
- .35

+37.3
-38.9
- .4

+37.5
-37.9
- .05

-38.3
+37.2
- .3

215

b = -.08

5.0 33.7
33.0 4.3

33.0 4.3
5.0 33.9

33.2 4.3
4.5 33.4

4.8 33.5
33.0 4.2 +33.39

α hrtline 44 Hydrom 8² Cham p² Lewis & H. May β hrt. 8 hrt. γ hrt

47.7 30.5 47 42 57.9 42.5 57.5 - 74 1.5

4.6 46.7 49 8.5 128 42.4 18.3 - 252 17.3

21.6 2.3 50 51.3 27.2 42.4 38.7 - 42.8 32.3

38.9 18.7 51 57.7 - 59.8 41.2 41.5 0.7 47.7

36.5 18.6 34.5? 53 23.3 72 42.6 20.9 57.6 41.8 18.4 3.4

13.6 51.2 54 49.5 12.2 42.6 42.5 13.7 41.7 36.7 19.2

30 32 37 8.2 16 20 4 27.7 12 44 14 30.6 20 55 4 27 356

29 39.27 36 18.87 51 58.92 3 42.47 11 0.30 13 41.65 20 0.94 26 48.14

-0.06 +1.04 +3.61 +5.54 +6.74 +7.18 +8.22 +9.33
.00 +.02 +.06 +.09 +.11 +.12 +.14 .16

29 39.21 36 19.93 52 2.57 3 48.10 11 7.15 13 48.95 20 9.30 26 57.63

22 28.17 29 8.96 44 51.07 56 36.80 3 58.78 6 37.73 12 58.14 19 46.47

11.04 10.97 11.50 11.30 11.37 11.22 11.16 11.16

-0.09 -0.09 -0.22 -0.08 -0.05 -0.09 -0.06 -0.08

-0.02 -0.02 -0.12 -0.02 -0.02 -0.02 -0.02 -0.02

1.14 1.08 2.75 .96 .63 1.08 .74 1.05

$$0 = 11.11 + \Delta T + .94a - 1.22c$$

$$11.08 + .95a + 1.20c \quad c = +.01$$

$$11.19 + 1.10a + 1.31c$$

$$11.10 + 1.10a - 1.30c \quad c = -.03$$

$$0 = 1.38? + 6.37a + 4.70c \quad a = -.20?$$

$$= 0.03 + 6.16a' - 4.46c \quad a' = -.02$$

a and c are nearly 0

$$0 = 11.14 + .06a - 1.04c + \Delta T \quad 11.12$$

$$= 10.98 + .02a + 1.08c + \Delta T \quad 11.03$$

$$11.11 \quad 11.20 \quad 11.06 \quad 10.86 \quad 11.08$$

7 30 0

-21 7 11.10 .035

10 22 48.90 .965

2 31 34.72

7 51 14.18 .35

1 17.20 .201

$\Delta T + 19$ 56.98 57.03

Telegraph Signals with Mollenda
Received

Nica 1131 Mollenda 4026 Δ

26.7

9 0 26.1 = 14 33 0 5 32 33.9

Sent signals

9 2 25.6 9 6 0

Frequency Difference 5 32 34.0

" Anything more

Nica Nothing Good night

April 29. Observation Equations.

First series. Adopt $\Delta T = -21.7$ 11.08 $\sum \delta = 0$

| | | | | |
|-------------------|--------------------|-------------|---|-----|
| 10 Leon. Min. | +0.2 | | $+\Delta T + 1.03\alpha - 1.25\epsilon$ | .85 |
| ζ Cham. | +1.36 [✓] | | $+\Delta T - 5.34 - 6.05$ | .21 |
| μ Leonis | -0.2 | | $+\Delta T + .79 - 1.12$ | .92 |
| δ 19433 | -0.3 | | $+\Delta T + .00 - 1.05$ | .96 |
| η Leonis | +0.1 | | $+\Delta T + .61 - 1.05$ | .97 |
| λ Hydrae | -0.6 | | $+\Delta T + .12 - 1.02$ | .99 |
| μ Urs. Maj. | -0.6 | | $+\Delta T + 1.17 - 1.35$ | .81 |
| α Antliae | +1.5 | +0.1 = +.16 | $+\Delta T - .24 + 1.16$ | .90 |
| 44 Hydrae | +2.2 [✓] | .00 | $+\Delta T - .09 + 1.09$ | .94 |
| δ Cham. | -0.8 | -.35 = -.43 | $+\Delta T - 5.06 + 5.96$ | .22 |
| ρ^2 Leonis | -1.2 | | $+\Delta T + .29 + 1.00$ | 1. |
| ψ Urs. Maj. | -2.2 [✓] | | $+\Delta T + 1.27 + 1.42$ | .79 |
| β Crateris | -0.3 | +0.2 = -.01 | $+\Delta T - .07 + 1.08$ | .95 |
| τ Urs. Maj. | .00 | | $+\Delta T + .95 + 1.20$ | .88 |
| γ Crateris | +0.2 | | $+\Delta T + .02 + 1.05$ | .97 |

Second series. Adopt $\Delta T = -21.6$ 45.96 $\sum \delta = 0$

| | | | | |
|-------------------|--------------------|--------------|---|-----|
| β Cham. | -0.71 [✓] | -.11 = -.82 | $+\Delta T - 4.44\alpha + 5.12\epsilon$ | .25 |
| δ Comae | -0.1 | | $+\Delta T + .05 + 1.04$ | .98 |
| β " | -0.3 | +0.6 = +.03 | $+\Delta T - .08 + 1.08$ | .94 |
| χ Virg | -1.7 | | $+\Delta T + .19 + 1.01$ | 1. |
| β Comae | -1.2 | | $+\Delta T + .82 + 1.13$ | .92 |
| ψ Virg | -0.8 | | $+\Delta T + .17 + 1.01$ | 1. |
| δ Muscae | +2.12 [✓] | -1.30 = +.82 | $+\Delta T - 2.44 - 3.07$ | .40 |
| δ Virg | +0.9 | | $+\Delta T + .23 - 1.00$ | 1. |
| 43 Comae | +0.7 | | $+\Delta T + .83 - 1.14$ | .92 |
| γ Hydrae | +1.1 | +0.6 = +.17 | $+\Delta T - .08 - 1.08$ | .94 |
| κ Octantis | +1.15 [✓] | -1.47 = -.32 | $+\Delta T - 11.10 - 12.08$ | .10 |
| η Virg | +0.1 | | $+\Delta T + .18 - 1.01$ | 1. |
| 89 " | +1.0 | | $+\Delta T + .02 - 1.05$ | .97 |

218

-38.3
+37.4
-.2

clw

-39.5
+27.0
-.6

+37.5
-38.5
-.25

b = -0.08

4.3 34.0

4.5 34.0

33.5 4.0

33.5 3.9

33.3 3.7

4.5 34.0

-8.59

 β Cham δ Corri β Corri χ Vir^a γ Corri ψ Vir

15 28.5

39.3

2.8

3

40.8

4.2

16 48

54.8

19.2

18

57.8

19.4

17 58.5

10.1

35

32.7

14.3

34.1

19 15.5

25.3

51.2

47.7

31.2

49.3

20 31.5

40.8

7.3

2.8

48.0

4.2

21 48.0

56.4

23.3

17.8

5

19.3

23 8.5

32 12.8

36 40.5

41 33.7

54 22.7

56 35.3

9 19 16.93

31 25.64

35 51.33

40 47.96

53 31.40

55 49.40

Red. k 10.00

-6.69

-4.69

-3.97

-3.15

-1.06

-0.69

9 19

10.13

31 20.87

35 47.29

40 44.76

53 30.32

55 48.70

12 12

23.14

24 34.80

29 1.19

33 58.53

46 44.16

49 25.6

21 6

46.99

46.07

46.10

46.23

46.16

46.14

-.20

-.08

-.09

-.08

-.06

-.08

-.12

-.02

-.02

-.02

-.02

-.02

2.54

1.04

1.08

Aa Cc

E.99

.78

1.00

0.46.67? + ΔT -4.44a + 5.12c

a + 0.9

 ΔT

45.97

+.05

+1.04

.00

-.03

-.03

45.94

.94

45.94

45.99?

-.08

+1.08

-.01

-.03

-.04

.96

.95

45.95

43.84

-2.44

-3.07

+.09

46.09

45.87

+.23

-1.00

+.02

+.03

+.05

.90

.92

45.92

45.89

+.83

-1.14

+.03

.92

.89

46.00

45.85

-.08

-1.08

-.01

+.03

+.02

.88

.87

45.92

44.81

-11.10

-12.08

+.36

45.96

Additional (a)

45.86

+.02

-1.05

.00

+.03

+.03

.89

.89

46.13

+.19

+1.01

+.02

+.03

+.05

.89

.18

46.08

+.82

+1.13

+.02

+.03

+.05

.89

.18

46.04

+.17

+1.01

+.02

+.03

+.05

.89

.18

45.95

+.18

-1.04

+.02

+.03

+.05

.89

.18

 $\Delta T = -21.6$

45.92

.09

-39.8
+36.3
- .9

-38.9
+35.8
- .8

-39.5
+36.3
.8

-38.8
+36.1
- .7

219

 $b = -.24$

CE

| | | | | | | | |
|-------------|---------------|----------------|----------------|-------------------|---------------------------------------|----------------|---------|
| 5.0 34.8 | | 4.6 34.3 | | 4.8 34.7 | | 4.5 34.3 | |
| 33.0 3.3 | | 32.8 3.0 | | 33.0 3.3 | | 33.0 3.1 | |
| 8 Musca | 9 Virg | 43 Boie | y Hydrae | x Octantis | ^a -8 ¹¹ Virg | -17 37 | 89 Virg |
| 59 41.5 | 38.6 | 59.4 | 15.7 | - | 8.4 | 9.4 | |
| 30 | 54.3 | 17.3 | 32.7 | 25 14 | 11.6 24.3 | 26 | |
| 15.8 | 9.4 | 34.2 | 49 | 28 15.5 | 11.9 39.3 | 41.5 | |
| 2 17 | 24.3 | 51.3 | 5.2 | 31 16 | 12.4 54.4 | 57.3 | |
| 47.5 | 39.2 | 8.2 | 21.3 | 34 16.5 | 12.9 9.3 | 13 | |
| 32 | 53.7 | 24.7 | 37 | 37 12 | 14.4 24.2 | 28.2 | |
| <u>4 18</u> | <u>12 8.7</u> | <u>14 41.7</u> | <u>20 53.2</u> | <u>40 14 15.2</u> | <u>44 39.2</u> | <u>51 43.9</u> | |
| 2 1.83 | 11 24.03 | 13 50.97 | 20 4.87 | 31 12.07 | 43 54.16 | 50 57.04 | |
| +0.33 | +1.87 | +2.28 | +3.30 | +5.13 | +7.21 | +8.37 | |
| + .01 | + .03 | + .04 | + .06 | + .09 | + .12 | + .14 | |
| 2 1.87 | 11 25.93 | 13 53.29 | 20 8.23 | 31 18.29 | 44 1.49 | 51 5.55 | |
| 55 16.92 | 4 39.81 | 7 7.19 | 13 22.10 | 24 32.10 | 36 15.28 | 44 19.42 | |
| 44.35 | 46.12 | 46.10 | 46.13 | 46.19 | 46.21 | 46.13 | |
| - .45 | - .23 | - .19 | - .26 | - .14 | - .24 | - .25 | |
| - .06 | - .02 | - .02 | - .02 | - .24 | - .02 | - .02 | |
| 1.87 | .97 | .78 | 1.08 | 4.76 | .99 | 1.05 | |

$$0 = 0.70 - 4.49a + 4.08c$$

$$= 2.05 + 3.27a' + 1.93c$$

$$= 1.08 + 11.93a' - 10.94c$$

$$c = -.03 \text{ adopt}$$

$$a = +.13$$

$$a' = -.61$$

$$= -.12$$

$$0 = 0.59 - 5.26a + 3.99c$$

$$5.26a = 0.47$$

$$a = +.09 \text{ adopt}$$

$$10 \quad 0 \quad 0$$

$$-21 \quad 6 \quad 45.92 \quad 96.950$$

$$12 \quad 53 \quad 14.08 \quad .050^3$$

$$2 \quad 31 \quad 34.72$$

$$10 \quad 21 \quad 39.36 \quad .330^3$$

$$1 \quad 41.84 \quad .543$$

$$10.00 \quad \Delta T + 19 \quad 57.52.48 \quad \text{Hourly rate}$$

$$7.30 \quad 56.98.00 \quad +.49$$

8.5g.
Ree.

.947

.050³.330³

.543

.490

+ .49

220 +380
-387
-12

+380
-390
-125

-39.0
+37.5
-1.4

+37.5
-38.8
-1.3

April 30

b = -0.09

33.2 4.8

5.0 33.7

33.3 4.7

5.0 34.0

5.0 34.0

33.3 4.2

33.3 4.2

4.9 33.9

5 cham 6 Sext ^aLul 19.433 + Lennis ^av² Hydraz Hydraz d lms. p lms.

35 42.5 36.4 31.2 18.1 - 34 72 25.9

37 12 51.2 46.9 33.2 - 18.7 27.7 46.2

38 40 5.5 2.1 47.8 22.3 6.8 33.6 47.4 5.4

40 10 20.7 17.8 2.9 22.5 22.2 48.7 8.1 20.5

41 40.5 35.8 33.6 18.2 22.5 37.4 3.8 28.5 45.5

43 11 50.5 49.6 33.2 22.5 52.7 19.3 49.2 6

44 46.5 50 6.3 54 5.8 58 49.2 4 8.7 9 35.3 15 10.8 20 26.7

6 40 11.79 49 20.91 53 18.14 58 3.23 3 22.44 8 48.97 148.41 19 25.89

Red. k 7.30 -8.18 -6.68 -6.03 -5.25 -4.37 -3.48 -2.61 -1.74
-1.14 -1.11 -1.10 -1.09 -1.07 -1.06 -1.04 -1.03

6 40 3.47 49 14.12 53 12.01 57 57.89 3 18.00 8 46.43 14 5.76 19 24.12

9 36 53.09 46 4.63 50 2.55 54 48.43 0 8.46 5 35.98 10 56.17 16 14.64

21 3 10.38 9.49 9.46 9.46 9.54 9.45 9.59 9.48

-2.6 -0.08 -0.09 -0.09 -0.09 -0.09 -0.06 -0.06

-1.12 -1.02 -1.02 -1.02 -1.02 -1.02 -1.02 -1.02

2.84 .93 1.05 1.99 1.02 1.02 .65 .66

0 = 10.00 + ΔT - 5.34a + 6.05c - .05 - .60 - .65 9.35

9.38 + .25 + 1.00 + .00 - .10 - .10 .28

9.35 + .46 + 1.01 + .00 - .10 - .10 .25 9.26

9.34 + .12 + 1.02 + .00 - .10 - .10 .24

9.51 + 1.21 + 1.37 + .01 - .14 - .13 .38

9.40 + 1.17 + 1.35 + .01 - .14 - .13 .27

9.22 - .24 - 1.16 + .03 + .12 + .15 87 9.26

8.10 - 5.06 - 5.76 + .56 + .58 + 1.14 .24

9.28 + 1.24 - 1.42 - .14 + .14 .00 .22

Additional 9.17 + .95 - 1.20 - .10 + .12 + .02 .19

9.35 + .00 + 1.05 .00 - .10 - .10 9.25

9.43 + .10 + 1.02 .00 - .10 - .10 .33

9.23 - .09 - 1.09 + .01 + .11 + .12 .35

9.34 + .04 - 1.04 - .08 + .10 + .10 .44

9.26 + .29 - 1.00 - .03 + .10 + .07 .33

$\Delta T = -21 \quad 3 \quad 9.26$

-39.2

+37.1

-1.5

+37.3

-39.3

-1.4

-38.8

+36.3

-1.6

+37.0

-39.3

-1.6

-38.9

+37.0

-1.5

 $b = -.18$

5.0 34.2

33.3 4.0

4.8 34.0

33.2 3.8

4.8 34.1

33.1 4.0

5.0 34.3

32.8 3.5

5.0 34.3

33.2 3.8

2 Antliae 44 Hydrae ^a 4 Hydrae ^a 5² Char ^a p² Lennis ^a p² Ura. Mey. v Ura. ^{-17.7^a} y Crat.

- 28.6 57 43 35.5 55.9 54.7 5.3 59.7

- 45.7 13.4 45 6 11.6 17.1 24.2 16.1

38.2 21.3 2.1 29.2 46 32.3 26.7 38.3 42.2 32

38.4 38.7 18.5 44.5 47 58 41.5 59.4 50.1 47.5

38.4 56 34.3 0 49 23.5 56.4 20.3 17.9 3

38.4 12.7 50.2 15.2 50 47.5 10.9 40.9 35.3 18.2

38.3 26.30 33 6.7 37 30.7 52 14 0 25.9 8 1.9 16 53.3 23 33.9

89 25 38.34 32 18.01 36 44.29 47 56.69 59 41.27 6 58.94 15 59.92 22 47.20

-0.72 +0.38 +1.11 +2.95 +4.88 +6.07 +7.56 +8.67

-0.1 +.01 +.02 +.05 +.06 +.10 +.13 +.14

25 37.61 32 18.40 36 45.42 47 59.69 59 46.23 7 5.11 16 7.45 22 56.01

22 28.16 29 8.96 33 35.87 44 50.97 56 36.78 3 55.76 12 58.13 19 46.46

9.45 9.44 9.55 8.72 9.45 9.35 9.32 9.55

-2.1 -1.9 -1.9 -5.0 -1.7 -1.1 -1.3 -1.9

-0.2 -0.2 -0.2 -1.2 -0.2 -0.2 -0.2 -0.2

1.14 1.08 1.04 2.75 .96 .63 .74 1.05

$$0 = 9.46 + \Delta T + 1.19a + 1.36c$$

$$9.20 + \Delta T + 1.10a - 1.31c$$

$$0 = .26 - .09a + 2.67c \quad c = -.10$$

$$0 = 0.54 - 6.53a + 4.69c \quad a = +.01 \text{ adopt}$$

$$= 1.10 + 6.16a' + 4.45c \quad a' = -.11$$

 ΔT arcmin.

+1.2 9.24

.00 .25 9.27

+1.0 .33

-2.4 .37

-0.9 .35 9.38

+0.4 .44

+2.9 .33

+0.2 .44

9.32

7 30 0

-21 3 9.26

10 26 50.74

2 35 31.28

7 51 19.46

1 1 17.21

 $\Delta T + 20$ 2.25 2.19

Lby

-Red.

.324

.318

.76

.682

39.6

.402

.215

.157

Telegraph Signals with Mollendo.

Received

Anica 1131 Mollendo 4026

△

9 14 24.45 = 14 47 0 5 32 35.55

Sent signals

9 15 45 to 9 19 0

Aniquipa Difference 5 32 35.7

" The line from the station to Observatory
in Aniquipa is broken tonight. Shall have to wait
for an hour to get it repaired.

Anica O.K. sorry. Anything else

Aniquipa No

Good night

01.1

April 30. Observation Equations

First series

$$\Delta T = -21 \ 3 \ 9.32 \quad a = 00 \quad c = -10$$

| | | | | |
|---------------------|------|---------------|-----------------------------|-----|
| ζ Cham. | -08 | | $+\Delta T - 5.34a + 6.05c$ | .21 |
| δ Sext. | +04 | | $+\Delta T + .25 + 1.00$ | 1. |
| δ ab. 19483 | +07 | | $+\Delta T + .00 + 1.05$ | .96 |
| π Leonis | +07 | | $+\Delta T + .46 + 1.01$ | 1. |
| ν Hydra | -01 | | $+\Delta T + .10 + 1.02$ | .99 |
| λ " | +08 | | $+\Delta T + .12 + 1.02$ | .99 |
| λ Urs. Maj. | -05 | | $+\Delta T + 1.21 + 1.38$ | .81 |
| μ " " | +06 | | $+\Delta T + 1.17 + 1.35$ | .81 |
| α Antlice | -02 | $+01 = -.01$ | $+\Delta T - .24 - 1.16$ | .90 |
| 44 Hydra | -03 | .00 | $+\Delta T - .09 - 1.09$ | .94 |
| ϕ " | -12 | | $+\Delta T + .04 - 1.04$ | .98 |
| δ Cham | +64 | $-.35 = +.29$ | $+\Delta T - 5.06 - 5.76$ | .22 |
| ρ Leonis | -.04 | | $+\Delta T + .29 - 1.00$ | 1. |
| ψ Urs. Maj. | -.04 | | $+\Delta T + 1.27 - 1.42$ | .79 |
| ν " " | +03 | | $+\Delta T + .95 - 1.20$ | .88 |
| γ Crateris | -.12 | | $+\Delta T + .02 - 1.05$ | .97 |

Second series p. 227

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+36.1 -39.3 -39.1 -38.9
 -38.5 +36.1 +35.6 +36.0
 -.6 -.8 -.9 $b = -.22$ -.7

33.0 3.1 4.8 34.5 4.7 34.4 4.5 34.4
 43 34.2 33.0 31.8 59 32.7 2.9 33.0 3.0
 β Conti \times Virg 316000 ψ Virg 8 Muscae 2 Virg 43 Comae
 = - 387 2.4 55 41.5 37.4 58.2
 50.1 34.3 17.1 47.0 56.5 18.3 29.5 53.3 16.2
 50.3 50.6 32.2 46.9 13.4 33.4 15.5 8.2 33.2
 50.4 6.8 47.2 46.9 30.4 48.6 58 1.2 23.3 50.2
 50.3 22.3 2.2 46.8 47.3 3.7 46.8 38.2 7.2
 50.5
 32 38.7 16.7 46.8 37 18.3 31.5 52.7 23.4
 \downarrow 37 31.9 46.9 20.7 52 33.6 0 17.5 8 7.7 10 40.4
 9 31 50.32 36 46.88 49 30.10 51 48.33 58 0.50 7 22.97 9 49.97 ⁸³

Red. to 10.00 -46.3 -38.1 -1.72 -1.35 -0.33 +1.21 +1.62
 -.08 -.06 -.03 -.02 -.01 +.02 +.03
 9 31 45.61 36 43.01 49 28.35 51 46.96 58 0.16 7 24.20 9 51.48
 12 29 1.19 33 58.52 46 44.16 49 2.55 55 16.91 4 39.81 7 7.19
 21 2 44.42 2 44.49 44.19 44.41 43.25 44.39 44.29
 -.24 -.22 -.17 -.22 -.41 -.21 -.17
 -.62 -.02 -.02 -.02 -.06 -.02 -.02

1.08 .99 .78 1.00 1.87 .97 .78
 ΔT
 0 44.16 + ΔT -.08 a - 1.08 +.04 44.20 ΔT evening
 42.78 -2.44 -3.07 +.12 42.90 +.23 44.20
 44.16 +.23 -1.00 +.04 44.20 +.19 44.22
 +.17 44.21
 44.10 +.83 -1.14 +.05 44.15 -.08 44.10
 +.02 .14 44.09
 44.14 -.08 +1.08 +.04 44.10 +.18 .14
 -.11 43.97
 44.59 -11.10 +12.08 -.48 44.11
 44.18 +.02 +1.05 -.04 44.14 44.16

Additional a 44.18 +.82 +1.13 -.05 44.13
 44.25 +.19 +1.01
 44.00 +.82 -1.13
 44.17 +.17 -1.01 $\Delta T = -21.2$ 44.15
 44.15 +.18 +1.01
 44.18 +.30 +1.00
 44.01 -.11 +1.10

-38.6 +36.7
+36.4 -38.8
-.55 -.5

-38.5
+36.5
-.5

+36.5
-38.2
-.4

clw

$$b = -.14$$

4.3 34.3 33.4 33

37 34.8

33.3 3.2

33.2 3.2 44 34.4

33.3 3.2

40 34.2

y Hydra 12 Octantia m Vng

89 Vng

p Vng

47 Hydrae

11 Portia

15.6

-

8

9.2

18.8

33.2

17.6

31.7

21

14

11.6

23.2

24.8

33.7

50

34.3

47.2

24

8.5

12.1

37.7

40.2

48.2

5.7

50.5

36

27

10

13.6

52.8

55.7

3

22

74

19.7

30

10.8

14.4

7.9

11.3

18

38.5

24.6

36

33

11.5

13.9

23.2

27

33

55

41.5

16 52.9

36

21

39

38.8

47 43.4

52 48.7

56 11.8

59 19.2

16 3.73

27

13.03

38

53.09

46 55.94

52 3.34

55 22.33

59 7.87

+2.64

+4.47

+6.39

+7.71

+8.55

+9.10

+9.71

+0.04

+0.07

+0.11

+0.13

+0.14

+0.15

+0.16

16 6.41

27

17.57

38

59.59

47 3.78

52 12.03

55 31.58

59 17.74

13 22.10

24

32.07

36

15.28

44 19.43

49 27.70

52 47.40

56 33.43

44.31

45.50

44.31

44.35

44.33

44.18

44.31

-0.15

-0.67

-0.14

-0.15

-0.13

-0.15

-0.11

-0.02

-0.24

-0.02

-0.02

-0.02

-0.02

-0.02

-0.02

1.08

4.76

.99

1.05

.95

1.09

.78

$$c = -.04$$

$$0 = 1.38 + 2.67a + 2.07c$$

$$10 \quad 0 \quad 0$$

$$= 0.41 - 11.92a' + 10.95c$$

$$-21 \quad 2 \quad 44.15 \quad .16$$

$$2.67a = -1.30 \quad a = -.49$$

$$12 \quad 57 \quad 15.85$$

$$11.92a' = -.03 \quad a' = .00$$

$$2 \quad 35 \quad 31.28$$

$$10 \quad 21 \quad 44.57$$

$$1 \quad 41.86$$

$$10.00 \text{ pm } \Delta T + 20$$

$$2.71 \quad .70$$

Hourly Rate

$$7.30 \quad "$$

$$2.25 \quad .19$$

$$.720$$

22. Red.

$$.142$$

$$.858$$

$$.578$$

$$.858$$

$$.720$$

cloudy at Arica all night.
No observations.

May, 1

Telegraph Signals with Mollendo.

Arica 1131

Moll 4026

Δ

8 58 22.4 = 14 31 0

5 32 37.6

Sent signals

8 59 45 to 9 3 0

Arequipa - Difference 5 32 37.7

Haven't been able to get Arequipa tonight.

Arica. How many successful nights at your end?

" Two with a broken level in Arequipa
" what about other two?

" No good "

" Cloudy here tonight.

" O.K. Good night

" Try again Monday
" Good night.

April 30. Observation Equations
Second series

$$\Delta T = -21.24416 \quad a = 0.0 \quad c = -0.4$$

| | | | |
|-------------------|------------------------|------------------------------|-----|
| β Comae | $-.04 + .06 = +.02$ | $+ \Delta T - .08a - 1.08c$ | .94 |
| χ Virg. | $-.13$ | $+ \Delta T + .19 - 1.01$ | 1. |
| β Comae | $+.11$ | $+ \Delta T + .82 - 1.13$ | .92 |
| ψ Virg. | $-.05$ | $+ \Delta T + .17 - 1.01$ | 1. |
| δ Muscae | $+1.26 - 1.30 = -.04$ | $+ \Delta T - 2.44 - 3.07$ | .70 |
| δ Virg. | $-.04$ | $+ \Delta T + .23 - 1.00$ | 1. |
| γ Comae | $+.01$ | $+ \Delta T + .83 - 1.14$ | .92 |
| γ Hydra | $+.06 + .06 = +.12$ | $+ \Delta T - .08 + 1.08$ | .94 |
| κ Octantis | $+1.05 - 1.47 = -1.42$ | $+ \Delta T - 11.10 + 12.08$ | .10 |
| μ Virg. | $+.05$ | $+ \Delta T + .18 + 1.01$ | 1. |
| δ " " | $+.02$ | $+ \Delta T + .02 + 1.05$ | .97 |
| ρ " " | $+.02$ | $+ \Delta T + .30 + 1.00$ | 1. |
| γ Hydra | $+1.19 + .02 = +1.21$ | $+ \Delta T - .31 + 1.10$ | .94 |
| η Bootis | $+.03$ | $+ \Delta T + .82 + 1.13$ | .92 |

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| | | | | | | |
|-------|-------|-------|-------|-------|-------|----------|
| +32.6 | -39.5 | +41.0 | -39.2 | +40.3 | -38.4 | +40.9 |
| -46.5 | +40.7 | -38.3 | +41.0 | -38.7 | +40.7 | -36.9 |
| -13.9 | +1.2 | +2.7 | +1.8 | +4 | +1.6 | +1.0 |
| -3.5 | +3 | +7 | +4.5 | | | |
| -1.03 | +0.9 | +2.1 | +1.3 | | | b = +2.4 |

May 3/97

28.8 3.8 6.8 32.7 336.74 62.33.0 336.67 50.334 347.6.2

10.3 36.2 33.3 74 6.132.2 340.7.0 59.32.8 345.62 4.232.7

2 Can May 2 Can May 5 Can 2 Can May β Gem β Argus 2 Rigel

35.7 25 46.8 1 16.2 26.2

52.1 20 1.7 58.5 42.7

7.7 36.5 16.3 39.5 58.7

23.2 53.2 31.2 3 21.5 15.2

38.8 98 46.2 35 31.7

54.8 ? 26 1.3 46.3 48.2

3 33.9.5 56 42.6 26 17.2 6 5 30.5 9 5.6

3 32 2.2.97 55 52.94 4 25 31.53 6 3 22.29 8 15.47

Red 4.40 -6.18 -0.68 +4.20 Red 4.7.30 -14.23 -13.43

-1.10 1.01 +.07 - .24 - .22

3 32 16.69 55 52.25 25 35.80 6 3 7.82 8 1.82

6 40 37.32 4 12.79 33 56.01 9 12 3.83 16 57.43

20 51 39.37 39.46 39.79 20 51 3.99 4.39

-1.03 +.10 +.79 +4.3 +.26

- .02 - .02 - .02 - .06 - .02

1.04 1.11 .92 1.79 1.10

| | Δa | ΔT | | |
|---------------------------------------|------------|------------|---------|---------|
| $0 = 38.28 + \Delta T + .03a - 1.04c$ | $-.01$ | 38.27 | | |
| 39.54 | $-.15$ | -1.12 | $+ .04$ | 39.58 |
| 89 | | | | |
| 39.76 | $+.41$ | $+1.00$ | $-.10$ | 39.79 |

0 = 38.91 + ΔT - .06a - 1.08c
= 39.4⁰ + ΔT + .18a - .04c
- .04 + .18a
- .04a
39.36 = ΔT

Probably level value on
2 Can May is fictitious.

+40.9
-37.5
+.85

-39.1
+40.0
+.2
+.06

34.7 6.2
~~5.2 33.8~~ 5.3 33.8
4.5 33.0 34.2 5.8

adjusted level

2 Hydrae 10 Lem. Min 4 chain

5.4 18.5

20.7 37.2

35.2 55.2

50.2 138

5.3 32.5

20.4 51.3

14 36.3 20 10.7

13 50.50 19 14.17

-12.51 -11.62

-2.1 -1.19

13 37.78 19 2.36

22 33.30 27 57.42

4.38 4.94

+2.4 +.04

-.02 -.02

.99 .71

very faint

too faint

| Additional equations | (g) | p. 230 | Δa | ΔT |
|----------------------|--------------|---------|------------|------------|
| 4.63 | -14 | +1.11 | +0.04 | 4.63 |
| 0 = 4.21 | + ΔT | -0.09 a | +1.09 e | +0.02 |
| 73 | | | | .23] |
| 4.80 | +0.04 | +1.04 | -.01 | 72 |
| | | | | 79 |
| 4.67 | +2.9 | -1.00 | -.07 | .60 |
| 4.50 | +0.02 | -1.05 | -.00 | .50 |

-38.3
+38.0
-.1

$b = 00$

+38.5
-38.1
+.1

-38.0
+38.8
+.2

cl Σ

| | | | | | | |
|---|--------------------|--------------------|------------------|------------------|---------------------|---------|
| 4.7 33.6 | | | 33.7 4.9 | | 4.7 33.3 | |
| 33.5 4.5 | | | 4.7 33.4 | | 33.8 5.0 | |
| α Antia | α 44 Hydrae | α 44 Hydrae | δ^2 Cham. | δ^2 Cham. | α for Senus | |
| 43.7 | 26.6 | 5.5 | 31 36 52.9 | | 53.2 | |
| 1 | 42.5 | 10.5 | 33 25 53.0 | | 87 | |
| 17.8 | 58.3 | 25.3 or 8 | 34 25 52.6 | | 238 | |
| 35.1 | 14.3 | 41.3 | | | 38.6 | |
| 52.3 | 30.7 | 56.7 | | | 53.6 | |
| 9.7 | 4.7 | 12.3 | | | 8 | |
| 7 14 28 | 21 4 | 25 28.7 | | | 40 10 53.1 | 48 23.2 |
| 7 13 35.37 | 20 14.77 | 24 41.47 | 35 52.83 | 35 52.82 | 47 38.44 | |
| Rel. 47.30 - 2.70 | -1.60 | -0.87 | +0.97 | +0.97 | +2.90 | |
| -1.04 | -1.03 | -1.01 | +1.02 | +1.02 | +1.05 | |
| 7 13 32.63 | 20 13.14 | 24 40.66 59 | 35 53.84 | 35 53.81 | 47 41.39 | |
| 10 22 28.11 | 29 8.91 | 33 35.84 | 44 50.68 | 44 50.68 | 56 36.76 | |
| 20 51 4.52 | 4.23 | 4.82 75 | 3.14 | 3.13 | 4.63 | |
| 00 | .00 | .00 | 00 | +1.17 | +1.06 | |
| -0.2 | -0.2 | -0.2 | -1.12 | -1.12 | -1.02 | |
| 1.14 | 1.08 | 1.04 | 2.75 | 2.75 | .96 | |
| 4.36 | | | ΔT | | ΔT circling | |
| $0 = 4.46 + \Delta T - 2.19a + 2.83c + .55$ | | | 5.01 | | +18 4.56 | |
| 4.60 | + .18 | + 1.01 | - .04 | 4.56 | -1.24 .56 | 4.64 |
| 4.96 | + 1.03 | + 1.25 | - .26 | 4.70 | -1.14 .67 | |
| 4.50 | -1.24 | + 1.16 | + .06 | 4.56 | +1.04 .79 | |
| 3.02 | -5.06 | + 6.76 | + 1.26 | 4.28 | -1.07 4.42 | |
| 3.18 | -5.06 | - 5.76 | + 1.26 | 4.44 | +1.08 .53 | |
| 4.74 | +1.24 | - 1.42 | - .32 | 4.42 | -1.26 .31 | 4.47 |
| 4.40 | - .07 | - 1.08 | + .02 | 4.42 | +1.29 .60 | |
| 4.47 | + .08 | - 1.03 | - .02 | 4.53 | +1.02 .50 | |
| 4.25 | -1.26 | - 1.17 | + .06 | 4.31 | | |
| 4.62 | + .31 | - 1.00 | - .08 | 4.54 | | |
| 4.84 | + 1.38 | - 1.50 | - .34 | 4.50 | | |

Additional p. 229

$\Delta T = -20.51 \quad 4.50$

-38.8
+39.2
+.1

+38.9
-38.0
+.2

-38.0
+39.0
+.25

+39.0
-38.1
+.2

2.31

b = +.06

| | | | | | | | |
|-----------|--------------|---------------|---------------|-------------------|--------------|-----------|--|
| 5.0 33.8 | | | 33.9 5.0 | 4.7 33.3 | | 34.0 5.0 | |
| 34.0 5.2 | | | 4.7 33.3 | 34.0 5.0 | | 4.7 33.4 | |
| 4 UMa Maj | β Crat | δ Crat | γ Crat | ϵ Hydrae | ν Leonis | X UMa Maj | |
| 52.1 | - | 25.7 | 56.7 | 1.5 | 53.4 | 26.6 | |
| 14.4 | 5.3 37.3 | 41.6 | 13.2 | 19.8 | 9.2 | 50.2 | |
| 35.4 | 21.7 37.5 | 57.3 | 28.6 | 37.4 | 24.2 | 12.7 | |
| 86.7 | 37.8 37.5 | 12.6 | 44.3 | 54.7 | 39.2 | 35.3 | |
| 17.6 | 53.7 37.3 | 27.9 | 0 | 12.3 | 53.7 | 57.6 | |
| 38.2 | 9.5 37.5 | 43 | 15.2 | 29.2 | 8.4 | 19.5 | |
| 55 59.4 | 58 25.7 | 5 58.4 | 11 30.7 | 19 46.5 | 23 23.4 | 32 41.8 | |
| 54 56.26 | 57 37.43 | 5 123.6 | 10 44.10 | 18 54.49 | 22 38.79 | 31 34.81 | |
| +4.09 | +4.54 | +5.62 | +6.69 | +8.03 | +8.65 | +10.12 | |
| +0.07 | +0.08 | +0.62 | +0.11 | +0.13 | +0.14 | +0.17 | |
| 55 0.42 | 57 42.05 | 4 18.07 | 10 50.90 | 19 2.65 | 22 47.58 | 31 45.10 | |
| 3 58.70 | 6 37.69 | 14 13.73 | 27 58.45 | 27 58.45 | 31 43.00 | 40 40.28 | |
| 4.72 | 4.36 | 4.34 | 4.46 | 4.20 | 4.58 | 4.82 | |
| +0.04 | +0.06 | +0.06 | +0.06 | +0.07 | +0.06 | +0.04 | |
| -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | |
| .63 | 1.08 | 1.03 | 1.05 | 1.14 | .95 | .59 | |

L. S.
Red.

$$0 = 0.16 - 11.5c \quad c = +.01$$

$$= 4.69 + .32a + 1.14c + \Delta T$$

$$= 4.67 + .45a - 1.20c + \Delta T$$

$$= 0.02 - .13a + 2.34c \quad c = .00$$

$$0 = 0.50 + 3.22a - 1.58c \quad a = -.15$$

$$= 1.48 + 4.82a - 4.60c \quad \frac{-0.32}{-.24}$$

$$= 1.61 + 6.37a' + 4.34c \quad a' = -.25$$

| | | | |
|-----------------|-------|-------|--------|
| 7 | 30 | 0 | 7 |
| -20 | 51 | 4.50 | 4.513 |
| 10 | 38 | 55.50 | 55.483 |
| 2 | 47 | 20.94 | |
| 7 | 51 | 34.56 | 34.543 |
| | 1 | 17.26 | .256 |
| | | | .287 |
| | | | .247 |
| $\Delta T + 20$ | 17.30 | 17.24 | |

Telegraph Signals with Hollands

Arica 1131

Holl 4026

Δ

20

8 54 19.95 = 14 27 0

5 32 40.05

Sent signals

8 55 25 to 8 59 0

Arquipo Difference 5 32 40.2

Nothing more

Arica How many more nights

" Are you asking me or the astronomer

" Astronomer

" You know better than we, but we can ask Observatory

How many good nights have you had

" Two and tonight

" Signals tomorrow

" Yes

" Tell me tomorrow whether we need any more

" O.K.

Goodnight

May 3. Observation Equations.

First series.

$$\Delta T = -20 \ 51 \ 4.56 \quad a = -.25 \quad c = .00$$

| | | | | |
|------------------|--|----------|--|--------------------------------|
| β Aquas | ³⁵ -.45 +.10 | +.04 = - | .31 + ΔT - 2.19 ω + 2.83 ϵ | ³ .47 |
| δ Pyxis | +.11 | | + ΔT - .14 + 1.11 | .93 |
| α Hydra | ⁰⁰ .50 | | + ΔT + .18 + 1.01 | 1. |
| 10 Leon. Min. | ¹⁴ +.40 | | + ΔT + 1.03 + 1.25 | .85 |
| α Antlia | ⁰⁰ +.00 | +.01 | + ΔT - .24 + 1.16 | .90 |
| 44 Hydra | ³³ +.33 | .00 | + ΔT - .09 + 1.09 | .94 |
| ϕ " | ¹⁶ -.22 | | + ΔT + .04 + 1.04 | .98 |
| δ^2 Cham | +.28 | -.35 = - | .07 + ΔT - 5.06 + 5.76 | .22 |
| " " | +.12 | -.35 = - | .23 + ΔT - 5.06 - 5.76 | .22 |
| ρ^2 Leonis | -.04 | | + ΔT + .29 - 1.00 | 1. |
| ψ Urs. Maj. | ¹⁴ +.76 | | + ΔT + 1.24 - 1.42 | .79 |
| β Crateris | ¹⁴ +.02 | +.02 = + | .16 + ΔT - .07 - 1.08 | .95 |
| δ " | +.03 | | + ΔT + .08 - 1.03 | .98 |
| γ " | +.06 | | + ΔT + .02 - 1.06 | .97 |
| ξ Hydra | ²⁵ +.25 | -.01 = + | .24 + ΔT - .26 - 1.17 | .90 |
| ν Leonis | +.02 | | + ΔT + .31 - 1.00 | 1. |
| χ Urs. Maj. | +.06 | | + ΔT + 1.38 - 1.50 | .75 |

Second series p. 237

234

-38.5 $+38.9$ $+38.1$ -38.4
 $+37.8$ -38.4 -38.0 $+38.9$
 $-.2$ $+.1$ $.0$ $+.1$

6 = 00

46 337 340 49 334 47 47 337

335 4.3 47 337 4.5 335 340 4.9

8 Corn 3 Corn X Virg 39 Corn X Virg 8 Mice 2 Virg 43 Mice

58.2 58.3 59.6 43 375 347 473 13.6

15.2 14.2 15.3 44 253 362 50.5 473 30.7

+ 5 21.7 317 293 30.7 45 11.5 5.4 474 47.7

22.5 22.2 477 443 45.7 57.5 20.5 472 4.5

37.5 21.7 3.8 59.3 07 433 35.5 47.0 20.7

52.6 21.8 19.5 14 15.7 27.5 49.8 47.2 58.38

9 16 ^{21.8} 8.2 20 35.7 25 28.9 40 30.6 48 13.5 56 5 ↓

9 15 21.84 19 47.40 24 44.04 39 45.47 45 56.59 55 20.20 57 47.23

Red. 10.00 -7.33 -6.61 -5.79 -3.33 -2.31 -0.77 -0.87
 $-.12$ $-.11$ $-.10$ $-.06$ $-.04$ $-.01$ $-.01$

9 15 14.39 19 40.68 24 38.15 39 42.08 45 54.24 55 19.42 57 46.85

12 24 34.79 29 1.18 33 58.51 49 2.54 55 16.87 4 39.81 7 7.18

20 50 39.60 39.50 39.64 39.54 37.37 39.81 39.67

.00 .00 .00 .00 .00 .00 .00

-.02 -.02 -.02 -.02 -.06 -.02 -.02

1.04 1.08 An ΔT 1.87 .97 .78

Δ = 39.58 + ΔT + .05a - 1.04c -.01 39.57 ΔTearing

39.48 -.08 -1.08 +.02 39.50 +.05 39.57

37.31 -2.44 -3.07 +.63 37.94 39.51 -.08 1.50

39.59 +.23 -1.00 -.06 39.53 +.23 1.53

39.65 +.83 -1.14 -.22 39.43 +.19 1.57

39.57 -.08 +1.08 +.02 39.59 +.17 1.48

36.46 -11.10 +12.08 +2.89 39.35 39 48 39.53

39.86 +1.44 +1.55 -.37 39.49 -.08 1.59

39.52 +.35 +1.00 -.09 39.43 +.18 1.53

39.62 +.19 -1.01 -.05 39.43 +.30 1.63

.52 +.17 -1.01 -.04 39.43 -.11 1.41

.58 +.18 +1.01 -.05 39.43 -.15 1.41

.71 +.20 +1.00 -.08 39.43 -.15 1.41

.38 -.11 +1.10 +.03 39.43 -.15 1.41

.87 -.15 +1.11 +.04 39.43 -.15 1.41

ΔT = -20 50 39.50

39.52

1697bae.proj.1170U

clw
-37.8
+38.5
+1.2
-37.6
+39.2
+.4
b = +.07
235
+39.1
-38.5
+.15

| | | | | | | | | |
|---|-------|----------|----------|----------|----------|----------|----------|----------|
| 4.4 | 33.4 | 4.3 | 33.3 | | | | 34.1 | 5.0 |
| 33.7 | 4.8 | 34.2 | 5.0 | | | | 4.7 | 33.8 |
| 4 Hydron K Oct. m Vng n Vng f Vng 47 Hydron e Vng 11 Hydron | | | | | | | | |
| 12.6 | 6.5 | 5.3 | 57.7 | 16 | 30.7 | 14.4 | 14.5 | |
| 28.8 | 9.7 | 20.3 | 20.9 | 31 | 47 | 29.2 | 31.2 | |
| 44.5 | 12.3 | 35.1 | 43.4 | 45.3 | 2.8 | 43.7 | 47.2 | |
| 0.6 | 15.35 | 50.1 | 6.3 | 0.4 | 19.1 | 58.7 | 3.8 | |
| 16.7 | 18.3 | 5.2 | 29.5 | 15.3 | 35.7 | 13.7 | 20.5 | |
| 33.2 | 24.5 | 20.3 | 52.7 | 30.3 | 52 | 28.8 | 37.3 | |
| 10 | 4 | 50.2 | 24.14 | 27.36.1 | 35.17.3 | 40.46 | 44.9.2 | 47.44.3 |
| 4 | 0.94 | 15.579 | 50.34 | 34.6.83 | 40.0.70 | 43.19.50 | 46.58.83 | 51.4.17 |
| | +0.66 | +2.48 | +4.41 | +5.60 | +6.57 | +7.12 | +7.72 | +8.39 |
| | +1.01 | +1.04 | +1.07 | +1.09 | +1.11 | +1.12 | +1.13 | +1.14 |
| 4 | 1.61 | 15.8.31 | 26.54.82 | 34.12.52 | 40.7.38 | 43.26.74 | 47.6.98 | 51.12.70 |
| 13 | 22.10 | 24.34.94 | 36.15.29 | 43.32.68 | 49.27.72 | 52.47.42 | 56.27.21 | 0.23.39 |
| | 39.51 | 36.37 | 39.53 | 39.84 | 39.66 | 39.32 | 39.47 | 39.31 |
| | +1.08 | +1.33 | +1.07 | +1.04 | +1.07 | +1.08 | +1.07 | +1.18 |
| | -1.02 | -1.24 | -1.02 | -1.02 | -1.02 | -1.02 | -1.02 | -1.02 |
| | 1.08 | 4.76 | .99 | .57 | .95 | 1.09 | .94 | 1.10 |

0 = 39.62 + ΔT + .53a - 1.07c
= 39.69 + ΔT + .90a + 1.28c
= 0.07 + .37a + 2.35c c = +.01
= 2.31 + 2.97a + 2.00c a = -.80 rej.
= 3.23 + 12.00a' - 10.80c a' = -.26 at 1/2
10 0 0
-20 50 39.50 52.488
13 9 20.50 57
2 47 20.94
10 21 59.56 67
1 41.90 898
10.00 pm ΔT + 20 17.66 .64 669
7.30 " 17.30 .24 16

May 34th/97

Telegraph Signals with Mollendo

Anica 1134 Moll. 4026 Δ
 9 1 18.15 = 14 34 0 5 32 41.85

Sent signals

9 2 45 - 9 6 0

Aniquipa Difference 5 32 42.0

Prof. Bailey asks how many more nights

Prof. Upton needs.

Anica - cloudy here tonight. Are you getting anything?

" Yes.

" How much did you get on the bad nights?

" ~~8 and nothing~~

5, 1 and 0

Have we 3 good nights besides?

" Yes.

" Let us try one night more

" O.K.

Good night.

Cloudy at Anica May 4th all night,
 clearing May 5th 1pm when obser-
 vations were begun, p. 238.

May 3. Observation Equations.

Second series

$$\Delta T = -20 \ 50 \ 39.52 \quad a = -.26 \quad c = .00$$

| | | | | |
|-------------------|-------|-----------|---|-----|
| δ Corvi | -.05 | | $+\Delta T + .05\omega - 1.04\omega$ | .98 |
| β " | +.02 | +.06 = + | $.08 + \Delta T - .08 \rightarrow 1.08$ | .94 |
| χ Virg. | -.05 | | $+\Delta T + .19 - 1.01$ | 1. |
| ψ " | +.04 | | $+\Delta T + .17 - 1.01$ | 1. |
| δ Muscae | +1.58 | -1.30 = + | $.28 + \Delta T - 2.44 - 3.07$ | .40 |
| δ Virg. | -.01 | | $+\Delta T + .23 - 1.00$ | 1. |
| 43 Comae | +.09 | | $+\Delta T + .83 - 1.14$ | .92 |
| γ Hydrae | -.07 | +.06 = - | $.01 + \Delta T - .08 + 1.08$ | .94 |
| κ Octantis | +.17 | -1.47 = - | $1.30 + \Delta T - 11.10 + 12.08$ | .10 |
| m Virg. | -.01 | | $+\Delta T + .18 + 1.01$ | 1. |
| η Virg. Maj. | +.03 | | $+\Delta T + 1.44 + 1.55$ | .73 |
| ρ Virg. | -.11 | | $+\Delta T + .30 + 1.00$ | 1. |
| 47 Hydrae | +.11 | +.02 = + | $.13 + \Delta T - .11 + 1.10$ | .94 |
| τ Virg. | +.09 | | $+\Delta T + .35 + 1.00$ | 1. |
| π Hydrae | +.11 | +.03 = + | $.14 + \Delta T - .15 + 1.11$ | .93 |

May 5/97
-41.4 -40.8 +40.2
+40.5 -40.3 -40.6
-1.2 -1 -1
-0.6 -0.3
+40.6
-41.1
-1
-0.3
-40.4
+41.0
+0.15
+0.04

forming land mts
asymmetrical
QW

-39.6 +40.6 -39.6
+41.2 -39.0 +41.4
+4 +4 +4.45
+12 +12 +13

80 32.4 7.6 33.2 33.0 7.2 33.3 7.3 7.2 33.2 63 33.3 33.8 6.8 6.3 33.2
33.0 7.5 33.0 7.3 7.3 33.3 7.6 33.5 33.3 7.7 34.0 7.2 6.0 33.0 34.2 7.2

30 mm 2 Aug 2 Can May 2 Can May 8 Can 2 Can Min 8 Can
47.7 9.7 32.4 23.3 - -
3.5 35.6 48.5 41.2 - - clouds

18.3 0.3 4.2 58.2 15.2 29.4 17.8 35.2
33.7 24.8 19.8 15.2 30.2 29.5 34.5 34.8
48.7 49.5 35.4 32.3 45 29.4 51.5 34.8
3.5 13.2 50.5 48.8 -15 from all 0.2 29.6 8.7 34.9

1 54 18.5 3 6 38 25 6.2 39 6 15.7 29.3 26.5 34.6
1.53 33.41 3 5 24.44 24 19.57 38 15.00 4 17 29.44 22 34.86

Red 2.00 -1.06 4.0 -8.97 -5.86 -3.57 +2.87 +3.71
-0.02 -1.15 -1.0
1 53 32.3 5 15.47 24 13.91 38 11.43 17 32.31 22 38.57
5 9 35.75 21 39.27 40 37.30 54 35.11 4 12.63 33 55.99 39 2.47
20 43 56.6 36.20 43 36.41 36.32 36.32 36.10
-0.6 -0.04 -0.03 +0.04 -0.02 +0.11 +0.09
-0.02 -0.03 -0.02 -0.02 -0.02

Red 2.00 1.99 1.36 1.04 1.12 1.11 .92 .78
0 = 56.50 + 18a - 1.01c + ΔT 0 = +ΔT ΔT

-0.05 + 18a 36.26 +0.03a - 1.04c
-1.01c 36.34 -0.20 -1.14
20 43 56.45 ΔT 36.41 +0.41 +1.03
2 0 0 4 0 0 35.97 +0.83 +1.14

5 16 3.55 7 16 23.68 .719 2280
2 55 14.06 2 55 14.06 0 = .37 - 1.03a a = +.36

2 20 49.49 4 21 9.62 459 0 = 36.30 + ΔT - 0.8a - 1.09c
23.07 20 42.79 .785 = 36.48 + ΔT + 1.46a + 1.00c
ΔT + 20 26.48 20 26.83 .874 = 36.36 + ΔT + 1.6a - 0.4c
hourly rate + 20 -0.04 16a 3/a = -.25
36.32

Cloudy after 6 pm thro' night.

May 5/97

Signals with Mollendo.

Arica 1131 Moll 4026 Δ
~~18~~ =
~~16.6~~ =
 7 58 16.55 = ¹³~~14~~ 31 0 5 32 43.45

Sent signals

7 59 25 to 8 3 0

Arequipa Diff. = 5 32 43.6

Arica

"

Anything more.

"

My steamer leaves tonight.

"

Anything more

"

Expect me at Arequipa

Friday night

"

Cargo train?

"

Yes. Carry your chronometer clamped in its box, not swinging.

"

All done

End night

Chromometer comparisons between Arica and Mollendo
by cable. W.C. at Arica chm 1131

W.B.C. " " " 4026

Signals sent by hand, read by deflection of light
from mirror galvanometer.

| p. 202 | April 27. | Arica from Mollendo | $\Delta \left(\frac{4026-1131}{M-A} \right)$ | Δ Moll from Arica. |
|--------|-----------|-----------------------------------|--|---|
| | | \downarrow 8 59 28.35 = 14 32 0 | $\begin{matrix} h. m. s. \\ 5 32 31.65 \end{matrix}$ | $\begin{matrix} Mean \\ 31.72 \end{matrix}$ |
| 210 | " | 28 9 3 27.5 = 14 36 0 | 32.5 | 32.6 32.55 0.83 |
| 216 | " | 29 9 0 26.1 = 14 33 0 | 33.9 | 34.0 33.95 1.40 |
| 222 | " | 30 9 14 24.45 = 14 47 0 | 35.55 | 35.7 35.62 1.67 |
| 226 | May 1 | 8 58 22.4 = 14 31 0 | 37.6 | 37.7 37.65 2.03 |
| 232 | | 3 8 54 19.95 = 14 27 0 | 40.05 | 40.2 40.12 2.47 |
| 236 | | 4 9 1 18.15 = 14 34 0 | 41.85 | 42.0 41.92 1.80 |
| 239 | | 5 7 58 16.55 = 13 31 0 | 43.45 | 43.6 43.52 1.60 |

| | 4026-1131 | Relative | Rate of p174 | Adopted | Rate of 4026 | Hourly | Hourly | Hourly |
|---------|-----------|-------------|--------------|---------|--------------|--------|--------|--------|
| Apr. 27 | | Daily Rates | 1131 | 1131 | Rate of 4026 | Hourly | Hourly | Hourly |
| 28 | | + 0.83 | + 4.46 | + 4.46 | 4.34 + 3.6/3 | .15 | 3.51 | .15 |
| 29 | | 1.40 | 4.56 | 4.56 | 4.66 3.46 | .13 | 3.26 | .135 |
| 30 | | 1.67 | 4.73 | 4.73 | 5.19 3.06 | .13 | 3.52 | .15 |
| May 21 | | 2.03 | 4.88 | 4.88 | 5.00 2.85 | .12 | 2.97 | .12 |
| 2 | | 1.24 | 5.02 | 5.06 | 5.00 3.82 | .16 | 3.76 | .16 |
| 3 | | | | | | | | |
| 4 | | 1.80 | 5.24 | 5.20 | 5.17 3.40 | .14 | 3.37 | .14 |
| 5 | | + 1.67 | | + 5.28 | 5.17 + 3.61 | .15 | 3.50 | .15 |

Reduction May 5 from p. 238

241

| | ΔT | a | c | Σ | ΔT |
|---------------------------------------|------------|-------|-----|---|--|
| $0 = 36.50 + \Delta T + .18a - 1.01c$ | | | | $\begin{smallmatrix} 13 \\ -18 \end{smallmatrix}$ | 36.26 |
| 36.13 | -.93 | -1.65 | | $\begin{smallmatrix} 4 \\ +26 \end{smallmatrix}$ | $\begin{smallmatrix} 24 \\ 18 \end{smallmatrix}$ |
| 36.26 | +.03 | -1.04 | | $\begin{smallmatrix} 08 \\ -74 \end{smallmatrix}$ | .17 |
| 36.34 | -.21 | -1.14 | | $\begin{smallmatrix} 09 \\ -75 \end{smallmatrix}$ | $\begin{smallmatrix} 30 \\ 25 \end{smallmatrix}$ |
| 36.41 | +.41 | +1.00 | | $\begin{smallmatrix} 08 \\ +73 \end{smallmatrix}$ | $\begin{smallmatrix} 38 \\ 43 \end{smallmatrix}$ |
| 36.17 | | | | $\begin{smallmatrix} 09 \\ -13 \end{smallmatrix}$ | .04 |
| 36.97 | +.83 | +1.14 | | $\begin{smallmatrix} 2 \\ -23 \end{smallmatrix}$ | 36.89 |
| | | | | | 36.23 |

$$0 = 36.33 + \Delta T + .00a - 1.06c$$

$$36.29 \quad +.62 \quad +1.07c$$

$$0 = 0.04 - .62a - 2.13c$$

$$\text{If } a = -.25 \quad c = +.08$$

$$0 = 0.20 + .93a + 0.59c$$

$$= 0.26 + 1.55a + 2.72c$$

$$.93a = -.25 \quad a = -.27$$

$$1.55a' = -.38 \quad a' = -.24$$

$$\text{If } c = .00, \quad a = -.22$$

$$a' = -.24$$

$$-.16$$

 $\Delta T = -.25$
 $c = +.08$

| | | | | |
|------------|-------|-----|----------|------------|
| ΔT | a | c | Σ | ΔT |
| -.04 | 36.35 | .27 | 36.35 | .26 |
| +.23 | .36 | .23 | .25 | .17 |
| -.01 | .25 | .17 | .39 | .30 |
| +.05 | .39 | .30 | .31 | .38 |
| -.10 | 36.31 | .39 | 36.32 | .28 |
| -.21 | 35.96 | .05 | | |
| | | | | 36.27 |

Adopt 36.23

4 0 0

-20 43 36.23 36.281

Observation Equations

$$\text{Adopt } \Delta T = -20 \quad 43 \quad 36.23 \quad a = -.25 \quad c = +.08$$

| | | | | | |
|--------------------|------|----------------------------|-----|------------|--------|
| β Orionis | -.04 | $+\Delta T + .18a - 1.01c$ | 1. | 4 21 9.71 | 9.659 |
| α Argus | .00 | $+\Delta T - .93a - 1.65c$ | .69 | 42.79 | 42.785 |
| α Com. Maj. | +.06 | $+\Delta T + .03a - 1.04c$ | .97 | 4 20 26.92 | 26.873 |
| ϵ " " | +.07 | $+\Delta T - .21a - 1.14c$ | .92 | + 20 26.92 | |
| α " Min | -.16 | $+\Delta T + .41a + 1.00c$ | 1. | | |
| β Gem. | +.18 | $+\Delta T + .83a + 1.14c$ | .92 | | |

May 6 pm
Sextant for time
W balcony of Hotel Amer.
Africa

57 35 58 0
58 25 40
59 14.5 20
3 0 3.5 57 0
2 58 49.50 57 30

1 52 57 20
2 40 0
3 31 40
3 4 19.5 56 20
3 3 5.62 56 50

57 30 56 50
-10 46 -10 46

57 19 14 56 39 14
off. h 28 ³⁹~~40~~ ³⁷~~47~~ 28 19 37
Par. + 8 + 8

Refr. - 1 46 - 1 48

Semi + 15 51 - 15 51

h 28 53 50 28 2 6

z 61 6 10 61 57 54

δ 16 46 56 16 46 56

φ - 18 28 43

φ-δ - 35 15 39

φ+δ - 1 41 47

on arc off
0 42 0 359 39 50
41 40 30
42 0 20
42 30 20
0 42 2.5 359 39 30
0 40 46.2

Images from

Local time 3 22

Long 4 42

hr. Time 8 3

Obs. Time 8 57

Δδ from 16' 42"
mid. 16 34
4.30 p 16 39 = 999"
 $\frac{283}{999} \times \frac{1.12}{8.95} = 372" = 6' 12"$

a z+(φ-δ) 26 50 31 26 42 15

b z-(φ-δ) 96 21 49 97 13 33

c z+(φ+δ) 59 24 23 60 16 7

a z-(φ+δ) 62 47 57 63 39 41

1/2 a 12 55 16 13 21 8

1/2 b 48 10 54 48 36 46

1/2 c 29 42 12 30 8 4

1/2 d 31 23 58 31 49 50
~~31 42 34~~

Reduction by single altitudes

$$\tan \frac{1}{2} t = \sqrt{\frac{\sin \frac{1}{2}(Z + (\phi - \delta)) \sin \frac{1}{2}(Z - (\phi - \delta))}{\cos \frac{1}{2}(Z + (\phi + \delta)) \cos \frac{1}{2}(Z - (\phi + \delta))}}$$

| | | |
|--------------------------|--------------------|---------------------|
| log $\sin \frac{1}{2} a$ | 9.34949 | 9.36349 |
| " " $\frac{1}{2} b$ | 9.87231 | 9.87521 |
| " $\sec \frac{1}{2} c$ | 0.06118 | 0.06306 |
| | 06877 | 07078 |
| " " $\frac{1}{2} d$ | 0.28316 | 0.27785 |
| | 35175 | 37254 |
| Σ | 9.56614 | 9.57961 |
| | 9.67588 | 9.68627 |
| " $\tan \frac{1}{2} t$ | 9.78307 | 9.78980 |
| | 25 21 58 | 25 54 2 |
| $\frac{1}{2} t$ | 31 15 2 | 31 38 46 |
| | 50 43 56 | 51 48 4 |
| $\frac{1}{2} t$ | 2 5 0.1 | 2 6 35.0 |
| t | 4 10 0.2 | 4 13 10.0 |

Eg. of time
6th Nov -3 32.90 ^{4.72} [4.44]
4.16

Δ Eg. norm 4.44

4.30 p. 4.34

$$\frac{1.45}{4.34} \times \frac{1.12}{8.95} = 1.62$$

Eg. -3 34.5

| | | |
|--------|------------|------------|
| t | 3 22 55.7 | 3 27 12.3 |
| Am | 11 56 25.5 | 11 56 25.5 |
| Mean t | 3 19 21.2 | 3 23 37.8 |
| Chm | 2 58 49.5 | 3 3 5.6 |
| Corr. | + 20 31.7 | 20 32.2 |
| | + 20 32.0 | at 3 p.m. |

Sextant for time

May 7 pm

W balcony hotel Americana
Anica

| | | | On arc | Off arc |
|---|----------------|-------------|-----------|--------------|
| A | 17 38 | 73 0 | 0 42 30 | 359 39 0 |
| | 18 30.5 | 40 | 30 | 38 40 |
| | 19 25 | 20 | 30 | 39 0 |
| | <u>20 20.5</u> | <u>72 0</u> | <u>20</u> | <u>38 40</u> |
| | 2 18 58.50 | 72 30 | 0 42 27.5 | 38 50 |
| | | | 0 10 39 | |

| | | |
|---|-------------|--------------|
| B | 21 22 | 72 40 |
| | 22 15.5 | 20 |
| | 23 10 | 0 |
| | <u>24 4</u> | <u>71 40</u> |
| | 2 22 42.9 | 72 10 |

Local Time 2 40

Long 4 41

Gr. Time 7 21

Berl. " 8 15

 ΔS nom 16 26

" mid 16 17

4 8 pm 16 23 = 983

$$\frac{328}{983} \times \frac{103}{8.25} = 338 = 5 38$$

| | | |
|-------|----------|----------|
| | 72 30 | 72 10 |
| | -10 39 | -10 39 |
| | 72 19 21 | 71 59 21 |
| App h | 36 9 40 | 35 59 40 |

Par + 7 + 7

Refr. -1 20 -1 20

Semi +15 50 -15 50

h 36 24 17 35 42 37

 δ 17 2 56 ϕ -18 28 43 $\phi - \delta$ -35 31 39

z 53 35 43 54 17 23

 $\phi + \delta$ -1 25 47 $a z + (\phi - \delta)$ 18 4 4 18 45 44 $b z - (\phi - \delta)$ 89 7 22 89 50 2 $c z + (\phi + \delta)$ 52 9 56 52 51 36 $d z - (\phi + \delta)$ 55 1 30 55 43 10 $\frac{1}{2}a$ 9 2 2 9 22 52 $\frac{1}{2}b$ 44 33 41 44 58 31 $\frac{1}{2}c$ 26 4 58 26 25 48 $\frac{1}{2}d$ 27 30 45 27 51 35

Reduction

| | | |
|--------------------------|---------|----------|
| log $\sin \frac{1}{2} a$ | 9.19595 | 9.21219 |
| " " $\frac{1}{2} b$ | 9.84614 | 9.84879 |
| " $\sin \frac{1}{2} c$ | 0.04665 | 0.04795 |
| " " $\frac{1}{2} d$ | 0.05212 | 0.05350 |
| Σ | 9.14086 | 9.16243 |
| " $\tan \frac{1}{2} b$ | 9.57043 | 9.58122 |
| $\frac{1}{2} b$ | 20 24 2 | 20 52 11 |
| b | 40 48 4 | 41 44 22 |

Eg. of time

7th Berl. norm -3 37.06 ^{4.16} ~~3.88~~
3.61

 Δ norm 3.88

4.08 pm 3.79

$$\frac{3.79 \times 8.25}{24} = 1.30$$

Eg. -3 38.4

| | | |
|-------|-------------|------------|
| b | 2 43 12.3 | 2 46 57.5 |
| Norm | 11 56 21.6 | 11 56 21.6 |
| Mean | 2 39 33.9 | 2 43 19.1 |
| Chm | 2 18 58.5 | 22 42.9 |
| Corr. | + 20 36.4 | 36.2 |
| | <u>35.8</u> | |

May 9 pm

Arrived at Bequpa from Anica

Chm 11 31 Sid clock
8 27 54.5 = 11 55 15

Arquiza
Roger Transit

May 10

No levels taken as level
is broken.

W. L. L.

| | | | | | | | | | | | |
|--------------|---------------|--------------|--------------|--------------|--------|-------|---------|--------|----------------|-------|--------|
| 3 | 2 | 3 | 4 | 6 | +48 21 | 159 | 2 21 | +7 11 | +9 18 | -22 3 | -78 44 |
| B | Maj. | Plem. | f | ing | π ing | o ing | z Corri | B Cham | | | |
| 21.2 | 42 | | | | 37.6 | 58.5 | | 3518.5 | A ₃ | | |
| 52.2 | 12.3 | 44.3 | 58.5 | 19.5 | | | | 54 | | | |
| 7.7 | 23.2 | 54.7 | 9 | 36.3 | 20.5 | 31.7 | 36.30 | | | | |
| 23 | 33.7 | 5 | 19.2 | 40.5 | 31.7 | 31.7 | 38.15 | B | | | |
| 38.8 | 44.7 | 15.3 | 29.7 | 51 | 42.8 | 31.6 | 40 | 1.7 | | | |
| | | | | | | | | 1.8 | | | |
| | | | | | | | | 2.4 | | | |
| 54.3 | 11 | 55.3 | 13 | 25.7 | 46.3 | 1.5 | 54.2 | 31.8 | 1.2 | | |
| 89 | 25.5 | | | | 24 | 1 | 28 | 22.5 | 33 | 16.3 | 31.6 |

[illegible]

| | ΔT | $+1.36a$ | $+1.64\Delta b$ | $+1.50c$ | -0.12 |
|-----------------|------------|----------|-----------------|----------|---------|
| $0 = 39.29$ | $+1.54$ | $+1.88$ | $+1.04$ | -0.09 | |
| 39.47 | $+1.32$ | $+1.95$ | $+1.00$ | -0.09 | |
| 39.52 | $+1.40$ | $+1.92$ | $+1.01$ | -0.09 | |
| 39.59 | $+1.44$ | $+1.91$ | $+1.01$ | -0.09 | |
| 39.38 | -1.11 | $+1.07$ | $+1.08$ | -1.0 | |
| $m \quad 39.73$ | -4.55 | $+2.38$ | $+5.13$ | -5.5 | |
| 39.96 | -4.55 | $+2.38$ | -5.13 | $+5.5$ | |
| 38.86 | -1.0 | $+1.0$ | -1.0 | $+0.9$ | |
| $m \quad 39.19$ | -1.12 | $+1.08$ | -1.09 | $+1.10$ | |
| $0 \quad 39.44$ | $+1.79$ | $+1.81$ | $+1.13$ | $+1.10$ | |
| 39.29 | $+1.35$ | $+1.94$ | -1.00 | $+0.9$ | |
| 39.44 | -2.50 | $+1.78$ | -3.07 | | |
| 38.62 | | | | | |

chrn 1131

lid clk

247

$$9 \ 31 \ 11.5 = 13 \ 2 \ 40$$

$$9 \ 37 \ 0 = 15 \ 9 \ 47.7$$

$$37 \ 52.3$$

$$10 \ 40$$

Lamp W

| | | | | | |
|----------|----------|----------|---------|------------------------|----------|
| -78 44 | -15 57 | -22 50 | +28 6 | +3 57 | -71 0 |
| Beham | S' Covi | S' Covi | 31 Cova | S' Covi | S' Cova |
| 267 | 51 | 15.8 | 29 dr | 52.5 c | |
| 48.5 | 13.4 | | 38.2 | 14 | |
| 43 31.5c | 59.2 | 247 | 42.2 | 48.4 | 25 35.5 |
| 7 2 | 10.2 | 357 | 59 | 56 | |
| 44 | 42.20 | 42.5 | 15.9 | 27.5 B ₄ | 9.2 |
| -43.18 | 17.5 | 31.5 | 15.8 | 10.7 c ₂ | 18 19.8 |
| 45 52.5 | 52.53 | 57 20.5 | 16.1 | 26 c ₄ | 25 35.00 |
| 39 59.02 | 52 9.97 | 56 35.95 | 15.8 | 15 33.7 c ₅ | 17 58.92 |
| +1.65 | +3.64 | +4.37 | 14 | +7.27 | +7.88 |
| 39 60.67 | 52 13.61 | 56 40.23 | 15.7 | 17 58.92 | 22 45.54 |
| 12 22.54 | 24 34.76 | 29 1.15 | 14 | 23.12 | 18 6.80 |
| 38.13 | 38.85 | 39.08 | 44.09 | 50 27.67 | 55 16.75 |
| + .83 | + .36 | + .38 | 39.03 | 39.13 | 37.46 |
| - .10 | - .02 | - .02 | + .28 | + .33 | + .62 |
| | | | - .02 | - .02 | - .06 |

$$0 = 1.10 + 10.26c \quad c = -.09$$

$$x = 39.45 + \Delta T + .61a + .86\Delta b + 1.11c$$

$$y = 39.36 + \Delta T + .57a + .88\Delta b - 1.06c$$

$$0 = 0.51 - 5.46a + 1.52\Delta b + 4.02c$$

$$= 0.50 + 5.12a - 1.50\Delta b + 4.07c$$

$$A = 0.01 - 10.28a + 3.02\Delta b - .05c$$

$$= 0.44 + 1.47a + 0.43\Delta b - .42c$$

$$= 0.15 - 0.91a + 0.27\Delta b + 0.04c$$

$$= 0.30 - 1.19a + 0.25\Delta b - .29c$$

$$= 2.58 - 10.23a + 3.02\Delta b - 1.63c$$

$$0 = 39.28 + 1.08a + .72\Delta b + \Delta T$$

$$.48 - .08a + 1.06\Delta b + \Delta T$$

$$B = .20 - 1.16a + .34\Delta b$$

$$y \Delta b = 0, a = +.17$$

$$m A \quad y \quad a = +.17, \Delta b = +.58$$

$$A \quad a = +.10, \Delta b = +.23$$

m + c_e

$$39.16$$

$$39.38$$

$$39.43$$

$$39.50$$

$$39.29$$

$$39.63$$

$$39.28$$

$$39.54$$

$$39.28$$

$$39.54$$

$$39.39$$

$$39.53$$

$$Eg. \quad x, y, 0 = 39.40 + \Delta T + .59a + .87\Delta b$$

$$Eg. \quad m, n, 0 = 39.48 + \Delta T - .08a + 1.06\Delta b$$

$$Eg. \quad x, t, 0 = 0.04 + 5.16a - 1.52\Delta b$$

$$y, t, 0 = 0.05 - 5.12a + 1.50\Delta b$$

$$\therefore \Delta b = 3.4a, \text{ both same sign}$$

$$\Delta b \text{ from obs. by SDB with coarse}$$

$$\text{level May 5 is about } +.40$$

$$\therefore a = +.12$$

$$39.40$$

$$+ .07 + .59a$$

$$+ .35 + .87\Delta b$$

$$39.82$$

$$39.48$$

$$-.01 = -.08a$$

$$+ .42 + 1.06\Delta b$$

$$39.89$$

Adopt Provisionally

$$\Delta T = -20 \ 27 \ 39.86$$

Clock sometimes

[illegible]

Approximate Longitude required observed.

Former book

Chronometer 1131 voyage to Holland 4 46 6

p. 134

Moni culmiatis;

S. G. B. 4 nights

" " comp. with F.S. }
at Providence }

at Providence

W.C., 2 nights

Solar eclipses

171 133

20 1/8. 135

This book

175 p. 53

12 81

Mean

4 46 12 adopt

Approx. Long. Arica by carrying chronometer to + from Arica.

Chm 1131 DT Daily Rate

| | | | | | |
|----------------|-----|-------|------------|--------|---------|
| May 5, 4.00 pm | +20 | 26.83 | Arica M.T. | p. 174 | Transit |
| 6 3.00 " | | 32.0 | " | " | Sextant |
| 7 2.24 " | | 35.8 | " | " | " |

| | | | | | |
|---------------|-----|-------|---------------|--------|---------|
| May 10 8.30 " | +15 | 56.09 | Arequipa M.T. | p. 248 | Transit |
| 13 7.00 " | 16 | 3.88 | | | " |
| 14 7.30 " | 16 | 6.56 | | | |
| 15 7.45 " | 16 | 9.05 | | | |

Left Arica May 8, 3 pm.

Arr. Arequipa 9, 6 "

Reduction to May 9 noon

| | | |
|--------------------------|------------|----------------|
| Adopt rate on Arica M.T. | 3.91 daily | = 0.163 hourly |
| " " " Arq. " | 2.65 " | .110 " |

May 7 2.20 pm to May 9 noon, $45^h 40^m = 45.7^h$

May 9 noon to " 10 8.30 pm $32.30 = 32.5$

| Arica | Arequipa |
|----------|-----------|
| +20 35.8 | +15 56.09 |
| + 7.4 | - 3.58 |
| +20 43.2 | +15 52.5 |

| | | | |
|------------|---|------|------|
| Δ long | 4 | 50.7 | |
| Long Arica | 4 | 41 | 19.9 |
| | 4 | 46 | 10.6 |

10 - 13

p 159

4 46 11 = approx long.

Adopting 3.3 for whole interval 3.25 days + 20 35.8

| | |
|-----|-------|
| | +10.7 |
| 20 | 46.5 |
| 15 | 56.1 |
| + 4 | 50.4 |
| 41 | 19.9 |
| 46 | 10.3 |

These levels were used on Rogers' transit at Anquiza, after the breaking of the level of that instrument.

Levels.

Level tried on E pier in transit room

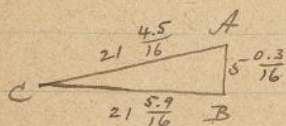
Level borrowed from Engineers' Dept. RR at Anquiza

| 12.20 pm | Send of bubble | Read of bubble | Send | Read | div | div |
|----------|----------------|----------------|------|------|-------------|-------------|
| | 0.25 | 0.6 | 0.85 | 55.2 | | |
| | 3.25 | 16.9 | | | | |
| | 3.85 | 19.6 | 4.15 | 71.0 | 3.60 = 19.0 | 0.189 |
| | | | | | | 3.30 = 15.8 |
| | | | | | | 0.209 |
| | 3.85 | 19.5 | 4.15 | 71.0 | 3.60 = 19.2 | 0.188 |
| | | | | | | 15.8 |
| | 0.25 | 0.3 | 0.85 | 55.2 | | 0.209 |
| | 0.25 | 0.3 | 0.85 | 55.2 | | |
| | | | | | 3.60 = 19.1 | 0.188 |
| | 3.85 | 19.4 | 4.15 | 71.1 | | 15.9 |
| | | | | | | 0.207 |
| | 3.85 | 19.4 | 4.15 | 71.1 | 3.60 = 19.4 | 0.186 |
| | | | | | | 15.8 |
| | 0.25 | 0.0 | 0.85 | 55.3 | | 0.209 |
| 12.30 pm | | | | | 0.1878 | 0.2085 |

| 12.35 pm | 2.00 = | div |
|----------|--------|--------|
| 0.80 | 9.7 | 55.2 |
| | 9.3 | 9.0 |
| 2.80 | 19.0 | 64.2 |
| | | 9.15 |
| | | 0.219 |
| 3.00 | 65.0 | 19.9 |
| | 9.0 | 9.0 |
| 1.00 | 56.0 | 10.9 |
| | | 9.0 |
| | | 9.2 |
| 0.80 | 55.2 | 9.7 |
| | | 9.1 |
| 2.80 | 64.2 | 18.9 |
| | | |
| 3.00 | 65.0 | 19.9 |
| 1.00 | 56.0 | 10.7 |
| | | 9.0 |
| | | 9.2 |
| | | 9.1 |
| | | 0.220 |
| | | 0.2202 |

12.40 pm

Level trier



$$\tan \frac{1}{2} A = \frac{\sqrt{(s-b)(s-c)}}{s(s-a)}$$

| | | | | | |
|-----|---------|------------------------|----------|-----------------|----------|
| b | 21.281 | log (s-b) | 0.40714 | s-a | 0.39190 |
| a | 21.369 | " (s-c) | 1.27452 | | 1.27452 |
| c | 5.019 | " $\frac{1}{s-a}$ | 9.60810 | s-b | 9.59286 |
| 2s | 47.669 | " $\frac{1}{s}$ | 8.62279 | | 8.62279 |
| s | 23.8345 | Σ | 9.91255 | | 9.88207 |
| s-a | 2.4655 | " $\tan \frac{1}{2} A$ | 9.95628 | | 9.94104 |
| s-b | 2.5535 | $\frac{1}{2} A$ | 42 7 14 | $\frac{1}{2} B$ | 41 7 22 |
| s-c | 18.8155 | A | 84 14 28 | B | 82 14 44 |
| | | " sin A | 9.99780 | sin B | 9.99601 |
| | | " t | 1.32799 | a | 1.32978 |
| | | " R | 1.32579 | | 1.32579 |
| | | " 0.0099 | 7.99564 | | |
| | | " tan A | 6.66985 | | |
| | | " " 1" | 4.68557 | | |
| | | " 1 ^{rev} | 1.98428 | | |
| | | " 1 ^{rev} | 96.445 | | |

| | | | | | |
|------------|---------|----------------------|---------|------------------|---------|
| log 0.1878 | 9.27370 | log 1 ^{rev} | 1.25798 | 1 ^{rev} | = 18.11 |
| .2085 | 9.31911 | " | 1.30339 | | 20.11 |
| .2202 | 9.34282 | " | 1.32710 | | 21.24 |

Level of Buff + Berger, thermolite of hypoxa obumata

12.45 pm

1.60 0.6 17.8
0.35 10.0 27.4

1.25 = 1 div. =
9.4 9.6 9.5 0.132

0.40 9.8 27.0
1.65 0.0 17.5

9.8 9.5 9.65 0.130

1.55 1.0 18.3
0.30 10.4 27.9

9.4 9.6 9.5 0.132

0.35 10.0 27.4
1.60 0.6 18.0

9.4 9.4 9.4 0.133

12.50 pm

0.1318 log = 9.11992
1.98428
1.10420
1 div = 12.71
= ^s0.847 adopt.

Level from RR engineers was used with a long bubble stretching between the end graduations, there being no graduations in the middle. The value of 1_{div} differs in different parts of the tube. Using the comparisons for position in which level was used, we have

p. 251 $1_{div} = 21.24$

. 253 20.30

20.88
20.807 = ^s1.387 adopt
1.39

May 14

10.30 am Level from Engineer's Dept RR.

1 div =

2.80 6.9 54.8

2.60 = 12.8 12.1 12.4 0.211

0.20 19.7 66.9

0.10 20.1 67.5

2.70 = 13.1 12.7 12.9 .209

2.80 7.0 54.8

2.80 7.0 54.8

2.70 = 13.2 12.7 13.0 .208

0.10 20.2 67.5

0.10 20.1 67.4

2.70 = 13.0 12.6 12.8 .211

2.80 7.1 54.8

.2098 $\log = 9.32181$
 1.98575
 1.30756
 1 div = 20.303

1.15 pm

2.30 =

2.70 8.9 54.8

10.8 10.5 10.65 .216

0.40 19.7 65.3

0.40 19.8 65.3

10.9 10.5 10.7 .215

2.70 8.9 54.8

2.70 8.9 54.8

10.8 10.5 10.65 .216

0.40 19.7 65.3

0.40 19.8 65.2

10.9 10.4 10.65 .216

2.70 8.9 54.8

.2158 $\log = 9.33405$
 1.98575
 1.31980
 1 div = 20.883

New level for {Draeger} Rogers Transit See p. 140

1.55 am

1 div =

| | | | | | | | |
|-----|------|------|--------|------|------|-------|-------------|
| .90 | 4.4 | 27.7 | | | | | |
| .40 | 62.7 | 85.7 | 0.50 = | 58.3 | 58.0 | 58.15 | 000860 ref. |

| | | | | | | | |
|-----|------|------|--------|------|------|------|--------|
| .40 | 67.0 | 80.0 | 0.50 = | 62.8 | 62.8 | 62.8 | .00796 |
| .90 | 4.2 | 27.2 | | | | | |

| | | | | | | | |
|-----|------|------|--------|------|------|-------|--------|
| .90 | 0.2 | 23.1 | 0.50 = | 60.7 | 60.8 | 60.75 | .00823 |
| .40 | 60.9 | 83.9 | | | | | |

| | | | | | | | |
|-----|------|------|--------|---|------|--|--------|
| .45 | 58.2 | 81.2 | 0.50 = | - | 63.4 | | .00789 |
| .95 | - | 17.8 | | | | | |

| | | | | | | | |
|-----|-----|------|--------|---|------|--|--|
| .85 | 5.3 | 28.3 | 0.35 = | - | 38.9 | | .00900 ref. bubble prob. stuck in tube |
| .50 | - | 67.2 | | | | | |

| | | | | | | | |
|-----|------|------|------|------|------|------|--------|
| .50 | 51.0 | 74.0 | 0.35 | 44.2 | 44.2 | 44.2 | .00792 |
| .85 | 6.8 | 29.8 | | | | | |

100800 log = 7.90309

1.05 pm

1.98575

9.88884

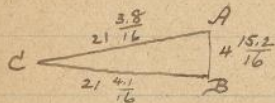
1 div = 0.7742

Adopt 0.0516

See p. 140 for earlier values.

The level had leaked and one end having been opened more alcohol was inserted. Replacing the tube in its brass tube is likely to have given it a different value, as the tube is not itself graduated and its central position is only roughly indicated by an etched line. The level is a poor one - extremely sluggish and with roughness inside, so that the slowly moving bubble may stick in the tube.

Level tries



| | | | | | |
|-----|--------|------------------------|----------|-----------------|---------|
| b | 21.238 | log(s-b) | 0.39515 | s-a | 0.39199 |
| a | 21.256 | " (s-c) | 1.27351 | | 1.27351 |
| c | 4.950 | " $\frac{1}{s-a}$ | 9.60801 | s-b | 9.60827 |
| 2s | 47.444 | " $\frac{1}{s}$ | 8.62485 | | 8.62485 |
| s | 23.722 | Σ | 9.90152 | | 9.89520 |
| s-a | 2.466 | " $\tan \frac{1}{2} A$ | 9.95076 | | 9.94760 |
| s-b | 2.484 | $\frac{1}{2} A$ | 41 45 32 | $\frac{1}{2} B$ | 41 33 7 |
| s-c | 18.772 | A | 83 31 4 | B | 83 6 14 |
| | | " $\cos A$ | 9.99721 | " $\sin B$ | 9.99684 |
| | | " t | 1.32711 | a | 1.32748 |
| | | " R | 1.32432 | | 1.32432 |

| | | |
|-----------------|--------|---------|
| log | 0.0099 | 7.99564 |
| " tan | A | 6.67132 |
| " " | " | 4.68557 |
| " $\frac{1}{r}$ | | 1.98575 |
| $\frac{1}{r}$ | | 96.772 |

Proper Transit

May 13/97

| | | | | | | | |
|-----------------------|---------------------------------|------------------------|---------------------------------|-----------------------|---|---------------------------------|----------|
| el. W | -37.9 +39.6 + .4 + .12 | 35.0 3.9 | +38.9 -37.8 + .3 + .09 | 3.3 34.6 | -37.9 +39.0 +1.1 + .3 + .09 | -38.0 +38.9 + .2 + .06 | 3.3 34.7 |
| 34.9 4-3 | | 3.4 34.4 | | 35.2 3.8 | | 35.1 3.8 | |
| ζ Lennis | +23 56 | γ Lennis | -16 19 | ρ Lennis | +23 44 | δ^2 Chain | |
| 13.7 | 34.3 | 22.9 | 40.1 | 0.8 | 56.305 | | |
| 30.2 | 50.3 | 38.6 | 55.3 | 17.2 | 57.57 | | |
| 46.2 | 6 | 53.5 | 9.9 | 33 | 59.20.5 | | |
| 2.3 | 21.7 | 9 | 25.3 | 49.2 | 0 47.4 | | |
| 18.6 | 37.6 | 24.4 | 40.3 | 5.4 | 47.5 | | |
| 35.1 | 53.5 | 40.2 | 55.4 | 22 | 48.1 | | |
| 6 27 52.3 | 31 10.4 | 37 56.4 | 44 11.3 | 54 39.2 | | | |
| 6 27 2.63 | 30 21.97 | 37 9.29 | 43 25.37 | 53 49.54 | 0 47.67 | | |
| Red. 57.00 | -5.41 - .09 | -4.87 - .08 | -3.75 - .06 | -2.72 - .05 | -1.01 - .02 | +0.13 | |
| 6 26 57.13 | 30 17.02 | 37 5.48 | 43 22.60 | 53 48.51 | 0 47.80 | | |
| 10 11 0.08 | 14 19.99 | 21 8.39 | 27 25.56 | 37 51.47 | 44 49.63 | | |
| 20 15 57.05 | 57.03 | 57.09 | 57.04 | 57.04 | 58.17 | | |
| + .10 - .02 .83 | + .10 - .02 .86 | + .09 - .02 1.04 | + .08 - .02 .91 | + .08 - .02 .84 | + .15 - .12 2.56 | | |
| Δa | Δc | Δz | ΔT | | | | |
| 0 = 57.13 | + .71 | + 1.09 | + .13 | - .02 | + .11 | 57.24 | |
| 57.11 | + .64 | + 1.07 | + .12 | - .02 | + .10 | .21 | |
| 57.16 | .00 | + 1.04 | .00 | - .02 | - .02 | .14 | 57.19 |
| 57.10 | + .45 | + 1.01 | + .08 | - .02 | + .06 | .16 | |
| 57.10 | + .70 | + 1.09 | + .13 | - .02 | + .11 | .21 | |
| 58.20 | -5.16 | + 5.76 | -.93 | - .11 | - 1.04 | .16 | |
| 57.93 | -5.16 | - 5.76 | -.93 | + .11 | - .82 | .11 | |
| 57.22 | + .32 | - 1.00 | + .06 | + .02 | + .08 | .30 | |
| 57.29 | - .11 | - 1.08 | - .02 | + .02 | .00 | 57.29 | 57.14 |
| 56.71 | + .92 | - 1.20 | + .17 | + .02 | + .19 | 56.90 | |
| 56.97 | + .39 | - 1.01 | + .07 | + .02 | + .09 | .06 | |

$$\Delta T = -20 \ 15 \ 57.17$$

$$7 \ 11 \ 27.5 = 10 \ 54 \ 25$$

$$7 \ 34 \ 0 = 13 \ 6 \ 47.8$$

cl

+38.8

-37.9

+1.9

+1.2

+0.6

35.1 37

3.2 34.7

5² Chanp³ +2 31

-22 16

+33 39

+26 36

Lemnis

β Brat

✓ Urs. May

o Leonis

50.2

41.9

55.3

58

57

58.7

14.2

13.7

20.8

15.2

32.3

28.7

0 48.8 47.1

35.8

31.2

50.2

44 ?

2 14.5 46.9

50.6

47.3

8

59

3 38.5 48.0

5

3

25.4

13.4

47.6

5 45

18 20

23 19.1

29 43.3

32 28.4

0 47.40

17 35.44

22 31.06

28 49.81

31 43.60

+ 0.13

+ 2.89

+ 3.70

+ 4.74

+ 5.21

+ .05

+ .06

+ .08

+ .09

0 47.53

17 38.38

22 34.82

28 54.63

31 48.90

44 49.63

1 41.19

6 27.57

12 57.95

15 51.97

57.90

57.19

57.25

56.68

56.93

+ .15

+ .05

+ .06

+ .05

+ .06

- .12

- .02

- .02

- .02

- .02

2.56

.95

1.07

.77

.93

$$0 = 57.11 + \Delta T + .62a + 1.06c$$

56.97

+ .54a

- 1.07c

7 0 0

7 11 27.5

$$0 = 0.27 + 11.5c \quad c = -.02 \text{ adpt.}$$

-20 15 57.17

16 3.88

$$0 = 1.09 - 5.78a + 4.70c \quad a = +.17$$

10 44 2.83

7 27 31.38

$$0.96 - 5.70a' - 4.69c \quad a' = +.18$$

3 26 47.31

1 13.52

$$0 = 0.14 + .08a + 2.13c \quad c = -.07$$

7 17 15.52

3 26 47.31

1 11.64

10 55 32.21

Chm 1131

16 3.88

54 25

16 2.93

1 7.21

7 34 0

Sid. Chel

7 50 3.93

May 14 9.73

13 6 47.8

Δ 2.52

5 16 43.9

Chm 4026

7 31 22.5 = 11 18 20

34 124 = 13 7 0

35 0 7 47.6

10 19 11 24 30

34.8 2.9 +27.7 -36.7 2.4 34.3

2.7 34.3 +.2 +.35 35.0 31

-31 17 -8 15

May 14/97

3897phae.proj.11700
-38.1
-36.6
-1.4
-12
3.3 34.7 34.0 2.6
62 -0.08 +7.54

52 Cham X Leonis β Crat v. Um. Maj. δ Leonis ξ Hydre ν Leonis

| | | | | | | | | | | |
|---|----|------|------|------|------|------|--------------|------|------|---|
| 6 | 52 | 28.5 | 54.8 | 43.5 | 56.7 | 59.6 | - | 33.7 | 48.3 | ? |
| | 53 | 58.5 | 10.6 | 0.6 | 15.7 | 15.2 | - | 33.6 | 4 | ! |
| | 55 | 25.5 | 25.7 | 16.7 | 33.6 | 30.5 | 49.6 | 32.5 | 18.9 | |
| | 56 | 51 | 40.8 | 32.8 | 51.5 | 45.6 | 49.4 | 49.8 | 33.7 | |
| | 58 | 16.5 | 55.8 | 48.7 | 9.3 | 0.4 | 49.5 | 7.3 | 48.7 | |
| | 59 | 40.5 | 10.5 | 4.5 | 26.7 | 15.2 | 49.7 49.6 | 24.3 | 3.5 | |

1 65 12 25.6 19 20.7 25 44.7 28 30.1 40 41.8 44 18.2

6 56 49.57 7 11 40.54 18 32.50 24 51.17 27 45.23 39 49.56 43 33.61

Red. 57.30 -5.45 -3.01 -1.88 -0.85 -0.37 +1.62 +2.23
-0.06 -0.03 -0.02 -0.01 -0.00 +.02 +.02

6 56 44.06 11 37.50 18 30.60 24 50.31 27 44.86 39 51.20 43 35.86

10 44 49.53 59 44.57 6 37.56 12 57.94 15 51.96 27 58.30 31 42.91

20 11 54.53 52.93 53.04 52.37 52.90 52.90 52.95
-0.20 -0.07 -0.02 +0.02 +0.06 +0.09 +0.10
-0.12 -0.02 -0.02 -0.02 -0.02 -0.02 -0.02

2.56 .92 1.07 $A_{\alpha}^{a=+18} C_{\alpha}^{a=+100} \Sigma$.93 1.13 .96
 $A_{\alpha}^{a=+18} \Sigma \Delta T$

0 = 54.21 + ΔT -5.16a -5.76c -0.93 -0.46 -1.39 52.82

52.84 +.42 -1.01 +.08 -.08 .00 .84

53.00 -.11 -1.08 -.02 -.09 -.11 .89

52.87 +.92 -1.20 +.17 -.10 +.07 .44 52.90

52.94 +.39 -1.01 +.07 -.08 -.01 .93

52.97 -.30 -1.17 -.05 -.09 -.14 52.83

53.03 +.28 -1.00 +.05 -.08 -.03 53.00

57.37 -4.55³ +5.13² -4.55 +.41 -4.14 53.23

52.85 +.01 +1.04 +.01 +.08 +.09 52.94 .00 +.08 52.93

53.24 -.12 +1.08 -.12 +.09 -.03 53.21 -.02 +.07 53.31

? 52.59 +.27 +1.00 +.27 +.08 +.35 52.94 +.05 +.13 52.72

52.28 +.79 +1.14 +.79 +.09 +.88 53.16¹ +.14 +.23 .51

52.78 +.35 +1.00 +.35 +.08 +.43 53.21 +.06 +.14 52.92

52.62 +.48 +1.02 +.48 +.08 +.56 53.18 +.09 +.17 52.79

53.10 52.93

1897phae.proj.11700

2d companion

9 14 55.5
16 6.74
9 31 2.24
1 33.85
3 30 43.87
13 3 19.92
1 9.92 ΔT lex clock

14 45 0 = 9 12 12.5
9 14 55.5 = 13 2 10
14 53 32 = 13 8 0
53

259

dw

38.5
16.2
+6
+18
35.2 3.3 35.2 3.1
22 34.0 1.9 33.9
-75 44
-15 57
+38.3
-35.8
+.6
4.18

+37.3
-36.7
34.6 2.7 -36.3
+1.0
22 34.1 +.07
+37.5 2.3 34.3
+.2
+0.6 34.8 2.7

Beham. 8 Corri 8 Corri y Ving 31 Come 8 Ving 8 Ving
-22 50 -0 53 +28 6 +3 57 +11 31

| | | | | | | |
|---------|-------|---------|---------|---------|--------|--------|
| 20 21 | 30.1 | 54.2 | 24.2 | 31.2 | 20.6 | 56.6 |
| 21 38.5 | 45.7 | 10.2 | 39.2 | 47.9 | 35.4 | 11.8 |
| 22 52.5 | 0.5 | 26.2 | 53.7 | 4.5 | 49.9 | 26.5 |
| 24 9 | 16.3 | 42.2 | 8.5 | 21.3 | 4.8 | 41.8 |
| 25 26 | 31.2 | 58.5 | 23.5 | 38.4 | 19.7 | 57.2 |
| 26 42.5 | 47.3 | 14.5 | 38.5 | 55 | 34.7 | 12.3 |
| 28 3 | 37.37 | 41.31.8 | 58.53.8 | 59 13.1 | 2 50.5 | 9 28.2 |

8 24 10.36 36 16.40 40 42.51 58 8.77 58 21.63 2 5.09 8 42.06

+8.90 +10.89 +11.62 +12.84
+.10 +.12 +.13 +.14
+14.52 +15.13 +16.21
+.16 +.17 +.18

24 19.36 36 27.41 40 54.26 48 21.75 58 36.31 2 20.39 8 58.45

12 22.30 24 34.73 29 1.12 36 29.23 46 44.07 50 27.65 57 5.86

57.06 52.68 53.14 52.52 52.24 52.74 52.59
+.43 +.19 +.12 +.09 +.06 +.06 +.05
-.12 -.02 -.02 -.02 -.02 -.02 -.02

2.38 1.04 1.08 .96 .81 .94 .90

0 = 52.72 + ΔT + .58 a - 1.07 c c = +.10 7 30 9 7 31 22.5

52.56 + ΔT + .54 a + 1.05 c -20 11 53.00 52.958 16 6.56

0 = .16 - 2.12 c c = +.08 11 18 7.00 7.012 47 29.06

0 = 1.49 - 5.74 a - 5.69 c #3 30 43.87 1 14.36

= 4.81 - 5.09 a + 4.08 c 7 47 23.13 142 3 30 43.87

+5.74 a = 1.01 a = +.18 1 16.57 .570 11 4 37.30

5.09 a' = 5.14 a' = +1.00 ΔT + 16 6.56 6.548 11 18 20

Ving A < 40 52.89 52.92 53.00 52.94 53.12 52.94 53.21

Chm 1131 1 9.73

7 34 12.4 2d companion

7 50 18.96 979 9 12 12.5

13 7 0 16 6.74

ΔT - 5 16 41.04 41.05 9 28 19.24

Chm 4026 -5 16 40.76

-20 11 53.00 adolt

260

$$744 \ 53 = 13 \ 17 \ 40$$

$$45 \ 25 \quad 18 \ 11.9$$

$$46 \ 18.5 = 11 \ 37 \ 15$$

$$124 \ 50 = 11 \ 40 \ 0$$

clw

May 15/97

$$34.8 \ 2.1 \ -36.9 \ -37.4$$

$$2.2 \ 35.1 \ +37.3$$

$$+37.5 \ -36.5 \ 35.3 \ 2.2$$

$$2.3 \ 35.1 \ -0.3$$

$$35.1 \ 2.2 \ 0$$

$$+0.7 \ 1.7 \ 34.8$$

X Lewis β Gattis v Urs Maj o Lewis E Hydree v Lewis β King

$$57 \ 46 \ 59.3 \ 1.9 \ 59.4 \ 50.5 \ 27.7$$

$$12.2 \ 2.3 \ 17.3 \ 17 \ 16.9 \ 5.5 \ 42.7$$

$$26.6 \ 17.6 \ 34.6 \ 31.4 \ 33.6 \ 19.8 \ 57.3$$

$$41.8 \ 33.8 \ 52.4 \ 46.5 \ 51.2 \ 34.8 \ 12$$

$$57 \ 50 \ 10.3 \ 1.3 \ 8.7 \ 49.8 \ 26.7$$

$$12 \ 6.2 \ 28.3 \ 16.5 \ 26.3 \ 4.8 \ 41.7$$

$$8 \ 27.6 \ 15 \ 23.2 \ 21 \ 37.2 \ 24 \ 32.3 \ 36 \ 44.6 \ 40 \ 20.4 \ 53 \ 57.7$$

$$7 \ 7 \ 42.03 \ 14 \ 34.16 \ 20 \ 52.77 \ 23 \ 46.70 \ 35 \ 51.53 \ 39 \ 35.09 \ 53 \ 12.26$$

$$Red. 5 \ 7.45 - 6.13 \ -5.00 \ -3.96 \ -3.49 \ -1.50 \ -0.89 \ +1.35$$

$$7 \ -.07 \ -.05 \ -.04 \ -.04 \ -.02 \ -.01 \ +.01$$

$$10 \ 7 \ 35.83 \ 14 \ 29.11 \ 20 \ 48.77 \ 23 \ 43.17 \ 35 \ 50.01 \ 39 \ 34.19 \ 53 \ 18.62$$

$$10 \ 59 \ 44.56 \ 6 \ 37.55 \ 12 \ 57.93 \ 15 \ 51.95 \ 27 \ 58.32 \ 31 \ 42.90 \ 45 \ 22.31$$

$$20 \ 7 \ 51.27 \ 51.56 \ 50.84 \ 51.22 \ 51.69 \ 51.29 \ 51.31$$

$$-.03 \ -.03 \ -.02 \ -.01 \ 0 \ +.02 \ +.07$$

$$-.02 \ -.02 \ -.02 \ -.02 \ -.02 \ -.02 \ -.02$$

$$.92 \ 1.07 \ .77 \ .93 \ 1.13 \ .96 \ .95$$

$$0 = 51.22 \ +\Delta T \ +.42a \ +1.01c \ +.38 \ -.20 \ +.18 \ 51.40 \ C_0 \ 2$$

$$51.51 \ -.11 \ +1.08 \ -.10 \ -.22 \ -.32 \ .19 \ -.12 \ -.22$$

$$50.80 \ +.92 \ +1.20 \ +.83 \ -.24 \ +.59 \ .39 \ -.11 \ +.25$$

$$51.19 \ +.39 \ +1.01 \ +.35 \ -.20 \ +.15 \ .84 \ 51.34 \ -.13 \ -.40$$

$$51.67 \ -.30 \ +1.17 \ -.27 \ -.23 \ -.50 \ .17 \ -.11 \ +.14$$

$$51.29 \ +.28 \ +1.00 \ +.25 \ -.20 \ +.05 \ .34 \ -.11 \ +.18$$

$$51.36 \ +.32 \ +1.00 \ +.29 \ -.20 \ +.09 \ .45$$

$$51.33 \ +.42 \ +1.01 \ +.38 \ -.20 \ +.18 \ .51$$

$$51.15 \ +.44 \ +1.01 \ +.40 \ -.20 \ +.20 \ .35$$

$$56.54 \ -4.55 \ +5.13 \ -4.10 \ -1.03 \ -5.13 \ .41$$

$$54.52 \ -4.55 \ -5.13 \ -3.96 \ +1.03 \ -2.93 \ .69$$

$$51.31 \ +.01 \ -1.04 \ +.01 \ +.21 \ +.22 \ .53 \ +.11 \ +.12$$

$$51.64 \ -.12 \ -1.08 \ -.10 \ +.22 \ +.17 \ .76 \ +.12 \ +.02$$

$$51.21 \ +.27 \ -1.06 \ +.23 \ +.20 \ +.44 \ .65 \ +.14 \ +.24$$

$$51.59 \ +.79 \ -1.14 \ +.69 \ +.23 \ +.92 \ .51 \ 51.62$$

$$51.23 \ +.35 \ -1.00 \ +.30 \ +.20 \ +.50 \ 51.73 \ +.11 \ +.41$$

$$52.39 \ -2.50 \ -3.07 \ -2.18 \ +.61 \ -1.57 \ 50.82 \ +.11 \ +.20$$

$$51.22 \ +.20 \ -1.00 \ +.17 \ +.20 \ +.37 \ 51.59$$

$$50.55 \ +.80 \ -1.14 \ +.70 \ +.23 \ +0.93 \ .48$$

$$51.55 \ +.12 \ -1.08 \ -.10 \ +.22 \ +.12 \ .67 \ 51.48 \ +.12 \ +.02$$

$$8 \ 46 \ 85 = 12 \ 38 \ 15$$

$$8 \ 50 \ 23.1 \ 14 \ 23 \ 10$$

$$50 \ 55 \ 41.8$$

cl e

+38.3

-36.5

+45

+13

35.7 2.4

2.1 35.2

-37.3

+37.5

+0.1

35.3 2.3

+37.6

-37.6

0

2.3 35.3

+7.11
Ti Ving+9.18
o Ving β cham β cham δ Corri β Corri γ Ving β Comae δ Ving

41.4

2.4

162.45

55.1

25.2

31.8

21.3

56.7

17.7

17 40.5

12

40.9

49.6

37

11.2

32.3

54.5

28.3

56

6.5

52.1

26.2

47.5

20 13.3

18.4 18.1 44.3

11

23.6

7.2

41.2

2.5

12.3

21 29

11.0 33.8 18.0

0.6

25.7

40.2

22

56.3

17.8

12.5

22 43

11.2 49.2 18.4

16.3

40.3

56.8

36.3

412.2 8 33.7

23 59.5

33 4.7

37 32.7

44 55.2

55 13.5

58 51.4

$$8 \ 3 \ 26.46 \ 7 \ 47.70 \ 20 \ 12.70 \ 20 \ 10.97 \ 32 \ 18.20 \ 36 \ 44.19 \ 44 \ 10.61 \ 54 \ 22.14 \ 58 \ 6.76$$

+3.03

+.03

+3.74

+.04

+5.78

+.10

+5.78

.10

7.77

+.09

+8.50

+.09

+9.72

+.11

+11.40

+.13

+12.01

+.18

3 29.52

7 51.48

20 18.58

20 16.85

32 26.06

36 52.78

44 20.44

54 34.67

58 18.90

55 38.25

0 0.40

12 22.23

12 22.23

24 34.73

29 1.12

36 29.21

46 44.06

50 27.65

51.27

+.08

-.02

51.08

+.09

-.02

56.35

+.31

-.12

54.62

+.02

-.12

51.33

0

-.02

51.66

0

-.02

51.23

0

-.02

50.61

0

-.02

51.25

0

-.02

.92

.91

2.38

2.38

1.04

1.08

.96

.81

.94

$$0 = 51.18 + \Delta T + .48a + 1.03c$$

Using $A < 40$ $c = -.11$

50.96

+.48a

-1.03c

0 =

0.23

+2.10c

c =

-.11

51.29

.44

=

2.02

+10.26c

c =

-.20

.27

51.40

.43

0 =

5.45

-5.01a

+4.10c

.54

3.56

-5.03a

-4.06c

.43

.68

.56

51.56

1.43

-2.98a

-2.06c

.64

.50

.57

a =

+.90

a' =

+.87

a' =

+.61

$$\Delta T = -20.7 \ 51.48$$

[illegible]

Class 1131

1 9.73 May 14
2.51 Rate

Second companions.

| | | | | | | | |
|----|----|-------|----|----|-------|----|-------|
| 8 | 47 | 8.5 | 8 | 50 | 23.1 | 50 | 55 |
| | 16 | 9.15 | | 16 | 9.15 | 16 | 9.15 |
| 9 | 3 | 17.65 | 9 | 6 | 32.25 | 7 | 4.15 |
| | 1 | 29.25 | 14 | 23 | 10 | 23 | 41.8 |
| 3 | 34 | 40.43 | -5 | 16 | 37.75 | | 37.65 |
| 12 | 39 | 27.33 | | | | | 37.70 |
| | 38 | 15 | | | | | |
| | 1 | 12.33 | | | | | |

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cl: ϵ

clw

| | | | | | | | | | | | |
|------|------|-------|-------|------|-----|------|------|-------|-------|------|------|
| 2.1 | 35.8 | -37.9 | -38.2 | 35.8 | 2.4 | 35.8 | 2.4 | +38.2 | +37.1 | 35.2 | 2.1 |
| | | +37.0 | +36.4 | | | | | -36.9 | -36.8 | | |
| 35.3 | 1.7 | - .2 | - .45 | 35.0 | 1.4 | 1.8 | 35.1 | + .3 | + .1 | 1.8 | 35.0 |
| | | - .06 | - .13 | | | | | + .09 | + .03 | | |

| π Virg | σ Virg | ϵ Corvi | β Cham. | β Cham. | δ Corvi | β Corvi |
|------------|---------------|------------------|---------------|---------------|----------------|---------------|
| 46.2 | | 55.2 | 4 23.5 | 16.4 | 37.2 | 1 |
| 2 | | 12.3 | 5 43.5 | 15.3 | 52.6 | 17.2 |
| 17.2 | | 28.5 | 7 1 | 15.9 | 7.5 | 33 |
| 32.1 | | 44.7 | | 8 16 | 17.5 | 23.2 |
| 47.1 | 8.3 | 52.9 | 0.6 | 9 32 | 17.1 | 38.7 |
| 1.6 | 23.3 | 53.4 | 16.2 | 10 49 | 17.2 | 54.3 |
| 75.2 | 16.8 | 56 38.3 | 53.3 | 12 9.5 | 16.6 | 21 10.7 |
| 75.1 | 31.86 | 57 53.20 | 0 44.27 | 8 15.87 | 8 17.10 | 20 23.46 |
| Red 58.20 | 4.68 | 3.95 | 16 | -1.93 | -1.93 | +0.6 |
| .05 | | -3.63 | -3.00 | -1.93 | -1.93 | +0.79 |
| 7 51 | 27.13 | 57 49.53 | 0 41.24 | 8 13.92 | 8 15.15 | 20 23.52 |
| 11 55 | 38.23 | 0 0.37 | 4 52.07 | 12 22.03 | 12 22.03 | 24 34.71 |
| 19 55 | 48.90 | 48.84 | 49.01 | 51.89 | 53.12 | 48.81 |
| -0.5 | -0.8 | -0.11 | -0.31 | +2.1 | +0.7 | +0.3 |
| -0.2 | -0.2 | -0.2 | -0.2 | -0.12 | -0.2 | -0.2 |
| .92 | .91 | 1.07 | 2.38 | 2.38 | 1.04 | 1.08 |

A_a C_a Σ ΔT

| | | | | | | | |
|-----------|--------------|--------|--------|-------|-------|-------|-------|
| 0 = 48.83 | + ΔT | + .42a | -1.01c | + .29 | + .11 | + .40 | 49.23 |
| 48.74 | | + .44 | -1.01 | + .30 | + .11 | + .41 | 49.15 |
| 48.88 | | - .11 | -1.08 | - .07 | + .12 | + .05 | 48.93 |
| 51.46 | | -4.55 | -5.13 | -3.09 | + .56 | -2.53 | 48.93 |
| 53.21 | | -4.55 | +5.13 | -3.46 | - .56 | -4.02 | 49.19 |
| 48.86 | | + .01 | +1.04 | + .01 | - .11 | - .10 | 48.76 |
| 49.12 | | - .12 | +1.08 | - .09 | - .12 | - .21 | 48.91 |
| 48.37 | | + .79 | +1.14 | + .60 | - .13 | + .47 | 48.84 |
| 48.92 | | + .35 | +1.00 | + .27 | - .11 | + .16 | 49.08 |

$$\Delta T = -19 \text{ } 55 \text{ } 49.00$$

$$8 \ 15 \ 0 = 13 \ 47 \ 44.25$$

$$8 \ 32 \ 54.5 = 12 \ 35 \ 50$$

$$2.1 \ 1.6 \ 34.8 \begin{matrix} -36.4 \\ +38.0 \\ +.4 \end{matrix} \ 35.5 \ 2.2 \ \begin{matrix} +37.7 \\ -35.7 \\ +.5 \end{matrix}$$

$$35.7 \ 2.3 \ +.12 \ 1.2 \ 34.5 \ \begin{matrix} +.5 \\ +.15 \end{matrix}$$

31. Comae 8 brig.

$$38.1 \ 27.3$$

$$54.9 \ 42.3$$

$$311.3 \ 56.9$$

$$28.3 \ 11.8$$

$$45.3 \ 26.7$$

$$2.3 \ 41.9$$

$$43 \ 20 \ 46 \ 57.7$$

$$42 \ 28.60 \ 46 \ 12.09$$

$$\begin{matrix} +3.69 & +4.30 \\ +.04 & +.05 \end{matrix}$$

$$42 \ 32.33 \ 46 \ 16.44$$

$$46 \ 44.04 \ 50 \ 27.64$$

$$48.29 \ 48.80$$

$$\begin{matrix} +10 & +.14 \\ -.02 & -.02 \end{matrix}$$

$$.81 \ .94$$

$$8 \ 20 \ 0 \ 8 \ 15 \ 0 \ 8 \ 32 \ 54.5$$

$$-19 \ 55 \ 49.00 \ +16 \ 16.09 \ +16 \ 16.10$$

$$12 \ 26 \ 11.00 \ 8 \ 31 \ 16.09 \ 8 \ 49 \ 10.60$$

$$3 \ 46 \ 30.10 \ 13 \ 47 \ 44.25 \ 1 \ 26.93$$

$$8 \ 37 \ 40.90 \ -5 \ 16 \ 28.16 \ 3 \ 46 \ 30.10$$

$$1 \ 24.81 \ 12 \ 37 \ 7.63$$

$$8 \ 36 \ 16.09 \ 35 \ 50$$

$$+16 \ 16.09 \ 8.20 \text{ fm} \ 1 \ 17.63$$

$$9.05 \ 7.45 \text{ fm} \ 15 \text{ vt}$$

$$7.04 \ \Delta$$

$$2.35 \text{ daily} = .10 \text{ per hour}$$

$$+16 \ 15.69 \ \therefore \text{at } 4.20 \text{ fm.}$$

$$0 = 48.78 + \Delta T + .43a - 1.01c \quad 92 = -.04$$

$$48.64 \quad +.57a + 1.07c \quad -.11$$

$$0 = 0.14 - .14a - 2.08c \quad c = +.06 \quad -.11$$

$$0 = 1.75 + 10.26c \quad c = -.17 \quad \text{adft.}$$

$$0 = 2.68 - 4.98a - 4.12c \quad 4.98a = 3.38$$

$$4.57 - 5.12a' + 4.06c \quad 5.12a' = 4.88$$

$$a = +.68$$

$$a' = +.76$$

Points in vicinity of Observatory, whose distances can be determined by triangulation using as base line distance obly to a house = AA

Angle A

Adopt.

| | | | | |
|-----------------------|------------------------------------|-----------|-------------------------------------|----------|
| Jesus (baths) | 219 17 10 - 98 57 5 = 120 20 5 S | 120 20 5 | 8 | 120 20 5 |
| Paucarpata | 350 49 30 111 6 20 = 120 16 50 | 120 16 50 | u | u |
| | | | u in trees prob. a diff. point Ref. | |
| Paucarpata Church | 196 55 40 - 98 57 5 = 97 58 35 S | 97 58 35 | S | 97 58 40 |
| | 31 39 20 - 293 34 10 = 97 58 45 u | 97 58 45 | u | |
| | | 40 35 | | |
| Characato " | 196 58 50 - 98 57 5 = 98 1 45 S | 98 1 45 | S | 98 1 55 |
| | 31 42 40 - 293 40 35 = 98 2 5 u | 98 2 5 | u | |
| San Antonio " | 193 53 25 - 98 57 5 = 94 56 20 S | 94 56 20 | S | 94 56 30 |
| | 27 21 0 - 293 40 35 = 83 40 25 u | 83 40 25 | u | |
| | -16 9 40 + 111 6 20 = 94 56 40 u | 94 56 40 | u | |
| Santa Rosa " | → 184 40 40 - 98 57 5 = 85 47 35 S | 85 47 35 | S | 83 40 22 |
| Santa Theresa | -27 26 0 + 111 6 20 = 83 40 20 u | 83 40 20 | u | |
| | -29 31 55 + 113 12 15 = 83 40 20 u | 83 40 20 | u | |
| Santa Domingo " | 175 49 50 - 98 57 5 = 76 52 45 S | 76 52 45 | S | 76 53 0 |
| | 10 14 40 - 293 40 35 = 76 34 5 u | 76 34 5 | u | |
| | -36 19 0 + 113 12 15 = 76 53 15 u | 76 53 15 | u | |
| Carmen Alto " | 174 44 35 - 98 57 5 = 75 47 30 S | 75 47 30 | S | 75 47 32 |
| | 9 28 0 - 293 40 35 = 75 47 25 u | 75 47 25 | u | |
| | -35 18 40 + 111 6 20 = 75 47 40 u | 75 47 40 | u | |
| Pantheon | 172 27 15 - 98 57 5 = 73 30 10 S | 73 30 10 | S | 73 30 15 |
| | -37 36 0 + 111 6 20 = 73 30 20 u | 73 30 20 | u | |
| Campania " | 172 7 25 - 98 57 5 = 73 10 20 S | 73 10 20 | S | 73 10 18 |
| | 6 52 0 - 293 40 35 = 73 11 25 u | 73 11 25 | u | |
| | -40 2 0 + 113 12 15 = 73 10 15 u | 73 10 15 | u | |
| Cathedral E | 172 20 45 - 98 57 5 = 73 23 40 S | 73 23 40 | S | 73 23 50 |
| | -37 42 20 + 111 6 20 = 73 24 0 u | 73 24 0 | u | |
| " W | 171 30 30 - 98 57 5 = 72 33 25 S | 72 33 25 | S | 72 33 12 |
| | 6 18 20 - 293 40 35 = 72 34 45 u | 72 34 45 | u | |
| | -40 39 15 + 113 12 15 = 72 33 0 u | 72 33 0 | u | |

| Angle α | | Adopt | | Angle at object 0 |
|-------------------|-------------------------------------|---------------------------|--------------------------------|--|
| -150 24 25 | + 206 17 36 | = 55 53 11 S | 55 53 32 | ⁰³ 14 46 23 |
| 55 52 40 | - 359 58 48 | = 55 53 52 U | | |
| -129 14 15 | + 206 17 36 | = 77 3 21 S | 77 3 34 | 4 57 46 |
| 77 2 20 | - 359 58 48 | = 77 3 47 U | | |
| 2 50 | | | | |
| -127 31 0 | + 206 17 36 | = 78 46 36 S | 78 46 54 | 3 11 11 |
| 78 45 40 | - 359 58 48 | = 78 47 12 U | | |
| 46 0 | | | | |
| -133 57 30 | + 206 17 36 | = 72 20 6 S | 72 20 29 | 12 43 1 |
| 72 19 40 | - 359 58 48 | = 72 20 52 U | | |
| Therisea | | | | |
| -123 3 35 | + 206 17 36 | = 83 14 1 S | 83 14 6 | 13 5 32 |
| 83 13 0 | - 359 58 48 | = 83 14 12 U | | |
| -114 51 20 | + 206 17 36 | = 91 26 16 S | 91 26 24 | 11 40 36 |
| 91 25 20 | - 359 58 48 | = 91 26 32 U | | 79 55 12 |
| -316 6 55? | + 340 21 4 | = 24 14 9 S | in true window assumed central | |
| -182 0 20 | + 206 17 36 | = 24 17 16 U S | 24 17 16 | ^(ref.) 79 55 12 |
| -239 28 52 | + 340 ²¹ 50 4 | | | |
| 100 51 | | = 100 52 12 S | 100 52 12 | 5 37 33 |
| 100 51 0 | - 359 58 48 | = 100 52 12 U | | |
| -245 30 40 | + 340 21 4 | = 94 50 24 S | | |
| -111 26 55 | + 206 17 36 | = 94 50 41 S | 94 50 46 | 11 58 56 |
| 94 50 0 | - 359 58 48 | = 94 51 12 U | | |
| -112 17 50 | + 206 17 36 | = 93 59 46 S | 93 59 59 | 12 36 11 |
| 93 59 0 | - 359 58 48 | = 94 0 12 U | | |
| -245 34 30 | + 340 21 4 | = 94 46 34 S | 94 46 28 | 12 40 20 |
| 94 45 10 | - 359 58 48 | = 94 46 22 U | | |

A

Adopt

| | | | | | |
|-----------------------------|----------------|--|---------------------------------------|----------|-----------|
| White stone on hill | 170 4 30 | -98 ^{54 25} 56 45 | = 71 ¹⁰ 8 45 | 71 10 5 | -2 |
| RR Merced church | -41 30 0 + 111 | 6 20 | = 69 36 20 | 69 36 20 | -10 9 |
| Yanaguara .. | 157 34 5 | -98 ^{57 5} 56 45 | = 58 37 0 | 58 37 0 | -10 10 |
| | 352 17 35 | -293 40 35 | = 58 37 0 | | |
| Trigo .. | 149 35 15 | -98 57 5 | = 50 38 10 | 50 38 12 | -8 12 |
| | 344 18 40 | -293 40 35 | = 50 38 5 | | |
| | -60 28 0 | + 111 6 20 | = 50 38 20 | | |
| Sachaca .. | 142 56 5 | -98 57 5 | = 43 59 0 | 43 59 0 | -7 13 |
| | 337 39 35 | -293 40 35 | = 43 59 0 | | |
| Carmia .. | 136 39 35 | -98 57 5 | = 37 42 30 | 37 42 18 | -8 11 |
| | 331 22 40 | -293 40 35 | = 37 42 5 | | |

2

Adopt

0

269

$$-237 \ 0 \ 35 \ +340 \ 21 \ 4 \ = \ 103 \ 20 \ 29 \quad 103 \ 20 \ 29 \quad 5 \ 29 \ 26$$

$$\begin{array}{r} -107 \ 7 \ 40 \ + \ 206 \ 17 \ 36 \\ 99 \ 9 \ 0 \ - \ 340 \ 21 \ 4 \ = \ 99 \ 9 \ 56 \\ 99 \ 9 \ 0 \ - \ 359 \ 58 \ 48 \ = \ 99 \ 10 \ 12 \end{array} \quad 99 \ 10 \ 4 \quad 11 \ 13 \ 36$$

$$\begin{array}{r} -103 \ 38 \ 30 \ + \ 206 \ 17 \ 36 \ = \ 102 \ 39 \ 6 \\ 102 \ 38 \ 0 \ - \ 359 \ 58 \ 48 \ = \ 102 \ 39 \ 12 \end{array} \quad 102 \ 39 \ 9 \quad 18 \ 43 \ 51$$

$$\begin{array}{r} -81 \ 25 \ 0 \ ? \ + \ 206 \ 17 \ 36 \ = \ 124 \ 52 \ 36 \\ 124 \ 52 \ 0 \ - \ 359 \ 58 \ 48 \ = \ 124 \ 53 \ 12 \end{array} \quad 124 \ 52 \ 54 \quad 4 \ 28 \ 54$$

$$\begin{array}{r} -74 \ 39 \ 20 \ + \ 206 \ 17 \ 36 \ = \ 131 \ 38 \ 16 \\ 131 \ 37 \ 20 \ - \ 359 \ 58 \ 48 \ = \ 131 \ 38 \ 32 \end{array} \quad 131 \ 38 \ 24 \quad 4 \ 22 \ 36$$

$$\begin{array}{r} -87 \ 3 \ 45 \ + \ 206 \ 17 \ 36 \ = \ 119 \ 13 \ 51 \\ 119 \ 13 \ 30 \ - \ 359 \ 58 \ 48 \ = \ 119 \ 14 \ 42 \end{array} \quad 119 \ 14 \ 16 \quad 23 \ 3 \ 26$$

Distances from Observatory

$$D : AQ :: \sin Q : \sin O$$

$$D = \frac{AQ \sin Q}{\sin O}$$

$$AQ = 2304.4$$

$$\log \sin Q \quad \log \sin O \quad \Delta \quad \log D \quad D$$

$$\log AQ \quad 3.362558$$

ft

| | | | | | |
|-----------------------------------|----------|----------|----------|-----------------------|-------|
| Jesus baths | 9.918022 | 8.818251 | 1.099771 | 4.462329 | 28995 |
| Paucarpata Ch. | 9.988828 | 8.937059 | 1.051769 | 4.414327 | 25961 |
| Characato " | 9.991622 | 8.744952 | 1.246670 | 4.6092 ² 8 | 40666 |
| San Antonio " | 9.979039 | 9.342689 | 0.636350 | 3.998908 | 9975 |
| Santa Theresa " | 9.996966 | 9.355105 | 0.641861 | 4.004419 | 10102 |
| Santa Domingo " | 9.999863 | 9.306186 | 0.693677 | 4.056235 | 11382 |
| Carmen Alto " | 9.614180 | 9.993244 | 9.620936 | 7.983494 | 963 |
| Pantheon | 9.992137 | 8.991366 | 1.000771 | 4.363329 | 23085 |
| Compañia | 9.998445 | 9.317244 | 0.681201 | 4.043759 | 11060 |
| Cathedral E | 9.998941 | 9.338845 | 0.660096 | 4.022654 | 10535 |
| " W | 9.998490 | 9.341184 | 0.657306 | 4.019864 | 10468 |
| White stone | 9.988118 | 8.980828 | 1.007290 | 4.369848 | 23434 |
| Merced ch. | 9.994434 | 9.289345 | 0.705089 | 4.067647 | 11685 |
| Yanaguera ^{RR station} " | 9.989324 | 9.506671 | 0.482653 | 3.845211 | 7002 |
| Tringo " | 9.913991 | 8.892874 | 1.021117 | 4.383675 | 24192 |
| Sachaca " | 9.873515 | 8.882598 | 0.990917 | 4.353475 | 22567 |
| Caima " | 9.940815 | 9.592898 | 0.347917 | 3.710475 | 5134 |

Densities

B: Bearings

Results

A - Acaspin

| Ag. rel. to Carmichael Spire | | | | Distance miles | Azimuth |
|------------------------------|------|-----------------|----|----------------|--|
| 5 | 44 | ³ 42 | 33 | 5.49 | ⁰ 49 ¹ 42.0 S 39 23.1 E |
| 1 | 22 | 11 | 8 | 4.92 | 27 20.6 17 1.7 |
| 6 | 22 | 14 | 23 | 7.70 | 27 23.8 17 5.0 |
| 5 | 19 | 8 | 58 | 1.89 | 24 18.4 13 59.4 |
| 2 | 7 | 52 | 50 | 1.91 | 13 2.3 2 43.4 E |
| 2 | 1 | 5 | 28 | 2.16 | 6 14.9 E 4 4.0 to 5 |
| 3 | — | | | 0.18 | 5 9.4 E |
| 5 | - 2 | 17 | 17 | 4.37 | 7 52.2 E |
| 10 | 2 | 37 | 14 | 2.09 | 2 32.2 E |
| 5 | 2 | 23 | 42 | 2.00 | 2 45.7 E |
| 8 | 3 | 14 | 20 | 1.98 | 1 55.6 E |
| 34 | 4 | 37 ² | 37 | 4.44 | S 0 32.0 E |
| 5 | 6 | 11 | 12 | 2.21 | S 1 1.8 W |
| 2 | 17 | 10 | 32 | 1.33 | 12 1.1 |
| 92 | 25 | 9 | 20 | 4.58 | 19 59.9 |
| 67 | 31 | 48 | 32 | 4.27 | 26 39.1 |
| 34 | - 38 | 5 | 14 | 0.97 | S 32 55.8 W |

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$$7 \frac{5}{24} 8.5 = 11 \quad 23 \quad 40$$

W
+37.5
-36.7
+.2
4.8 2.7 +.06
2.4 34.3
2.8 34.6
34.8 2.7 .00

E
-37.4
+37.5
+36.4
-37.3
-.2
-0.6
d.e
34.3 2.1
2.5 34.8

δ^2 Cham. γ Lennis β Crat v Urs. α Lennis ϵ Hydrae v Lennis

| | | | | | | |
|---------|---------------|------|------|------|------|----------|
| - | 8.6 | 57.3 | 10.9 | 13.3 | - | 1.7 |
| - | 23.7 | 13.7 | 24.8 | 28.4 | 28.3 | 2.9 17.3 |
| - | 25 38.2 | 29.2 | 46.2 | 43.2 | 45.2 | 3.0 32.3 |
| 6-26-28 | 3.9 53.3 | 45.3 | 4.2 | 5.8 | 2.5 | 2.8 47.3 |
| 27 | 54 3.5 8.3 | 1.3 | 22.2 | 13.1 | 20.2 | 3.1 2.3 |
| 29 | 24.5 3.0 23.3 | 17.7 | 4.0 | 28.2 | 37.7 | 3.1 16.7 |

40393 4734.7 5358.7 5643.9 8 56.2 3.1 12317

25 3.46 39 53.53 46 45.60 53 4.43 55 58.30 8 3.00 11 47.04

Red to 7.05 -4.12 -3.00 -1.96 -1.48 +.50 +1.11
 -0.04 -0.3 -0.2 -0.01 .00 +.01

24 56.84 6 39 49.37 46 42.57 53 2.45 55 56.84 8 3.50 11 48.16

44.5 ^{48.68} 10 59 44.48 6 37.47 12 57.83 15 51.89 27 58.23 31 42.84

| | | | | | | |
|------------|------|------|------|------|------|------|
| 8.16 19 40 | 4.89 | 5.16 | 4.62 | 4.92 | 5.27 | 5.31 |
| +15 | +05 | +03 | .00 | .00 | -00 | -01 |

| | | | | | | |
|-----|-----|------|-----|-----|------|-----|
| -02 | -02 | -02 | -02 | -02 | -02 | -0 |
| 2.4 | .92 | 1.07 | .77 | .93 | 1.13 | .96 |

[illegible]

| | Δa | Δc | Δ | Δ |
|-----|------------|------------|----------|----------|
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$$b = 8.29 + \Delta T - 5.16a + 5.76c - 4.28 + 1.73 - 2.55 \quad 5.64$$

4.92 + .42 + 1.01 + .35 + .30 + .65 5.57

5.11 - .11 + 1.08 - .09 + .32 + .23 5.34

4.60 +.92 +1.20 +.76 +.36 +1.12 5.72 5.50 5.

4.90 + .39 + 1.01 + .32 + .30 + .62 5.52

5.25 -.30 +1.17 -.25 +.35 +.10 5.35

$$5.24 + .28 \overline{) 1.00} \overline{) 1.29} - .30 - .59 \overline{) 4.65}$$

587 + 32 - 184 - 33 - 34 - 63 1.744

| | | | | | | |
|------|------|------|------|------|------|------|
| 8.00 | 1.20 | 1.00 | 1.50 | 1.50 | 1.50 | 1.50 |
| 8.00 | 1.20 | 1.00 | 1.50 | 1.50 | 1.50 | 1.50 |

8.44 1.42 -1.01 1.43 -1.30 -1.73 4.71 4.13 4.

| | | | | | | |
|------|-------|--------|-------|-------|-------|------|
| 5.67 | + .44 | - 1.01 | + .45 | - .36 | - .75 | 4.82 |
| 8.25 | - .11 | - 1.07 | + .11 | - .32 | - .21 | 4.84 |

$$1.53 \quad -4.55 \quad -5.13 \quad +4.69 \quad -1.54 \quad +3.15 \quad 4.78]$$

$\Delta T = -19.40$ 5.12 5.08

5.10

adopt

7 5 0 273
 -19 40 5.10
 11 24 54.90
 4 2 16.33
 7 22 38.58
 1 12.52
 21 26.06
 $\Delta T = +16$ 26.06
 May 18 16.09
 9.97
 daily rate 2.47
 per hour .10

-37.3
 +36.7
 -15
 -04
 -38.0
 +35.9
 -2.1
 -15
 -15

2.4 34.9
 347 2.0

27 35.3
 34.2 1.7

β Uing π Uing α Uing ϵ Corri β Cham

39 53 141 1.7 48 23.5

54.7 8.7 30 18.3 49 44

9.6 23.8 45.2 34.7 51 1

24.6 38.8 0.2 50.7 52 17.5

39.5 53.9 15.2 6.8 53 34

54 8.5 30 23.3 54 47.5

26 87 3623.5 4145.3 4538.6 56 45

25 24.30 35 38.60 41 0.00 44 50.59 52 16.00

+3.35 +5.04 +5.91 +6.55 +7.76
 +.03 +.05 +.06 +.07 +.08

25 27.68 35 43.69 41 5.97 44 57.21 52 23.84

45 22.25 55 38.19 59 0.34 4 52.04 12 21.74

5.43 5.50 5.63 5.17 2.10

-0.04 -0.04 -0.04 -0.10 -0.35

-0.02 -0.02 -0.02 -0.02 -0.12

.95 .92 .91 1.08 2.38

π
 A_c C_c ϵ ΔT

$$0 = 4.8a' + \Delta T + .58a + 1.07c$$

$$4.91 \quad +.40a + 1.01c$$

$$5.46 \quad +.39a - 1.01c$$

$$2.63 \quad -.58 \quad -3.21 \quad 4.98$$

$$+.21 \quad -.10 \quad +.11 \quad 5.03$$

$$0 = .65 - .19a - 2.08c \quad c = +.31 \quad -.06 \quad -.11 \quad -.17 \quad 4.94$$

$$= .55 - .01a - 2.02c \quad = +.27 \quad +.47 \quad -.12 \quad +.35 \quad 4.95 \quad 4.98$$

$$+.36 \text{ alpr}$$

$$0 = 3.38 - 5.74a + 4.69c \quad +.20 \quad -.10 \quad +.10 \quad 5.00$$

$$= 3.83 + 4.94a' + 4.12c \quad -.15 \quad -.12 \quad -.27 \quad 4.98$$

$$5.74a = 4.79 \quad a = +.83 \quad -.19 \quad +.10 \quad -.09 \quad 5.15$$

$$4.94a' = -5.07 \quad = -1.03 \quad -.22 \quad +.10 \quad -.12 \quad 5.25$$

$$\text{Instrument seems to have been} \quad -.29 \quad +.10 \quad -.19 \quad 5.25 \quad 5.25$$

disturbed.

$$\eta c = -.10 \quad II$$

$$5.74a = 2.91 \quad a = +.51$$

$$4.94a' = -3.42 \quad a' = -.69$$

$$-.30 \quad +.10 \quad -.20 \quad 5.37$$

$$+.08 \quad +.11 \quad +.19 \quad 5.24$$

$$+3.14 \quad +.51 \quad +3.65 \quad 5.28$$

5.12

Difference of level obiy + RR station

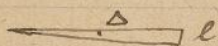
From f. 116

RR. from obiy $-1^{\circ} 51.28' S$
 52.66
 $-1 52.50 u$

obiy from RR $+1^{\circ} 48.56' S$
 $+1 48.87 u$

RR. from Q $-1 52.37 S$
 $-1 53.36 u$

obiy from Q $+0 31.64 S$
 $+0 31.08 u$



$$l = \Delta \tan \alpha$$

$$l = \text{app. diff. level}$$

| | From obiy | From RR | From Q |
|------------------|-----------|-----------|-----------|
| from Δ | 15518.6 | 15518.6 | 14657.8 |
| by Δ | 4.1908525 | 4.1908525 | 4.1660688 |
| by $\tan \alpha$ | 3.8244513 | 3.8138478 | 3.8287887 |
| " 1" | 4.6857265 | 4.6857193 | 4.6857295 |
| " a" | 3.8293038 | 3.8150462 | 3.8326366 |
| " a(5) | 8.51018 | 8.49957 | 8.51452 |
| " a(4) | 8.51503 | 8.50077 | 8.51837 |
| " l 5 | 2.70903 | 2.69042 | 2.68059 |
| u | 2.70588 | 2.69162 | 2.64644 |

2304.4

3.3624825

From Engineer Dept Ry,

3.2782962

Track at Holland gate is 2294.62 metres
 above sea level

4.6855870

3.2706788

by 2294.62 3.3607108

7.96388

" m. hft 0.5159938

7.95627

 Σ 3.8767046

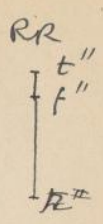
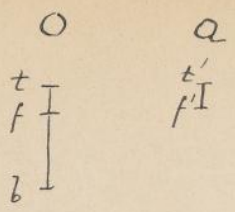
1.32636 21.20

7528.4

1.31875 20.83

1897phase.pdxj.12000

| | | |
|-------------------|-----------|--------|
| | S | u |
| RR from obj | 508.77 | 508.02 |
| obj " RR | 490.25 | 491.61 |
| RR " Q | 479.28 | 483.55 |
| Red for curvature | 0-RR 5.75 | |
| | 2-RR 5.15 | |
| | 0 2 0.13 | |



| | | |
|--------------------|-------|-------|
| obj. from 2 | 21.20 | 20.83 |
| Tel. above floor | 5.25 | |
| obj. above bench | 12.62 | |
| Tel RR above track | 33.75 | |

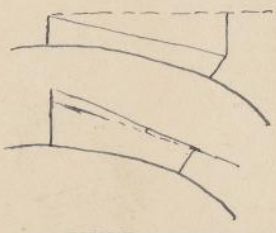
Given t above $\frac{t'}{t''}$
 " t'' below $\frac{t}{t'}$
 To find t above -

| | |
|--------------|--------------|
| t f 5.25 | f b 12.62 |
| t' f' 5.25 | f' b'' 28.50 |
| t'' f'' 5.25 | |

RR - obj.

From obj -

| | | | |
|--------|--------|--------|---------|
| obs. Δ | 508.77 | 508.02 | |
| curr. | -5.75 | -5.75 | } 23.62 |
| t b | -17.87 | -17.87 | |
| f'' | +28.50 | +28.50 | |
| f'' | +33.75 | +33.75 | Mean |
| | 518.90 | 518.15 | 518.525 |
| | 513.65 | 512.90 | 513.28 |



From Q
 To obj

| | | |
|-------|--------|--------|
| obs Δ | 21.20 | 20.83 |
| curr | + .13 | + .13 |
| t' f' | +5.25 | +5.25 |
| f b | -12.62 | -12.62 |
| | 13.96 | 13.59 |

To RR

| | | |
|-------|--------|--------|
| obs Δ | 479.28 | 483.55 |
| curr. | -5.15 | -5.15 |
| t' f' | -5.25 | -5.25 |
| f'' | +28.50 | +28.50 |
| | 497.38 | 501.65 |

3.40
 9.6
 0.70
 36
 9.10
 41
 29

513.30
 514.42

513.30

Point at obj is SW corner ^{lower} floor of piazza, outside base of stone pillar - main residence building.

Reduction to true level.

$$h = \frac{d^2}{D}$$

$$D = 7925.6 \text{ miles}$$

| | | | | | |
|------------------|----------|---------|---------|-----------|-----------|
| p. 115 | d = 2.94 | 2.78 | 0.426 | | check |
| log d | 0.46835 | 0.44404 | 9.63949 | log 511.4 | 2.7087607 |
| " d ² | 0.93670 | 0.88808 | 9.27898 | m. 6 ft | .5159938 |
| " $\frac{1}{D}$ | 6.10097 | 6.10097 | 6.10097 | Δ | 2.1927669 |
| " 5280 | 3.72263 | 3.72263 | 3.72263 | | 155.87 |
| " h | 0.76030 | 0.71168 | 9.10258 | | 2294.62 |
| h ft. | 5.75 | 5.15 | 0.13 | log | 2450.49 m |
| | | | | | 3.3892529 |
| | | | | | 2.9052467 |
| | | | | | 8039.81 |

| | | | | | |
|---------------|-------------------|---|--------------|--------|--------|
| RR. from Obiz | 503.02 | | Obiz from RR | 484.50 | 496.00 |
| | 496.63 | S | | 485.86 | 497.36 |
| | 502.27 | u | | 485.18 | 496.68 |
| Mean | 502.64 | | | | |
| | 499.45 | | | | |

| | | | | |
|-------------------|------------------|--------|-------|--------|
| Rel. above floor. | 5.25 | | 5.25 | 5.25 |
| floor to floor | 7.4 | | 490.4 | 501.93 |
| | 494.2 | | | |
| Mean | 497.30 | 499.66 | | |

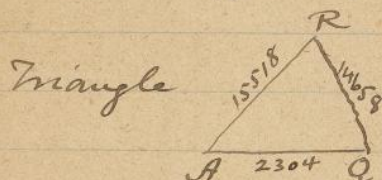
| | | | | |
|-------------------------------------|---------------|------------------------|--------|--------|
| floor Obiz above bench | 12.62 | RR. below Q. bench | 474.13 | 478.40 |
| tel. RR above track | 33.75 | Obiz above " | 21.07 | 20.70 |
| tel. above floor RR | 5.25 | Obiz above RR | 495.20 | 499.10 |
| \therefore bench Obiz above track | 508.78 | floor to floor | 497.15 | 41 |
| | 9. | bench Obiz above track | 513.03 | 29 |

Mean 512.4 ft. 514.4

| | | |
|-----------------|-----------------|----------------------|
| Height of track | 7528.4 | Engineer's dept RR. |
| | 8040 | Obiz above sea level |
| | 3 | |

Bench at Obiz is SW corner ^{lower} floor of piazza, outside base of stone pillar - main residence building.

Effect of errors.



| | | |
|----------------------|------------|---------|
| Change of 1 ft in AQ | affects AR | 6.7 ft. |
| " " 1' in Q | | 1.4 |
| " " 1' in R | | 31.6 |



| | | |
|----------------------|-----------|---------|
| Change of 1 ft in AR | affects h | 0.03 ft |
| " " 1' in A | | 4.6 |

| | | |
|-------------------|-----------|----------|
| Uncertainty in AQ | estimated | < 2 ft |
| " " Q | | < 15" |
| " " R | | < 20" |
| " " AR | | < 25" |
| " " A | | 30" |
| " " h | | < 5 feet |

Differences of level

| Several points - observatory. | | | | | Adopt | |
|-------------------------------|---------|--------|--------|--------|-----------|-------------------------------------|
| Jesus battis | W.H. | 14.408 | +4.332 | = 73.6 | + 1° 13.6 | Lower line of roof |
| Characato | +0 5' | 10.374 | +0.298 | 5.1 | +0 5.1 | Top of spire |
| Paucarpata | -0 9.5 | 9.518 | -0.558 | 9.5 | -0 9.5 | " " " |
| San Antonio | -1 19.8 | 7.200 | 2.876 | 48.9 | -0 48.9 | Edge of tower |
| San Domingo | -1 28.0 | 4.958 | 5.118 | 87.0 | -1 27.0 | Base of statue |
| Carmen Alto | -0 23.8 | 8.234 | 1.842 | 31.3 | - | |
| Campania | -1 55.2 | 4.348 | 5.728 | 97.4 | -1 37.4 | Flat roof of tower |
| Cathedral W | -1 57.0 | 4.254 | 5.802 | 99.0 | -1 39.0 | Flat roof of tower |
| E | | 4.294 | 5.782 | 98.3 | -1 38.3 | " " " |
| RR cupola | -2 6.0 | 3.714 | 6.362 | 125.1 | -2 5.1 | Top - machine shop. |
| " residence | -2 10 | 3.456 | 6.622 | 112.7 | -1 52.7 | Floor of balcony See p. 274 |
| Yanaguana | -2 18.5 | 4.000 | 6.076 | 103.3 | - | |
| Zingo | -2 0.5 | 4.024 | 6.052 | 102.9 | - | |
| Sachaca | -1 33.0 | 4.630 | 5.446 | 92.6 | -1 32.6 | Vertex of cone of tower |
| Cayma | -1 16.0 | 5.642 | 4.434 | 75.3 | -1 15.3 | Edge N tower |
| A house | -0 48.0 | 8.318 | 1.789 | 30.4 | -0 30.4 | Under edge of roof |
| | | .258 | | | | |
| | | .284 | | | | |
| | | .302 | | | | |
| | | .274 | | | | |
| Pantheon | | 5.922 | 4.154 | 70.6 | -1 10.6 | Base of front door ^{at N.} |
| | | 6.822 | | | | |

Jan 10.076

First measures by W.H. were with coarse circle only, second by vernier. The latter are to be adopted. The discrepancies are due in part to the selection of different points on the objects sighted.

| | p.271 | p.277 | | | | | |
|----------------|-------------------------|-----------------------------|--------------------|-------------------------------|---------|--------|------|
| | Distance | Angle | log d | log tan α | log h | miles | ft |
| Jesus baths | 5.49 | +1° 13.6 | 0.73957 | 7.86658 8.33058 | 9.07015 | 0.1175 | +620 |
| Paucarpata Ch. | 4.92 | -0 9.5 -0 5.1 | 0.69197 | 0.97772 7.44142 | 8.13339 | 0.136 | -72 |
| Characato " | 7.70 | +0 5.1 | 0.88649 | 0.70757 7.17127 | 8.05776 | 0.114 | +60 |
| San Antonio " | 1.89 | -0 48.9 | 0.27646 | 7.68931 8.15301 | 8.42947 | 0.0269 | -142 |
| St Domingo " | 2.16 | -1 27.0 | 0.33445 | 1.93952 8.40322 | 8.73767 | 0.0547 | -289 |
| Compania " | 2.09 | -1 37.4 | 0.32015 | 1.98856 8.45226 | 8.77241 | 0.0592 | -313 |
| Cathedral W | 1.98 2.00 | -1 39.0 | 0.29667 0.30103 | 1.99564 8.45934 | 8.76027 | 0.0576 | -304 |
| " E | 2.00 1.98 | -1 38.3 | 0.30103 0.29667 | 1.99255 8.45625 | 8.75292 | 0.0566 | -299 |
| Sachaca Ch | 4.27 | -1 32.6 | 0.63043 | 1.96661 8.43031 | 9.06074 | 0.1150 | -607 |
| Cayma " | 0.97 | -1 15.3 | 9.98677 | 1.87679 8.34049 | 8.32726 | 0.0212 | -112 |
| Panthen | 4.37 | -1 10.6 | 0.64048 | 1.84880 8.31250 | 8.95298 | 0.0897 | -474 |

h is height above or below telescope on upper floor of balcony. To reduce to lower floor of balcony at base of Post SW corner 18 ft must be added.

| | h' | Red. to true alt. for curv. p. 433 | Final h' | Cur. & % Repaction John's curv. p. 433 | Final h' |
|-------------|-----|------------------------------------|----------|--|----------|
| Jesus baths | 638 | 20 | + 658 | 18 | 656 |
| Paucarpata | 54 | 16 | - 38 | 14 | 40 |
| Characato | 78 | 40 | + 118 | 35 | 113 |
| San Antonio | 124 | 2 | - 122 | 2 | 122 |
| St Domingo | 271 | 3 | - 268 | 3 | 268 |
| Compania | 295 | 3 | - 292 | 2 | 293 |
| Cathedral W | 288 | 3 | - 285 | 2 | 281 |
| " E | 284 | 3 | - 281 | 2 | 282 |
| Sachaca | 589 | 12 | - 577 | 11 | 578 |
| Cayma | 94 | 1 | - 93 | 1 | 93 |
| Panthen | 456 | 13 | - 443 | 11 | 445 |

No of ^{metres} feet corresponding to $\begin{cases} 1'' \text{ in longitude} \\ 1'' \text{ in latitude} \end{cases}$

$$1^\circ \text{ Mer.} = 111132.09 - 556.05 \cos 2\varphi + 1.20 \cos 4\varphi$$

$$1^\circ \text{ Par.} = 111415.10 \cos \varphi - 94.54 \cos 3\varphi$$

Young,
Gen. Acct.

by least.

E

No

$$\varphi -16 \quad 22 \quad 28 \text{ by } \cos = 9.98202^{77} \quad 5.0469^{44} \quad 5.0289^{618} \quad 106896.08$$

$$2\varphi -32 \quad 44 \quad 56 \text{ " } \cos = 9.92483 \quad 2.74511 \quad 2.66994 \quad 467.67$$

$$3\varphi -49 \quad 7 \quad 24 \text{ " } \cos = 9.81586 \quad 1.97562 \quad 1.79148 \quad 61.87$$

$$4\varphi -65 \quad 29 \quad 52 \text{ " } \cos = 9.61777 \quad 0.07918 \quad 9.69695 \quad 0.50$$

$\Delta X \Delta \varphi$

$\Delta \varphi \Delta \lambda$

$$111132.09 \quad 106896.08$$

$$-467.67 \quad -61.87$$

$$+ 0.50$$

$$\begin{matrix} 3600 \\ 240 \end{matrix} \left. \begin{matrix} 110664.92 \\ 106834.21 \end{matrix} \right\} \begin{matrix} 270 \\ 360 \end{matrix}$$

$$27666.23 \quad 1780.57$$

$$1'' = 461.10^m \quad 1'' = 29.68^m$$

$$= 1513.8^f \quad 97.4^f$$

$$18444.15 \quad 26708.55$$

$$1'' = 30.74^m \quad 1'' = 445.14^m$$

$$= 100.86^f \quad = 1460.5^f$$

$$\text{by } = 2.00372 \quad 3.16450$$

$\Delta \lambda + \Delta \varphi$ for W tower

of Cathedral Areguipa

$$d = 10468 \text{ ft} \quad p. 270$$

$$\lambda = 1^\circ 55.6' E$$

$$\text{by sin } \alpha_3 \quad 8.52660$$

$$\text{" } d \quad 4.01986$$

$$\text{" } \cos \alpha_3 \quad 9.99975$$

$$\text{" } \Delta \lambda \quad 2.54646$$

$$\text{" } \Delta \varphi \quad 4.01961$$

$$\Delta \lambda \quad 351.9 \text{ ft}$$

$$\Delta \varphi \quad 10461.9 \text{ ft}$$

$$\text{" } \Delta \lambda^S \quad 9.38196$$

$$\text{" } \Delta \varphi'' \quad 2.01589$$

$$\Delta \lambda^S \quad 0.24^S$$

$$\Delta \varphi'' \quad 103.7$$

$$\text{Assume } \lambda = 4 \quad 46 \quad 11.77 \quad \varphi = -16^\circ 22' 28.1'' \quad \text{only}$$

0.24 ent

1 43.7 south

W of Greenwich

$$4 \quad 46 \quad 11.5$$

$$= -16 \quad 24 \quad 12$$

Cathedral

Red. to Paris

$$+ 9 \quad 21.0$$

W tower

W of Paris

$$4 \quad 55 \quad 32.5 = 73^\circ 53' 7.5''$$

$$[4 \quad 57 \quad 24 = 74 \quad 21 \quad 0 \quad -16 \quad 24 \quad 28 \quad \text{Paz Sclan}]$$

Lunitana House

Obey above Q house $20.98 - 12.62 + 5.25 = 13.51$ ft = $4\frac{1}{3}$ p. 275

Q house above RR track $511.4 - 13.51 = 497.9$ " $\frac{151.8}{160.2}$

Q house " sea level $\frac{7528.4}{8039.8} + 497.9 = 8026.3$ " = 2446.6

Distance obey - Q = 2304.4 ft = 702.4

az. from obey = $19^{\circ} 21' 54''$ S of W

log anti $\frac{52059}{9.98202}$

" d $\frac{36256}{3.78230}$

" cos az. 9.97470

" $\Delta \phi^{\text{ft}}$ 2.88315 $\log \Delta \phi^{\text{ft}}$ 0.87943 $\Delta \phi^{\text{ft}}$ $7\frac{1}{2}^{\text{ft}}$

" $\Delta \lambda^{\text{ft}}$ 3.33726 " $\Delta \lambda^{\text{ft}}$ 0.17276 $\Delta \lambda^{\text{ft}}$ 1.49

If $\lambda = 44611.5^{\text{ft}}$ $\phi = -16^{\circ} 22' 28.1''$ Obey

$\frac{7.58}{7.49}$
= 44618.3^{ft}

$\frac{7.58}{7.49}$
= $-16^{\circ} 22' 36''$ Q house

Distance to RR 14657.8 ft = 4467.6 metres

1897phae.proj.1170U

2

48



1897haa, prod. 1155