

KG
11365
337

06

*Observations
for
Time with
East Transit
1868, 1869.*

K611365.337

Harvard College Observatory

Long. W. $4^h 44^m 29^s.7$ Greenwich
 E. $0^h 23^m 41^s.5$ Washington

Lat. $42^\circ 22' 48''.6$ nat. tan. 0.9125
 log. tan. 9.96022
 nat. sec. 1.353
 log. sec. 0.1315

Wire intervals from last time book.

Illumination West.

Interval of each wire from mean of the
 five for 0° declination.

No. 1	+ 7 ^s .25	} from observations of 5 Ursae Minoris & 3 Urs. Min. made Aug. 3, 1868.
2	+ 3.62	
3	- 0 ^s .04	
4	- 3 ^s .60	
5	- 7 ^s .26	

Value in seconds of one revolution
 of the micrometer screw determined
 roughly June 2 1869 at 2^s.324



KG 11365.337

Date	1868	Oct. 3 ^d			
Observer		E. P. A.			
Illumin'n		East			
Star		μ Aquarii.	ν Eryni	61' Eryni	
Mag.		9° 28' S.	40° 40'	38° 7'	
δ					
Wire	a				
"	b				
"	c				
"	1	20 48 56.7	20 55 37.2	21 4 21.7	
"	2	49 00.3	42.0	26.0	
"	3	3.9	46.8	30.7	
"	4	7.6	51.7	35.6	
"	5	11.2	56.3	40.2	
"	d				
"	e				
"	f				
Sum		19.7	234.0	154.2	
Mean		20 49 39.4	20 55 46.80	21 4 30.84	
Red'n to					
m			+ .78	+ .78	
n. tan. δ			- .01	- .04	
c. sec. δ			+ .16	+ .16	
r					
T			20 55 47.3	21 4 31.74	
a		20 45 34.21	20 52 17.47	21 4 1.57	
ΔT			3 30.26	3 30.17	

Ill. E.
 $c' = +.125$
 $n = +.30$

Clock error at 21^h . 3^m 30.24

Date 1868 Oct. 3

Observer

E. P. Oat

Illumin'n

East

Star

5 Cygni

1 Regasi

1 Draconis.

Mag.

 δ

29° 42'

19° 15'

81° 54'

Wire

a

"

b

"

c

"

1

21 10 42.8 21 19 23.2 21 20 40.7

"

2

46.9 27.0 21 6.5

"

3

51.0 31.0 37.8

"

4

55.0 34.7 57.8

"

5

59.2 38.4

"

d

"

e

"

f

Sum

254.9

154.3

Mean

21 10 50.98 21 19 30.86 21 21 32.10

Red'n to

m

+ .78

n. tan. δ

- .10

c. sec. δ

+ .121

 τ

T

21 10 57.80

a

21 7 21.51 Reduced 21 16 1.41 9 17 59.01

 ΔT

3 30.29

Date	1868	Oct. 3								
Observer	E. P. A.									
Illumin'n	East									
Star	24 Urs. Maj. β Aquarii γ Aquarii									
Mag.										
δ	70° 24' 6° 9' S. 8° 26' S.									
Wire	a									
"	b									
"	c									
"	1	21	25	54.6	21	28	12	21	34	8.0
"	2		26	5.4			4.9			12.0
"	3			16.2			8.3			15.4
"	4			28.9			12.2			19.1
"	5			38.0			18.8			22.8
"	d									
"	e									
"	f									
Sum				81.1			42.4			77.3
Mean		21	26	16.22	21	28	8.48	21	34	15.46
Red'n to										
m										
n. tan. δ										
c. sec. δ										
r										
T										
a		9	22	45.10	21	24	38.96	21	30	45.86
ΔT										

Date	1868	Oct. 3		Oct 6
Observer		E. P. A.		E. P. A.
Illumin'n		Good.		
Star		E Regasi.	11 Cephei	β Squarii
Mag.		9° 17'	70° 43'	6° 9' D.
δ				
Wire	a			
"	b			
"	c			
"	1	21 41 6.9	21 41 10.0	24 28 7.3
"	2	10.7	20.7	10.8
"	3	14.1	31.6	14.4
"	4	17.8	42.7	18.3
"	5	22.4	53.0	21.8
"	d			
"	e			
"	f			
Sum		71.9	158.0	72.6
Mean		21 41 14.38	21 41 31.60	24 28 14.52
Red'n to				
m				
n. tan. δ				
c. sec. δ				
r				
T				
a		21 37 44.69	21 40 2.89	21 24 38.92
ΔT				

Date	1868	Oct. 6			
Observer		G. J. A.			
Illumin'n		East			
Star		ϵ Regasi	μ Capricorni	α Aquarii	
Mag.					
δ		$9^{\circ} 17'$	$14^{\circ} 10' S.$	$0^{\circ} 57' S.$	
Wire	a				
"	b				
"	c				
"	1	21 41 12.6	21 49 36.5	22 2 31.0	
"	2	16.4	40.2	34.7	
"	3	26.0	43.9	38.1	
"	4	23.3	47.9	42.0	
"	5	27.4	51.7	45.3	
"	d				
"	e				
"	f				
Sum		99.7	220.2	191.1	
Mean		21 41 19.94	21 49 44.04	22 2 38.22	
Red'n to					
m		+ .78			
n. tan. δ		- .25			
c. sec. δ		+ .13			
r					
T		21 41 20.60			
a		21 37 44.65	Reduced 21 46 8.36	21 59 2.74	
ΔT		3 35.95			

Ill. E.

$$c' = +.125$$

$$w = +.34$$

Clock fast (at $21\frac{1}{4}$) — $3^m 36^s.04$

Date	1868	Oct 6							
Observer		G. J. A.							
Illumin'n		East							
Star		ϵ Aquarii	π Aquarii	9 Draconis					
Mag.		8° 26' S.	0° 43'	76° 23'					
δ									
Wire	a								
"	b								
"	c								
"	1	22 13 28.9	22 22 3.1	22 26 51.4					
"	2	22 13 28.9	6.6	27 6.6					
"	3	32 32.5	10.4	22.2					
"	4	36.1	15.9	38.0					
"	5	39.9	17.4	53.0					
"	d								
"	e								
"	f								
Sum			51.4	111.2					
Mean			22 22 10.28	22 27 22.24					
Red'n to									
m			+ .78						
n. tan. δ			- .31						
c. sec. δ			+ .12						
r									
T			22 22 10.87						
a		22 9 54.59	22 18 34.73	10 23 44.86					
ΔT			3 36.14						

Date	1868	Oct. 6			
Observer	G. J. A.				
Illumin'n	East				
Star	γ Aquarii 226 Cephei. 3 Pegasi.				
Mag.					
δ	0° 47' S. 75° 33' 10° 9'				
Wire	a				
"	b				
"	c				
"	1	22 32 5.2			
"	2	9.0	22 33 21.7	22 38 23.4	
"	3	12.6	35.9	27.0	
"	4	16.1	51.0	30.8	
"	5	19.7	34 1.5	34.2	
"	d			38.2	
"	e				
"	f				
Sum		62.6		153.6	
Mean	22 32	12.52	22 33	38.25	22 38 30.72
Red'n to					
m					
n. tan. δ					
c. sec. δ					
τ					
T					
a	22 28	37.01	22 30	2.98	22 34 55.42
Δ T					

Read each
wire one fine
higher.

Date	1868	Oct. 6			
Observer		G. P. A.			
Illumin'n		East			
Star		α Pisc. Austr.	α Pegasi.	α Cephei	
Mag.					
δ		$30^{\circ} 19' S.$	$14^{\circ} 30'$	$67^{\circ} 24'$	
Wire	a				
"	b				
"	c				
"	1	22 53 51.1	23 1 42.0	23 16 33.8	
"	2	55.5	48.8	43.6	
"	3	59.4	49.2	52.6	
"	4	54 37	53.2	17 2.6	
"	5	8.0	57.0	12.0	
"	d				
"	e				
"	f				
Sum		297.7	247.2	264.0	
Mean		22 53 59.54	23 1 49.44	23 16 52.80	
Red'n to					
m			+ .78		
n. tan. δ			- .24		
c. sec. δ			+ .13		
r					
T			23 1 53.11		
a		22 50 23.85	22 58 14.07	23 13 18.32	
ΔT			3 36.04		

Date	1868	Oct 9								
Observer		G. J. A.								
Illumin'n		East								
Star		α Cygni.	μ Squarü		ν Cygni					
Mag.		44° 49'	9° 28' S.		40° 40'					
δ										
Wire	a									
"	b									
"	c									
"	1	20	34	44.8	20	44 ⁴⁴	23.5	20	51	4.2
"	2			42.6			27.3			9.1
"	3			54.4			30.7			13.5
"	4			59.5			34.9			18.4
"	5			36			38.1			23.2
"	d									
"	e									
"	f									
Sum		2		271.6			154.5			68.4
Mean		20	34	54.32	20	44	30.90	20	51	13.68
Red'n to										
m				+ .78			+ .78			+ .78
n. tan. δ				+ .03			- .32			- .02
c. sec. δ				+ .18			+ .13			+ .17
r										
T		20	35	55.31	20	44	31.49	20	51	14.61
a		20	36	57.97	20	45	34.12	20	52	17.33
ΔT		Clock slow	1	2.66		1	2.63		1	2.72

Block opened and regulated Oct. 9
 Ill. East.
 $c' = +.125$
 $n = +.30$ } assumed as before

Block slow (at $21\frac{1}{2}$) 1^m 2.70

Date	1868	Oct. 9			
Observer	S. J. A.	Marwins.	Marwins		
Illumin'n	East				
Star	σ^2 Lygni	γ Squari	α Pegasi		
Mag.					
δ		$0^\circ 47' \delta$	$14^\circ 30'$		
Wire	a				
"	b				
"	c				
"	1	20 57 23.4	22 27 26.1	22 57 8.3	
"	2	34.0	30.1	6.8	
"	3	42.7	33.5	10.6	
"	4	51.7	37.2	14.1	
"	5	58 1.3	40.7	18.0	
"	d				
"	e				
"	f				
Sum		2131	167.6	52.8	
Mean		20 57 42.62	22 27 33.52	22 57 10.56	
Red'n to					
m			+ .78	+ .78	
n. tan. δ			- .28	- .19	
c. sec. δ			+ .12	+ .13	
r					
T			22 27 34.14	22 57 11.28	
a			22 28 36.98	22 58 14.05	
ΔT			1 2.74	1 2.77	

Date 1868 Oct. 11

Observer

G. P. A.
East

Illumin'n

Star

2 Aquarii 32 Urs. Maj. 9 Draconis

Mag.

 δ $0^{\circ} 57' S.$ $65^{\circ} 46'$ $76^{\circ} 28'$

Wire

a

"

b

"

c

"

1

21 58 53.6 22 8 5.8 22 23 13.6

"

2

57.4 14.2 28.5

"

3

59 00.8 22.9 43.1

"

4

4.7 31.7 38.7

"

5

8.1 40.7 24 14.1

"

d

"

e

"

f

Sum

64.6

114.8

267.4

Mean

21 59 00.9 22 8 22.96 22 23 43.48

Red'n to

m

+1.75

n. tan. δ

-0.28

c. sec. δ

+1.12

r

T

21 59 1.51

a

21 59 2.69 10 8 24.42 10 23 45.20

 ΔT

Clock slow 1.18

Clock put forward 1 minute Oct. 10.

Ill. East

 $C' = +1.25$ $n = +.30$

assumed as before

Clock slow (at $22\frac{1}{4}$) 1.15

Date	1868	Oct. 11	Oct. 12	
Observer		B. J. A.	A. Searle	
Illumin'n		East	East	
Star		γ Aquarii	γ Aquilae	α Aquilae
Mag.				
δ		$0^{\circ} 47' S.$	$10^{\circ} 18'$	$8^{\circ} 32'$
Wire	a			
"	b			
"	c			
"	1	22 28 ^{28.0} 34.1	19 39 42.4	19 44 18.8
"	2	31.4	56.0	17.5
"	3	35.2	59.7	21.1
"	4	38.9	40 3.2	24.9
"	5	42.7	7.6	28.2
"	d			
"	e			
"	f			
Sum		176.2	298.3	105.8
Mean		22 28 34.24	19 39 59.66	19 44 21.10
Red'n to				
m		+ .75	+ .75	+ .75
n. tan. δ		- .28	- .18	- .19
c. sec. δ		+ .12	+ .13	+ .13
τ				
T		22 28 36.83	19 40 0.36	19 44 21.79
a		22 28 36.96	19 40 0.72	19 44 22.29
ΔT		1.13	0.36	0.50

Oct. 12 1868

$$c' = + .125$$

$$n = + .25$$

Clock slow (at 20^h) 0.37
 Daily rate since Oct. 9th - 0.78

1868phae.proj.:3385

Date	1868	Oct 12							
Observer		A Searle							
Illumin'n		East							
Star		E Draconis	λ	Wrs. Min.	α^2	Cephei			
Mag.		69° 56'		88° 55'		12° 57' S.			
δ									
Wire	a								
"	b								
"	c								
"	1	19	48	14.0		20	10	39.7	
"	2			25.0				41.4	
"	3			34.8				44.8	
"	4			46.1	19	58	52.81	48.91	
"	5			56.2	20	2	9.7	52.3	
"	d								
"	e								
"	f								
Sum				176.1				224.7	
Mean		19	48	35.22	19	55	47.99	20	10
Red'n to									
m									
n. tan. δ									
c. sec. δ									
r									
T									
a					Reduced				
ΔT		19	48	37.15	19	56	2.78	20	10
								45.74	

Date	1868	Oct. 12			
Observer	A. Searle				
Illumin'n	East				
Star	K Cephei α Capricorni ϵ Delphini				
Mag.					
δ	77° 19' 18° 38' S 10° 52'				
Wire	a				
"	b				
"	c				
"	1	20 12 42.2	20 19 39.4	20 26 48.0	
"	2	59.0	43.2	54.7	
"	3	13 15.8	47.0	55.4	
"	4	31.0	56.9	59.0	
"	5	47.6	54.8	27 2.8	
"	d				
"	e				
"	f				
Sum		75.6	235.3	276.9	
Mean		20 12 15.12	20 19 47.06	20 26 55.38	
Red'n to					
m					+ .75
n. tan. δ					- .18
c. sec. δ					+ .13
τ					
T				20 26 56.06	
a		20 13 18.15	20 19 47.90	20 26 56.34	
ΔT				0.26	

Date	1868	Oct. 12		
Observer	A. Searle H. Gannett			
Illumin'n	East			
Star	Gr. 3241 2 Pegasi o Cephei			
Mag.				
δ	72° 6'	14° 30'	67° 24'	
Wire	a			
"	b			
"	c			
"	1	20 30 10.4	22 58 5.2	23 12 5.1
"	2	21.4	9.9	13 7.5
"	3	32.1	12.9	16.2
"	4	45.1	16.7	25.7
"	5	57.0	20.4	35.5
"	d			
"	e			
"	f			
Sum		166.1	64.5	82.0
Mean	20 30	33.22	22 58 12.90	23 13 16.40
Red'n to				
m			+ .75	
n. tan. δ			- .16	
c. sec. δ			+ .13	
r				
T			22 58 13.62	
a	Reduced			
	20 30	35.23	22 58 14.02	23 13 18.19
ΔT			0.40	

Date	1868	Oct. 12	Oct. 13.	
Observer		H. Gannett.	O. C. Wendell.	Bridge.
Illumin'n		East.	East.	East.
Star		λ Draconis.	α Aquarii.	ζ Aquarii.
Mag.				
δ		$70^{\circ} 3'$	$313^{\circ} - 20'$	$313^{\circ} - 4'$
Wire	a			
"	b			
"	c			
"	1	23 23 8.0	21-58-55.4	22-22-57.1
"	2	18.5	-58.8	-23-0.8
"	3	28.8	59-2.2	-4.5
"	4	39.4	-5.9	-8.
"	5	50.5	-9.5	-11.7
"	d			
"	e			
"	f			
Sum		145.2	11.8	22.1
Mean		23 23 29.04	21-59-3.36	22 23 4.42
Red'n to				
m				
n. tan. δ				
c. sec. δ				
r				
T				
a		11 23 29.63		
ΔT				

Some stars observed early in the evening
of Oct. 16 are entered after the others of that date

Date	1868	Oct 16 th				
Observer	O. C. W.				over ABC Bridge	
Illumin'n	East				" def Wendell	
Star	2 Aquarii		0 Aquarii	7 Aquarii		
Mag.	0° 57' S.		8° 26' S.	0° 43'		
δ						
Wire	a				22	17 59.8
"	b				18	10.8
"	c					21.5
"	1	21	58 56.9	22	9 48.9	
"	2		59 20.2		52.4	
"	3		4.1		56.0	
"	4		7.9		59.7	
"	5		11.4	10	3.2	
"	d					51.0
"	e				19	1.7
"	f					12.4
Sum			20.5			280.2
Mean		21	59 4.10	22	9 56.04	
Red'n to						
m			+ .75		+ .75	
n. tan. δ			- .14		- .16	
c. sec. δ			+ .12		+ .13	
τ						
T		21	59 4.83	22	9 56.76	
a		21	59 2.62	22	9 54.48	22 18 34.63
Δ T	blackfast		2.21		2.28	

Oct. 16
Illumination East
C' = + .125 as before
m = + .15
Clock (at 21^{hr}) fast 2^s.28

Date	1868	Oct 16	Oct. 16 (the following stars of this date were observed earlier in the evening than the others)		
Observer	Bridge		A. J.		
Illumin'n	East.		E.		
Star	3 Regasi.		2 Regasi	3 Draconis	
Mag.	10° 9'		14° 30'	67° 26'	
δ					
Wire	a				
"	b				
"	c				
"	1	22 34 48.5	22 58 8.0		
"	2	53.0	14.7		
"	3	57.0	15.2	19 12	31.1
"	4	35 00.5	19.2		40.7
"	5	4.2	23.0		49.7
"	d				
"	e				
"	f				
Sum		284.2	77.3		
Mean		22 35 56.84	22 58 15.46	19 12	31.05
Red'n to					
m		+ .75	+ .75		
n. tan. δ		- .11	- .10		
c. sec. δ		+ .13	+ .13		
r					
T		22 35 57.61	22 58 16.21		
a		22 34 58.33	22 58 13.99	19 12	30.97
ΔT		Block fast 2.28	2.25		

Date	1868	Oct. 16	Oct. 16	Oct. 16
Observer		A. S.	A. S.	A. S.
Illumin'n		E.	E.	E.
Star		Razzi VII 67	κ Aquilae	γ Aquilae
Mag.				
δ		$68^{\circ} 43'$	$7^{\circ} 19' \text{ S.}$	$10^{\circ} 18'$
Wire	a			
"	b			
"	c			
"	1	19 16 53.1	19 29 43.4	19 39 54.9
"	2	17 3.2	47.0	58.6
"	3	13.1	pen failed to mark	40 2.0
"	4	23.3	54.5	5.9
"	5	33.2	57.9	9.5
"	d			
"	e			
"	f			
Sum		65.9		10.9
Mean		19 17 13.18	19 29 50.70	19 40 2.18
Red'n to				
m			+ .75	+ .75
n. tan. δ			- .16	- .11
c. sec. δ			+ .13	+ .13
τ				
T			19 29 54.12	19 40 2.95
a		7 17 10.76	19 29 49.03	19 40 0.65
ΔT		clock fast	2.39	2.30

Date	1868	Oct. 16	Oct. 16	Oct. 16
Observer		A. S.	A. S.	A. S.
Illumin'n		E.	E.	E.
Star		α Aquilae	ϵ Draconis	λ Ursae Minoris
Mag.		8° 32'	69° 56'	88° 55'
δ				
Wire	a			
"	b			
"	c			
"	1	19 44 16.4	19 48 16.4	
"	2	20.0	27.4	19 52 34.5
"	3	23.7	37.6	55 43.5
"	4	27.5	48.8	58 54.5
"	5	31.0	58.6	pen failed to record beginning of break on 5th wire.
"	d			
"	e			
"	f			
Sum		118.6	188.8	
Mean		19 44 23.72	19 48 37.76	19 55 43.99
Red'n to				
m		+ .75		
n. tan. δ		- .11		
c. sec. δ		+ .13		
r				
T		19 44.2419		
a		19 44 22.22	19 48 36.88	Reduced 19 55 57.91
ΔT		Blackfast 2.27		

Date	1868	Oct. 16	Oct. 17.	Oct. 17.
Observer		A. S.	O. C. H.	O. C. H.
Illumin'n		E.	East.	East.
Star		α Aquilae	ϵ Lepasi.	δ Piscium.
Mag.				
δ		$6^{\circ} 55'$	$10^{\circ} 9'$	$5^{\circ} 40'$
Wire	a			
"	b			
"	c			
"	1	19 57 37.7	22 34 50.2	23 21 14.1
"	2	41.2	53.9	17.9
"	3	44.8	57.7	21.3
"	4	48.5	35 1.3	25.3
"	5	52.0	4.9	28.8
"	d			
"	e			
"	f			
Sum		224.2	288.0	107.4
Mean		19 57 44.84	22 34 57.6	23 21 21.48
Red'n to				
m		+ .75	+ .75	+ .75
n. tan. δ		- .12	- .11	- .12
c. sec. δ		+ .13	+ .13	+ .13
T		19 57 45.60	22 34 58.37	23 21 22.24
a		19 57 43.30	22 34 55.32	23 21 19.11
ΔT		2.30	3.05	3.13

Oct. 17
Illumination East

$$\begin{aligned} C' &= +125 \\ n &= +.15 \end{aligned} \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{as before}$$

Clock fast (at $23\frac{1}{2}$) $3^{\circ} 08'$

Date	1868.	Oct. 17.	Oct. 17.	Oct. 17.
Observer		O. C. W.	O. C. W.	O. C. W.
Illumin'n		East.	East.	East.
Star		γ Cephei.	α Piscium.	γ Pegasi.
Mag.				
δ		$76^{\circ} 54'$	$6^{\circ} 8'$	$0^{\circ} 6'$
Wire	a			
"	b			
"	c			
"	1	23 33 32.7	23 52 30	0 6 24.3
"	2	49.8	33.7	28.1
"	3	34 6.7	37.1	31.8
"	4	22.2	40.9	35.5
"	5	38.3	44.6	39.2
"	d			
"	e			
"	f			
Sum		29.7	186.3	158.9
Mean		23 34 5.94	23 52 37.26	0 6 31.78
Red'n to				
m			+ .75	+ .75
n. tan. δ			- .12	- .10
c. sec. δ			+ .13	+ .13
r				
T			23 52 38.02	0 6 32.56
a		23 34 5.01	23 52 34.95	0 6 29.50
ΔT			3.07	3.06

Date	1868.	Oct. 20.	Oct. 20.						
Observer		O. C. W.	O. C. W.						
Illumin'n		East.	East.						
Star		μ Capric.	γ Aquarii.	32	Urs. Maj.	δ .			
Mag.		14° 40' S.	08° 57' S.	65'	45'				
Wire	a								
"	b								
"	c								
"	1	21	46	4.9	21	58	59.1		
"	2			8.4		59	2.9	32	8
"	3			12.2			6.3		20.3
"	4			15.8			9.8		29.2
"	5			19.2			13.5		37.3
"	d								46.9
"	e								
"	f								
Sum				60.5			31.6		
Mean		21	46	12.1	21	59	6.3	22	8
Red'n to									
m				+ .75			+ .75		+ .75
n. tan. δ				- .78			- .62		- 2.10
c. sec. δ				- .33			- .32		+ .78
r									
T		21	46	11.74	21	59	6.13	22	8
a		21	46	8.18	21	59	2.57	10	8
ΔT		Clock fast		3.56			3.56		3.55

Oct. 20 1868 Ill. E.

$-0.32141 = c$
 $+0.67162 = n$ } obtained from all the stars by Gauss's method.
 (This result agreed closely with one obtained from the circumpolar stars.)
 Clock fast (at 22 $\frac{1}{3}$) 3.56

Date	1868.	Oct. 30.			
Observer	O. C. W.				
Illumin'n	East.				
Star	π Aquarii. γ Drac. S. C. η Aquarii.				
Mag.					
δ	$0^{\circ} 43'$ \searrow $76^{\circ} 23'$ $0^{\circ} 47'$				
Wire	a				
"	b				
"	c				
"	1	22 18 30.9	22 23 20.1	22 28 33.4	
"	2	34.5	35.8	37.	
"	3	38.3	37.2	40.7	
"	4	41.8	24 5.7	44.2	
"	5	45.5	21.5	47.9	
"	d				
"	e				
"	f				
Sum		191.0	254.3	303.2	
Mean		22 18 38.2	22 23 50.86	22 28 40.64	
Red'n to					
m		+ .75	+ .75	+ .75	
n. tan. δ		- .60	- 3.38	- .62	
c. sec. δ		- .32	+ 1.37	- .32	
r					
T		22 18 38.03	22 23 49.60	22 28 40.47	
a		22 18 34.59	10 23 45.91	22 28 36.87	
ΔT		3.44	3.69	3.60	

Date	1868	Oct. 20.						
Observer		O. J. W.						
Illumin'n		East.						
Star		226 Cephei. & Pegasi.						Cephei.
Mag.								
δ		75° 33'		10° 9'				67° 24'
Wire	a							This observation is that of ϵ Cephei. \circ Cephei was not observed.
"	b							
"	c							
"	1	22 29						22 44 48.9
"	2	22 29	49.3	22 34	51.7			57.5
"	3	30	3.8		55.2			45 6.4
"	4		18.		58.9			15.1
"	5		33.2	35	2.6			23.8
"					6.5			
"	d							See next page for ϵ Cephei
"	e							
"	f							
Sum					274.9			31.3
Mean		22 30	3.79	22 34	58.98	22 45	6.26	
Red'n to								
m			+ .75		+ .75			
n. tan. δ			+ 1.99		- .49			
c. sec. δ			- 1.28		- .33			
r								
T			5.25	22 34	58.91			
a		22 30	2.16	22 34	55.29	23 13	17.97	
ΔT			3.09		3.62			

Date	1868.	Oct. 20.			
Observer	O. D. W.				
Illumin'n	East.				
Star	Cephei. & P. Aust. & Pegasi.				
Mag.					
δ	65° 31'	30° 19' S.	14° 30'		
Wire	a				
"	b				
"	c				
"	1	22 44 48.9	22 50 19.2	22 58 10.2	
"	2	57.5	23.4	13.9	
"	3	45 6.	27.5	17.4	
"	4	15.1	31.9	21.4	
"	5	23.8	36.	24.9	
"	d				
"	e				
"	f				
Sum	31.3	138.0	87.8		
Mean	22 45 6.26	22 50 27.6	22 58 17.56		
Red'n to					
m	+ .75	+ .75	+ .75		
n. tan. δ	+ .87	- 1.01	- .44		
c. sec. δ	- .77	- .37	- .33		
r					
T	22 45 7.11	22 50 26.97	22 58 17.54		
a	22 45 3.37	22 50 23.71	22 58 13.95		
ΔT	3.74	3.26	3.59		

Date	1868	Oct. 23								
Observer	C. P. A.									
Illumin'n	East									
Star	γ Draconis (4.6) γ Aquarii 2.2.6 Cygni									
Mag.										
δ	76° 23' 0° 47' S. 75° 33'									
Wire	a									
"	b									
"	c									
"	1	22	23	21.5	22	28	35.0	22	30	34
"	2			37.1			38.2			
"	3			52.2			42.2	22	30	54
"	4		24	7.1			45.2			20.3
"	5			23.6			49.0			34.7
"	d									
"	e									
"	f									
Sum				211.5			209.6			
Mean		22	23	52.30	22	28	41.92	22	30	5.65
Red'n to										
m				+1.75			+1.75			+1.75
n. tan. δ				-1.16			-.21			+1.68
c. sec. δ				-.13			+1.03			+1.12
r										
T		22	23	51.86	22	28	42.49	22	30	7.20
a		10	23	46.17	22	28	36.84	22	30	1.97
Δ T				5.69			5.65			5.23

Oct. 23 1868
 Illumination East
 $C' = +1.03$
 $n = +1.23$ } by Cauchy's method from all the stars
 Clock fast (at 23^h) 5.81

Date	1868	Oct. 23			
Observer	E. S. At				
Illumin'n	East				
Star	3 Pegasi		λ Aquarii		λ Pic. Austr.
Mag.					
δ	$10^{\circ} 9'$		$8^{\circ} 17' S.$		$30^{\circ} 19' S.$
Wire	a				
"	b				
"	c				
"	1	22	34	53.2	22 45 44.4 22 50 20.4
"	2			57.2	48.0 24.6
"	3			35 00.3	52.0 29.0
"	4			35 4.2	55.8 33.2
"	5			7.7	59.0 37.3
"	d				
"	e				
"	f				
Sum				243.6	259.2 144.5
Mean	22	35	00.72	22 45 51.84	22 50 28.9
Red'n to					
m				+ .75	+ .75
n, tan. δ				- .17	- .34
c. sec. δ				+ .03	+ .03
r					
T	22	34	1.33	22 45 52.38	22 50 29.34
a	22	34	55.25	Reduced 22 45 46.09	22 50 23.65
ΔT			6.08	6.29	5.66

Date	1868	Oct 23						
Observer	E. P. A.							
Illumin'n	East.							
Star	λ Pegasi		θ Piscium		λ Draconis (Feb.)			
Mag.	14° 30'		5° 40'		70° 3'			
δ								
Wire	a							
"	b							
"	c							
"	1	22 58	11.8	23 21	16.9	23-23	15.6	
"	2		14.2		20.4		26.8	
"	3		18.8		24.0		37.1	
"	4		22.4		27.9		47.8	
"	5		26.2		31.5		58.4	
"	d							
"	e							
"	f							
Sum		939		120.8		185.8		
Mean		22 58	18.78	23 21	24.16	23 23	37.16	
Red'n to								
m		+1.75		+1.75		+1.75		
n. tan. δ		-1.15		-1.19		-1.84		
c. sec. δ		+1.03		+1.03		-1.09		
r								
T		22 58	19.41	23 21	24.75	23 23	36.98	
a		22 58	13.92	23 21	19.08	11 23	30.10	
ΔT		5.49		5.67		6.88		

Date	1868	Oct. 26	Oct. 28.
Observer		C. C. M.	G. S. A.
Illumin'n		East	East.
Star		9 Draconis (6) i Cephei	2 Aquarii.
Mag.			
δ		76° 23' 65° 31'	0° - 57'
Wire	a		
"	b		
"	c		
"	1	22 23 232	22 44 50.0
"	2	39.0	59.0
"	3	54.9	45 7.9
"	4	24 8.9	16.9
"	5	25.4	25.2
"	d		
"	e		
"	f		
Sum		277.1	39.0
Mean		22 23 55.08	22 45 7.8
Red'n to			
m			
n. tan. δ			
c. sec. δ			
r			
T			
a		10 23 46.44	22 45 3.17
ΔT			21 59 2.46

Date	Oct. 28.		
Observer	G. S. A.		
Illumin'n	East.		
Star	32 Ara. Maj. L. C. H. Aquarii. 9 ^h Draconis. L. C.		
Mag.			
δ	$65^{\circ}-45'$ $0^{\circ}-43'$ $76^{\circ}-23'$		
Wire	a		
"	b		
"	c		
"	1	22-8-15.	22-18-33.9
"	2	24.	37.3
"	3	32.5	40.9
"	4	41.	44.7
"	5	50.	48.1
"	d		
"	e		
"	f		
Sum		162.5	204.9
Mean		21-8-32.5	22-18-40.9
Red'n to			
m			
n. tan. δ			
c. sec. δ			
τ			
T			
a		10 8 25.32	22 18 54.49
ΔT			10 23 46.62

Date 1868, Oct. 29

Observer

C. C. W.

Illumin'n

East.

Star

2 Aquarii? We. Maj. L. C. 71 Aquarii.

Mag.

 δ $-0^{\circ}57'S.$ $65^{\circ}45'$ $0^{\circ}43'$

Wire

a

"

b

"

c

"

1

"

2

"

3

"

4

"

5

"

d

"

e

"

f

21-59-2.	22-8-16.	22-18.34.1
5.9	24.4	37.7
9.2	33.5	41.2
13.	41.9	45.
16.4	51	48.7

Sum

Mean

46.5	166.8	206.7
21-59-9.3	22-8-33.36	22-18-41.34

Red'n to

m

n. tan. δ c. sec. δ

+ .74	+ .74	+ .74
- .41	- 1.38	- .40
- .05	+ .12	- .05

 τ

T

a

 ΔT

21 59 9.58	22 8 32.84	22 18 41.63
21 59 2.44	10 8 25.88	22 18 34.47
7.14	7.46	7.16

Oct. 29, 1868, Illumination East.
 $c' = -.05$ from observation of N. mer. mark
 $m = +.44$ " v Cephei & 9 Draconis

Clock fast (at $22^h \frac{3}{4}$) $7^s.13$

Date
Observer
Illumin'n

Star
Mag.
 δ

94 Draconis & Aquarii. 3 Refasi.
76°-23.-0°-47' 10"-9'

Wire a
" b
" c

" 1
" 2
" 3
" 4
" 5

" d
" e
" f

<i>22-23-24</i>	<i>22-28-36.1</i>	<i>22-34-52.8</i>
<i>39.9</i>	<i>39.9</i>	<i>58.1</i>
<i>55.</i>	<i>43.7</i>	<i>35-1.8</i>
<i>9.3</i>	<i>47.</i>	<i>5.8</i>
<i>25.9</i>	<i>51.</i>	<i>9.5</i>

Sum
Mean

<i>274.1</i>	<i>217.8</i>	<i>10.0</i>
<i>22-23-54.82</i>	<i>22-28-43.56</i>	<i>22-35-2.00</i>

Red'n to
m
n. tan. δ
c. sec. δ

<i>+ .74</i>	<i>+ .74</i>	<i>+ .74</i>
<i>- 2.22</i>	<i>- .40</i>	<i>- .32</i>
<i>+ .21</i>	<i>- .05</i>	<i>- .05</i>

r

T

<i>22</i>	<i>23</i>	<i>53.55</i>	<i>22</i>	<i>28</i>	<i>43.85</i>	<i>22</i>	<i>35</i>	<i>2.37</i>
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a

<i>10</i>	<i>23</i>	<i>46.71</i>	<i>22</i>	<i>28</i>	<i>36.77</i>	<i>22</i>	<i>34</i>	<i>55.18</i>
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ΔT

<i>6.84</i>	<i>7.08</i>	<i>7.19</i>
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Date	1868.	Oct. 29.		
Observer	O. C. W.			
Illumin'n				
Star	Cephei. & Pegasi. & Piscium.			
Mag.				
δ	65°-31'	14°-30'	5°-40'	
Wire	a			
"	b			
"	c			
"	1	22-44-57.1	22-58-13.	23-21-18.7
"	2	45-0.	16.9	22.1
"	3	8.7	21.7	25.9
"	4	17.7	24.2	29.5
"	5	26.0	28.	32.9
"	d			
"	e			
"	f			
Sum		43.5	102.5	129.1
Mean		22-45-8.70	22 58 20.56	23-21-25.82
Red'n to				
m		+ .74	+ .74	+ .74
n. tan. δ		+ .57	- .29	- .36
c. sec. δ		- .12	- .05	- .05
r				
T		22 45 9.89	22 58 20.96	23 21 26.15
a		22 45 3.06	22 58 13.86	23 21 19.02
ΔT		6.83	7.10	7.13

Date	1868								Nov. 3
Observer									A. S.
Illumin'n									E.
Star									λ Draconis. & Picium.
Mag.									δ Aquilae
δ									70°-3' 4°-55' 8° 32'
Wire	a								
"	b								
"	c								
"	1	23-23-17.	23-33-11.9	19	44	22.1			
"	2	28.	15.9			26.0			
"	3	38.2	19.			29.6			
"	4	49.6	22.9			33.3			
"	5	59.9	26.5			36.8			
"	d								
"	e								
"	f								
Sum		192.7	96.2			147.8			
Mean		23-23-38.54	23-33-19.24	19	44	29.56			
Red'n to									
m		+1.74	+1.74			+1.74			
n. tan. δ		-1.61	-.36			-.30			
c. sec. δ		+ .15	-.05			-.05			
r									
T		23 23 37.82	23 33 19.57	19	44	29.95			
a		11 23 30.40	23 33 12.49	19	44	21.92			
ΔT		7.42	7.08			8.03			

Date	1868	Nov. 3	Nov. 3	Nov. 3
Observer		A. S.	A. S.	A. S.
Illumin'n		E.	E.	E.
Star		λ Ursae Minoris	τ Aquilae	α^2 Capricorni
Mag.				
δ		$88^\circ 55'$	$6^\circ 55'$	$12^\circ 57' S.$
Wire	a			
"	b			
"	c			
"	1		19 57 43.2	20 10 46.0
"	2	19 52 10.0	46.6	49.6
"	3	55 22.8	50.5	53.2
"	4		54.1	56.9
"	5	20 1 46.6	57.7	11 0.7
"	d			
"	e			
"	f			
Sum			252.1	266.4
Mean		19 55 23.26	19 57 50.42	20 10 53.28
Red'n to				
m		+ .74	+ .74	+ .74
n. tan. δ		+ 20.47	- .32	- .46
c. sec. δ		- 2.60	- .05	- .05
τ				
T		19 55 41.87	19 57 50.79	20 10 53.41
a	Reduced	19 55 33.98	19 57 42.99	20 10 45.36
ΔT		7.89	7.80	8.05

Nov. 3 1868. Illumination East
 $C' = -0.5$ as determined Oct. 29
 $n = +.40$ by λ Urs. Min. & τ Capricorni

Clock fast (at 20^h) 7^h 59^m
 last three stars not used.

Date	1868	Nov. 3	Nov. 3	Nov. 3
Observer		A.S.	A.S.	A.S.
Illumin'n		E.	E.	E.
Star		π Capricorni	ϵ Delphini	α Cygni
Mag.				
δ		$18^{\circ} 38' 7''$	$10^{\circ} 52'$	$44^{\circ} 49'$
Wire	a			
"	b			
"	c			
"	1	20 19 47.6	20 26 56.2	20 36 53.4
"	2	51.5	59.8	58.8
"	3	55.2	27 3.4	37 3.5
"	4	59.1	7.1	8.4
"	5	20 3.0	10.9	13.7
"	d			
"	e			
"	f			
Sum		276.4	17.4	17.8
Mean		20 19 55.28	20 27 3.48	20 37 3.56
Red'n to				
m		+ .74	+ .74	+ .74
n. tan. δ		- .50	- .29	+ .03
c. sec. δ		- .05	- .05	- .07
r				
T		20 19 55.47	20 27 3.88	20 37 4.26
a		20 19 47.51	20 26 55.96	20 36 57.29
ΔT		7.96	7.92	6.97

Eye piece removed
and replaced previous
to the last three
observations which
are defective for
some reason.

Date	1868	Nov. 3	Nov. 3	Nov. 4.
Observer		A. S.	A. S.	E. T. A.
Illumin'n		E.	E.	E.
Star		μ Aquarii	ν Cygni	15 Androm.
Mag.		9° 28' S.	40° 40'	
δ				
Wire	a			
"	b			
"	c			
"	1	20 45 34.8	20 52 15.4	23 28 11.9
"	2	38.1	20.5	16.7
"	3	41.8	25.0	21.2
"	4	45.6	29.8	25.9
"	5	49.0	34.7	30.5
"	d			
"	e			
"	f			
Sum		209.3	125.4	106.2
Mean		20 45 41.86	20 52 25.08	23 28 21.24
Red'n to				
m		+ .74	+ .74	
n. tan. δ		- .43	- .02	
c. sec. δ		- .05	- .07	
τ				
T		20 45 42.12	20 52 25.73	
a		20 45 33.71	20 52 16.72	
ΔT		8.41	9.01	

Not an
almanac star

Date	1868.	Nov. 4,						
Observer		E. P. A.						
Illumin'n		East.						
Star		16 Piscium.	e Piscium.	Gr.	4163.			
Mag.								
δ						4° 55'	73° 41'	
Wire	a							
"	b	Not an						
"	c	almanac star						
"	1	23 29	42.7	23 33	13.1	23 48	13.5	
"	2		46.2		16.8		26.5	
"	3		49.9		21.2		39.	
"	4		53.6		24.		52.9	
"	5		57.1		27.7	49	4.7	
"	d							
"	e							
"	f							
Sum			249.5		101.8		196.6	
Mean		23 29	49.9	23 33	20.36	23 48	39.32	
Red'n to								
m					+ .74		+ .74	
n. tan. δ					- .41		+ 1.25	
c. sec. δ					- .05		- .18	
r								
T				23 33	20.64	23 48	41.13	
a				23 33	12.45	23 48	32.83	
ΔT					8.19		8.30	

Nov. 4, 1868 Illumination East
 $C = -.05$ as determined Oct. 29
 $m = +.5$ [by Gr. 4163 & 4164]
 Clock fast at 0h 8.20

Date	1868	Nov. 4								
Observer	E. P. A.									
Illumin'n	E.									
Star	α Piscium. δ Androm. 4 Drac. S. C.									
Mag.										
δ	6° 8'	28° 22'	78° 21'							
Wire	a									
"	b									
"	c									
"	1	23	52	35.5	0	1	36.9	0	5	28.1
"	2			39.1			41.			45.9
"	3			42.8			45.	6		3.9
"	4			46.4			49.1			21.9
"	5			50.			53.			39.6
"	d									
"	e									
"	f									
Sum			213.8				225.			19.4
Mean		23	52	42.76	0	1	45.	0	6	3.88
Red'n to										
m				+ .74			+ .74			+ .74
n. tan. δ				- .40			- .19			- 2.88
c. sec. δ				- .05			- .06			+ .25
r										
T		23	52	43.05	0	1	45.49	0	6	1.99
a		23	52	34.85	0	1	37.29	12	5	53.79
ΔT				8.20			8.20			8.20

1868phae.proj..338S

Date	1868.	Nov. 6.							
Observer		A. S.							
Illumin'n		East.							
Star		α Pegasi, α Cephei, λ Draconis.							
Mag.									
δ		$14^{\circ}-30'$	$67^{\circ} 24'$	$70^{\circ} 3'$					
Wire	a								
"	b								
"	c								
"	1	22 58	14.5	23 13	05.7	23 23	19.3		
"	2		18.1		14.		29.9		
"	3		22.		24.6		40.2		
"	4		25.9		33.9		57.9		
"	5		29.5		43.8	24	01.3		
"	d								
"	e								
"	f								
Sum			110.0		122.0		201.6		
Mean		22 58	22.0	23 13	24.4	23 23	40.32		
Red'n to m			+ .61		+ .61		+ .61		
n. tan. δ			- .29		+ .67		- 1.65		
c. sec. δ			- .05		- .13		+ .15		
r									
T		22 58	22.27	23 13	25.55	23 23	39.43		
a		22 58	13.76	23 13	17.36	11 23	30.85		
ΔT			8.54		8.19		8.58		

Nov. 6, 1868 Illumination East.
 $c' = - .05$ as determined Oct. 29
 $n = + .45$
 Clock fast (at $(23\frac{1}{2})$) 8.565

Date	1868.	Nov. 6.						
Observer		A. S.						
Illumin'n		East.						
Star		α Piscium.	ω Piscium.	δ Androm.				
Mag.		$4^{\circ} 55'$	$6^{\circ} 8'$	$28^{\circ} 22'$				
δ								
Wire	a							
"	b							
"	c							
"	1	23 33 13.8	23 52 36.0	0 1 37.2				
"	2	17.4	39.7	41.4				
"	3	21.9	43.5	45.3				
"	4	24.5	52.6	49.6				
"	5	28.	46.9	53.7				
"	d							
"	e							
"	f							
Sum		104.6	216.7	227.2				
Mean		23 33 20.92	23 52 43.54	0 1 45.44				
Red'n to								
m		+1.61	+1.61	+1.61				
n. tan. δ		-1.37	-1.36	-1.17				
c. sec. δ		-1.05	-1.05	-1.06				
r								
T		23 33 21.11	23 52 43.74	0 1 45.82				
a		23 33 12.43	23 52 34.83	0 1 37.27				
ΔT		8.68	8.91	8.55				

Date	1868	Nov. 6.	Nov. 7.	
Observer		A. S.	A. S.	
Illumin'n		East.	East.	
Star		4 Drac. L. C.	π Aquarii.	9 Drac. L. C.
Mag.		$78^{\circ} 21'$	$0^{\circ} 43'$	$76^{\circ} 23'$
δ				
Wire	a			
"	b			
"	c			
"	1	0 5 28.1	22 18 35.7	22 23 26.4
"	2	45.2	39.4	41.8
"	3	6 3.7	42.8	57.1
"	4	22.4	46.3	24 12.0
"	5	39.2	50.0	27.5
"	d			
"	e			
"	f			
Sum		18.2	214.2	284.8
Mean		0 6 3.64	22 18 42.84	22 23 56.96
Red'n to				
m		+ .61	+ .61	+ .61
n. tan. δ		-2.60	-1.52	-2.92
c. sec. δ		+ .25	- .05	+ .21
r				
T		0 6 2.90	22 18 42.88	22 23 57.86
a		12 5 53.94	22 18 34.35	10 23 47.58
ΔT		8.96	+ 8.53	7.28

Nov. 7 1868. Illumination East

$c' = -.05$ at m Oct. 29
 $m = +.58$

Clock fast (at 21^h) 8.46

Date	1868.	Nov. 7.		
Observer	A. S.			
Illumin'n	East			
Star	226 Cephei. Cephei. Pisc. Austr.			
Mag.				
δ	75° 33'	65° 31'	-30° 19'	
Wire	a			
"	b			
"	c			
"	1	22 29 37.8	22 57 23.9	
"	2	52.0 22 45	0.9 28.0	
"	3	30 6.1	9.3 32.1	
"	4	19.8	18.4 36.2	
"	5	35.4	27.3 40.7	
"	d			
"	e			
"	f			
Sum		31.1	160.9	
Mean	23 30	6.02 22 45	9.60 22 57	32.18
Red'n to				
m		+ .61	+ .61	+ .61
n. tan. δ		+ 1.72	+ .75	- .87
c. sec. δ		- 0.20	- .114	- .06
r				
T	23 30	8.15 22 45	10.82 22 57	32.45
a	22 29	6.03 22 44	62.70 22 57	23.48
ΔT		7.28	8.42	8.97

Date	1868.	Nov. 7.				Nov. 12.
Observer		A. S.				O. C. W.
Illumin'n		East.				East.
Star		α Pegasus.		α Andromedae		α Cephei.
Mag.						
δ		$14^{\circ} 30'$		$28^{\circ} 22'$		$67^{\circ} 24'$
Wire	a					
"	b					
"	c					
"	1	22 58 14.0	0	1 37.0	23 13 5.9	
"	2	18.6		41.3	15.5	
"	3	22.1		45.5	25.2	
"	4	25.8		49.5	34.2	
"	5	29.5		53.4	43.7	
"	d					
"	e					
"	f					
Sum		110.0		226.7	124.5	
Mean		22 58 22.0	0	1 45.34	23 13 24.9	
Red'n to						
m		+ .61		+ .61	+ .61	
n. tan. δ		- .38		- .21	+ .58	
c. sec. δ		- .05		- .06	- .13	
r						
T		22 58 22.18	0	1 45.68	23 13 25.96	
a		22 58 13.74	0	1 37.26	23 13 17.12	
ΔT		8.44		8.42	8.84	

Date	1868.	Nov. 12.		
Observer		O. C. Tr.		
Illumin'n		East.		
Star		θ Piscium.	ϵ Piscium.	ω Piscium.
Mag.				
δ		$5^{\circ} 40'$	$4^{\circ} 55'$	$6^{\circ} 8'$
Wire	a			
"	b			
"	c			
"	1	23 21 20.4	23 33 13.9	23 52 36.1
"	2	24.0	17.6	40.0
"	3	27.7	21.0	43.4
"	4	31.1	24.8	47.1
"	5	35.0	28.5	51.0
"	d			
"	e			
"	f			
Sum		138.2	105.8	217.6
Mean		23 21 27.64	23 33 21.16	23 52 43.52
Red'n to				
m		+ .61	+ .61	+ .61
n. tan. δ		- .32	- .32	- .31
c. sec. δ		- .05	- .05	- .05
τ				
T		23 21 27.88	23 33 21.40	23 52 43.77
a		23 21 18.87	23 33 12.38	23 52 34.78
ΔT		9.01	9.02	8.99

Nov. 12 1868 Illumination East
 $C' = -.05$ as determined Oct. 29
 $n = +.39$ from α Cephei & κ Draconis
 Clock fast (at 23 $\frac{3}{4}$) 9.01

Date 1868. Nov. 12.

Observer

O. C. W.

Illumin'n

East.

Star

 α Androm. γ Pegasi. κ Draconis.

Mag.

 δ $28^{\circ} 22'$ $14^{\circ} 27'$ $70^{\circ} 31'$

Wire

a

seems to be
some other star
near α Androm.

"

b

"

c

"

1

23 59 49.1 0 6 30.6 0 27 35.5

"

2

53.6

34.1

46.1

"

3

57.7

38.1

57.1

"

4

0 0 1.8

41.9

28

7.8

"

5

6.0

45.5

19.0

"

d

"

e

"

f

Sum

288.2

190.2

285.5

Mean

23 59 57.64 0 6

38.04 0 27

57.1

Red'n to

m

+.61

+.61

n. tan. δ

-.25

-1.46

c. sec. δ

-.05

+.15

r

T

0 6 38.35 0 27 56.40

a

0 6 29.35 12 27 47.58

 ΔT

9.00

8.82

Date	1868.	Nov. 12.	Nov. 13.		
Observer		O. C. W.	Davis.		
Illumin'n		East.	East.		
Star		α Cassiope.	α Cassiope.	η Picium.	
Mag.		58° 49'	69° 35'	14° 41'	
δ					
Wire	a				
"	b				
"	c				
"	1	0 33 1.7	1 21 21.1	1 24 30.0	
"	2	8.1	31.4	33.9	
"	3	14.3	41.9	37.5	
"	4	21.0	52.0	41.3	
"	5	27.05	22 3.0	45.0	
"	d				
"	e				
"	f				
Sum		72.15	209.4	187.7	
Mean		0 33 14.43	1 21 41.88	1 24 37.54	
Red'n to					
m		+ .61	+ .61	+ .61	
n. tan. δ		+ .22	+ .69	- .25	
c. sec. δ		- .09	- .14	- .05	
τ					
T		0 33 15.17	1 21 43.04	1 24 37.85	
a		0 33 6.43	1 21 34.07	1 24 28.60	
ΔT		8.74	8.97	9.25	

Nov. 13 1868.
 Illumination East
 $c' = -.057$ as on Nov. 12
 $n = +.39$

Clock fast (at $1\frac{3}{4}$) 9.23

Date	1868.	Nov. 13.	Nov. 16.
Observer		Bridge.	A. S.
Illumin'n			East.
Star		β Arietis	α Arietis, α Pic. Auct.
Mag.		$20^{\circ} 10'$	$22^{\circ} 50'$ $-30^{\circ} 19'$
δ			
Wire	a		
"	b		
"	c		
"	1	1 47 25.8	1 57 48.9 22 50.24.2
"	2	29.8	53.4 28.4
"	3	33.5	56.7 32.7
"	4	37.3 2	0 0.4 36.8
"	5	41.1	4.3 41.0
"	d		
"	e		
"	f		
Sum		167.5	283.3 163.1
Mean		1 47 33.5	1 57 56.66 22 50 32.62
Red'n to			
m		+ .61	+ .61 + .55
n. tan. δ		- .21	- .19 - .49
c. sec. δ		- .05	- .05 - .06
r			
T		1 47 33.85	1 59 57.03 22 50 32.62
a		1 47 24.62	1 59 47.82 22 50 23.32
ΔT		9.23	9.21 9.30

Date	1868.	Nov. 16.		
Observer		A. S.		
Illumin'n		East.		
Star		α Lepaci.	θ Picium.	γ Cephei.
Mag.		14° 30'	5° 40'	76° 54'
δ				
Wire	a			
"	b			
"	c			
"	1	22 58 15.1	23 21 20.4	23 33 39.1
"	2	18.8	24.1	55.1
"	3	22.6	27.8	34 10.8
"	4	26.1	31.1	26.9
"	5	30.0	34.6	42.5
"	d			
"	e			
"	f			
Sum		112.5	138.3	54.2
Mean		22 58 22.50	23 21 27.66	23 34 10.84
Red'n to				
m		+ .55	+ .55	+ .55
n. tan. δ		- .21	- .27	+ 1.12
c. sec. δ		- .05	- .05	- .13
r				
T		22 58 22.79	23 21 27.89	23 34 12.38
a		22 58 13.63	23 21 18.83	23 34 3.20
ΔT		9.16	9.06	9.18

Nov. 16 1868 Illumination East
 $c' = -.05$ as determined Oct. 24
 $n = +.33$ from γ 41.63 Do. Res. Aust.
 Clock fast (at 23 $\frac{1}{2}$) 9.05.

Date 1868. Nov. 16.

Observer A. D.
Illumin'n East.Star ω Piscium & Androm. 4 Dracon. C.
Mag. $6^{\circ} 8'$ $28^{\circ} 22'$ $78^{\circ} 21'$

Wire a

" b

" c

" 1

" 2

" 3

" 4

" 5

" d

" e

" f

Sum

Mean

Red'n to

m

n. tan. δ c. sec. δ τ

T

a

 ΔT

23	52	36.7	0	1	37.6	0	5	27.1
		40.0			41.7			46.0
		43.0			45.8		6	3.4
		46.9			49.8			19.9
		51.0			54.0			40.0

23	52	43.52	0	1	45.78	0	6	3.28
----	----	-------	---	---	-------	---	---	------

		+ .55			+ .55			+ .55
		- .26			- .12			- 1.90
		- .05			- .06			+ .25

23	52	43.76	0	1	46.15	0	6	2.18
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23	52	34.74	0	1	37.18	12	5	55.24
----	----	-------	---	---	-------	----	---	-------

		9.02			8.97			6.94
--	--	------	--	--	------	--	--	------

Focus badly adjusted

Date	1868.	Nov. 16.	Nov. 19		
Observer		A. S.	O. C. W.		
Illumin'n		East.	East.		
Star		Gr. 4163.	Gr. 4163.	2 Androm.	
Mag.		73° 41'	73° 41'	28° 22'	
δ					
Wire	a				
"	b				
"	c				
"	1	23 48 14.0	23 48 13.4	0 1 37.4	
"	2	27.5	26.4	41.8	
"	3	40.8	39.3	45.8	
"	4	53.2	52.0	49.9	
"	5	49 5.8	49 4.9	53.9	
"	d				
"	e				
"	f				
Sum		201.3	196.0	228.8	
Mean		23 48 40.26	23 48 39.2	0 1 45.76	
Red'n to					
m		+ .53	+ .55	+ .55	
n. tan. δ		+ .82	+ 0.67	- .10	
c. sec. δ		- .18	- .18	- .06	
r					
T		23 48 41.45	23 48 40.24	0 1 46.15	
a		23 48 32.17	23 48 32.06	0 1 37.14	
ΔT		9.28	8.48	9.01	

Nov. 19 1868. Illumination East.
 $c' = -10.5$ as determined Oct. 29.
 $n = +0.27$ by Polaris 832 Comp. fill.

clock fast (at $0^h \frac{1}{2}$) $8^s.94$

Date

Observer

Illumin'n

Star

Mag.

 δ

γ Ugeasi, R. Lac. S. C. & Cassiope
 $14^{\circ}27'$ $70^{\circ}31'$ $55^{\circ}49'$

Wire

a

"

b

"

c

"

1

"

2

"

3

"

4

"

5

"

d

"

e

"

f

0 6 30.6 0 27 35.8 0 33 0.9
 34.1 46.5 8.3
 37.9 57.4 14.4
 41.8 28 8.3 20.8
 45.3 18.8 27.4

Sum

Mean

189.7 286.8 71.8
 0 6 37.94 0 27 57.36 0 33 14.36

Red'n to

m

n. tan. δ c. sec. δ

+ .55

- .18

- .05

+ .55

- .01

+ .15

+ .55

+ .15

- .10

 r

T

a

 ΔT

0 6 38.26 0 27 57.05 0 33 14.96
 0 6 29.27 12 27 48.0 0 33 6.30
 8.99 9.05 8.66

Date	1868	Nov. 17.						
Observer		O. C. W.						
Illumin'n		East.						
Star		β Ceti.		32 Cam. foll. st. C Piscium.				
Mag.								
δ		$-18^{\circ} 43'$		$84^{\circ} 8'$		$7^{\circ} 11'$		
Wire	a							
"	b							
"	c							
"	1	0 37	1.8	0 46	58.2	0 56	10.0	
"	2		5.6	47	33.6		13.7	
"	3		7.2	48	8.6		17.2	
"	4		13.9		44.5		21.0	
"	5		17.0	49	19.6		24.6	
"	d							
"	e							
"	f							
Sum			46.6		44.5		86.5	
Mean		0 37	9.32	0 48	8.9	0 56	17.3	
Red'n to								
m			+ .55		+ .55		+ .55	
n. tan. δ			- .34		- 2.87		- .21	
c. sec. δ			- .05		+ .49		- .05	
τ								
T		0 37	9.48	0 48	7.07	0 56	17.59	
a		0 36	60.38	12 47	58.14	0 56	8.65	
ΔT			9.10		8.93		8.94	

Date	1868.	Nov. 19.	Nov. 23.
Observer	O. C. W.	O. C. W.	
Illumin'n	East.	East.	
Star	Polaris.	A Cassiope.	2 Cassiope.
Mag.			
δ	88° 37'	69° 35'	55° 49'
Wire	a		
"	b		
"	c		
"	1	1 21 21.0	0 33 2.20
"	2	1 9 28.9	31.9 8.70
"	3	11 48.2	41.8 15.00
"	4	14 22.2	52.7 21.30
"	5	16 39.1	22 2.4 27.90
"	d		
"	e		
"	f		
Sum		209.8	75.10
Mean	1 11 50.29	1 21 41.96	0 33 15.02
Red'n to			
m	+ .55	+ .55	+ .54
n. tan. δ	+ 16.80	+ .42	+ .16
c. sec. δ	- 2.05	- .14	- .09
r			
T	1 11 59.59	1 21 42.79	0 33 15.59
a	Reduced 1 11 50.68	1 21 33.93	0 33 6.22
ΔT	8.91	8.86	9.37

Date	1868.	Nov. 23.		
Observer	A. S.		O. C. W.	
Illumin'n	East.			
Star	A Cassiope. γ Piscium. γ Ceti			
Mag.				
δ	69° 35'	14° 40'	2° 41'	
Wire	a			
"	b			
"	c			
"	1	1 21 21.70	1 24 30.80	2 36 33.70
"	2	32.10	34.70	37.10
"	3	42.90	38.20	40.70
"	4	54.10	42.00	44.40
"	5	22 3.10	45.90	47.80
"	d			
"	e			
"	f			
Sum		254.10	191.60	203.70
Mean	1 21	42.82	1 24 38.32	2 36 40.74
Red'n to				
m		+ .51	+ .51	+ .51
n. tan. δ		+ .42	- .18	- .23
c. sec. δ		- .14	- .05	- .05
r				
T	1 21	43.61	1 24 38.60	2 36 40.97
a	1 21	33.80	1 24 28.55	2 36 31.14
ΔT		9.81	10.05	9.93

Nov. 23 1868 Illumination East
 $C' = -.05$ $n = +.27$ assumed as on Nov. 19

Block fast (at $1\frac{1}{2}^h$) 9^s.99

1868phae,proj..3388

Date	1868	Nov. 27								
Observer		A. S.								
Illumin'n		E.								
Star		λ Draconis		ϵ Piscium		Gr. 4163				
Mag.		70° 3'		4° 55'		73° 41'				
δ										
Wire	a									
"	b									
"	c									
"	1	23	23	21.6	23	33	15.2	23	48	16.0
"	2			31.9			28.8			28.2
"	3			42.5			22.3			41.6
"	4			53.3			25.9			54.7
"	5		24	4.0			29.8		49	2.0
"	d									
"	e									
"	f									
Sum				213.3			112.0			202.5
Mean		23	23	42.66	23	33	22.40	23	48	40.50
Red'n to										
m				+ .51			+ .51			+ .51
n. tan. δ				- 1.03			- .23			+ .70
c. sec. δ				+ .15			- .05			- .18
r										
T		23	23	42.29	23	33	22.63	23	48	41.53
a		11	23	31.55	23	33	12.20	23	48	31.57
ΔT				10.74			10.43			9.96

Nov. 27 1868, Illumination East.
 $c' = -.05$ assumed as determined Oct. 29
 $n = +.28$ from Polaris, 32 Cam.

clock fast (at $0^h \frac{1}{3}$) $10^s.34$

Date	1868	Nov. 27								
Observer		A. S.								
Illumin'n		E.								
Star		α Piscium	γ Andromedae	4 Draconis						
Mag.		6° 8'	28° 22'	78° 21'						
δ										
Wire	a									
"	b									
"	c									
"	1			0	1	39.1				
"	2					43.4	0	5	48.9	
"	3					47.3		6	8.7	
"	4					51.6			25.7	
"	5	23	52	52.3		55.6			43.0	
"	d									
"	e									
"	f									
Sum						237.0				
Mean		23	52	44.98	0	1	47.40	0	6	7.58
Red'n to										
m				+ .51		+ .51			+ .51	
n. tan. δ				- .22		- .10			- 1.62	
c. sec. δ				- .05		- .06			+ .25	
r										
T		23	52	45.22	0	1	47.75	0	6	6.72
a		23	52	34.63	0	1	37.03	12	5	54.87
ΔT				10.59			10.72			11.85

Date	1868	Nov. 27		
Observer		A. P.		
Illumin'n		E.		
Star		κ Draconis	α Cassiopeae	β Ceti
Mag.				
δ		$70^{\circ} 31'$	$55^{\circ} 49'$	$-18^{\circ} 43'$
Wire	a			
"	b			
"	c			
"	1	0 27 37.9	0 33 2.6	0 37 3.2
"	2	48.0	9.0	7.0
"	3	59.8	15.3	10.9
"	4	28 10.0	21.8	14.5
"	5	20.7	28.5	18.3
"	d			
"	e			
"	f			
Sum		296.4	77.2	53.9
Mean		0 27 59.28	0 33 15.44	0 37 10.78
Red'n to				
m		+ .51	+ .51	+ .51
n. tan. δ		- 1.05	+ .16	- .30
c. sec. δ		+ .15	- .09	- .05
r				
T		0 27 58.89	0 33 16.02	0 37 10.89
a		12 27 47.86	0 33 6.34	0 37 0.39
ΔT		14.03	9.68	10.50

Date	1868	Nov. 27			
Observer		A. S.			
Illumin'n		E.			
Star		32 Camelopard (foll.)	ϵ Piscium	Polaris	
Mag.					
δ		$84^{\circ} 7'$	$7^{\circ} 11'$	$88^{\circ} 37'$	
Wire	a				
"	b				
"	c				
"	1	0 47 4.3	0 56 11.5	1 9 16.0	
"	2	35.0	15.2	11 41.3	
"	3	48 10.6	18.8	14 14.5	
"	4	45.7	22.3	16 48.0	
"	5	49 20.9	26.0		
"	d				
"	e				
"	f				
Sum		53.5	93.8		
Mean		0 48 10.70	0 56 18.76	1 11 45.64	
Red'n to					
m		+ .57	+ .51	+ .51	
n. tan. δ		-2.98	- .22	+11.20	
c. sec. δ		+ .49	- .05	-2.05	
r					
T		0 48 8.72	0 56 19.02	1 11 55.30	
a		12 47 59.41	Reduad 0 56 8.66	Reduad 1 11 46.16	
ΔT		9.31	10.36	9.14	

Date 1868. Dec. 2.

Observer O. C. W.

Illumin'n East.

Star γ Piccium, α Piccium, β Anit's.Mag. $14^{\circ} 40'$ $8^{\circ} 30'$ $20^{\circ} 10'$

Wire a

" b

" c

" 1

" 2

" 3

" 4

" 5

" d

" e

" f

Sum

Mean

Red'n to

m

n. tan. δ c. sec. δ

r

T

a

A T

1	24	33.10	1	38	33.40	1	47	28.70
		37.00			37.00			32.70
		40.60			40.80			36.40
		44.50			44.30			40.10
		48.00			48.20			44.20

		203.20			203.70			182.10
1	24	40.64	1	38	40.74	1	47	36.42

1	24	28.47	1	38	28.72	1	47	24.55
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Date	1868. Dec. 2.				
Observer	O. C. W.				
Illumin'n	East,				
Star	50 Cassiope. & Arctis.			65 Ceti.	
Mag.	71° 47'			22° 50'	8° 14'
δ					
Wire	a				
"	b				
"	c				
"	1	1 52 9.4	1 59 57.8	2 6 8.4	
"	2	21.0	55.8	12.0	
"	3	32.3	59.7	15.7	
"	4	44.0	2 0 3.6	19.4	
"	5	55.6	7.6	22.9	
"	d				
"	e				
"	f				
Sum		162.3	298.5	78.4	
Mean		1 52 32.46	1 59 59.7	2 6 15.68	
Red'n to					
m					
n. tan. δ					
c. sec. δ					
r					
T					
a		1 52 20.80	1 59 47.77	2 6 63.88	
ΔT					

Date	1868 Dec. 3									
Observer										
Illumin'n										
Star	o Piscium			B. Arctis			50 Cassiopeae			
Mag.	8° 30'			20° 10'			71° 47'			
δ										
Wire	a									
"	b									
"	c									
"	1	1	38	33.0	1	47	28.9	1	52	9.0
"	2			37.			32.9			20.8
"	3			40.6			36.3			32.0
"	4			44.1			40.4			42.8
"	5			48.0			44.0			54.8
"	d									
"	e									
"	f									
Sum				202.7			182.5			159.4
Mean		1	38	40.54	1	47	36.50	1	52	31.88
Red'n to										
m				+ .39			+ .39			+ .39
n. tan. δ				- .24			- .17			+ .16
c. sec. δ				- .05			- .05			- .16
r										
T		1	38	40.64	1	47	36.67	1	52	32.77
a		1	38	28.73	1	47	24.57	1	52	20.82
ΔT				11.91			12.10			11.95

Dec. 3 1868
 Illumination East
 $c' = -.05$ as determined Oct. 29
 $n = +.39$ from 50 Cass. & Draconis.
 Clock fast (at $1\frac{3}{4}$) 11.98

Date	1868	Dec. 3		Dec. 4.
Observer		A. S.		A. S.
Illumin'n		E.		East.
Star		α Draconis	ϵ Ceti	γ Piscium.
Mag.				
δ		$65^{\circ} 0'$	$8^{\circ} 14'$	$6^{\circ} 8'$
				ω Piscium.
Wire	a			
"	b			
"	c			
"	1	2 0 42.1	2 6 8.0	23 52 39.1
"	2	51.2	11.9	42.8
"	3	59.0	15.6	46.3
"	4	1 7.7	19.1	51.0
"	5	16.4	22.9	53.8
"	d			
"	e			
"	f			
Sum		296.4	77.5	232.0
Mean		2 0 59.28	2 6 15.50	23 52 46.40
Red'n to				
m		+ .39	+ .39	+ .39
n. tan. δ		-.95	-.24	-.25
c. sec. δ		+ .12	-.05	-.05
r				
T		2 0 58.84	2 6 15.60	23 52 46.49
a		14 0 46.87	2 6 3.67	23 52 34.55
ΔT		11.97	11.93	11.94

Date	1868 Dec. 4.						
Observer	A. S.						
Illumin'n	East.						
Star	Anderson 41 Draconis, 16 Draconis						
Mag.	not an almanac star						
δ	33 Piscium	78° 20'	70° 30'				
Wire	a						
"	b						
"	c						
"	1		1 5 34.9	1 27 40.4			
"	2	23 58 45.2	52.1	50.9			
"	3	48.9	6 9.4	28 1.9			
"	4	52.9	57.6	12.8			
"	5	56.4	45.0	23.7			
"	d						
"	e						
"	f						
Sum			49.0	9.7			
Mean		0 6 9.80	0 28 1.94				
Red'n to							
m			+ .39	+ .39			
n. tan. δ			- 1.76	- 1.76			
c. sec. δ			+ .25	+ .15			
r							
T		0 6 8.65	0 28 1.32				
a		12 5 56.60	12 27 48.91				
ΔT		12.05	12.41				

Dec. 4 1868 Illumination East
 $c' = -.05$ as determined Oct. 29
 $n = +.31$ from 4 Draconis & 21 Cassiopeae
 Clock fast (at 0^h) 11.91⁵

Date	1868. Dec. 4											
Observer	A. S.											
Illumin'n	East.											
Star	α Cassio. 21. Cassio. α Androm.											
Mag.	55° 49' 74° 16' 28° 22'											
Wire	a											
"	b											
"	c											
"	1	0	33	4.1	0	36	50.00	1	41.4			
"	2			10.9		37	2.9		44.7			
"	3			17.1			15.9		48.8			
"	4			23.9			29.4		52.8			
"	5			30.4					56.9			
"	d											
"	e											
"	f											
Sum				86.4					243.6			
Mean		0	33	17.28	0	37	16.24	0	1	48.72		
Red'n to												
m				+ .39			+ .39		+ .39			
n. tan. δ				+ .17			+ .82		- .11			
c. sec. δ				- .09			- .18		- .06			
r												
T		0	33	17.75	0	37	17.27	0	1	48.96		
a		0	33	5.99	0	37	5.24	0	1	36.94		
Δ T				11.76			12.03			12.02		

Date	1868.	Dec. 8.								
Observer		O. C. W.								
Illumin'n		East.								
Star		ϵ Piscium.	Polaris.		η Piscium.					
Mag.		$7^{\circ} 11'$	$88^{\circ} 37'$		$14^{\circ} 40'$					
δ										
Wire	a									
"	b									
"	c									
"	1	0	56	13.0		1	24	33.0		
"	2			16.8				36.6		
"	3			20.2	1	11	30.9	40.2		
"	4			24.0		13	59.4	44.0		
"	5			27.8		16	27.6	47.8		
"	d									
"	e									
"	f									
Sum				101.8				201.6		
Mean		0	56	20.36	1	11	29.68	40.32		
Red'n to										
m				+ .39			+ .39	+ .39		
n. tan. δ				- .31			+ 16.00	- .26		
c. sec. δ				+ .13			+ 5.32	+ .13		
τ										
T		0	56	20.57	1	11	51.39	1	24	40.58
a		0	56	2.50	1	11	39.07	1	24	28.45
ΔT				12.07			11.32			12.13

Dec. 8 1868 Illumination East
 $c' = +.13$ determined Dec. 11
 n by trial $+ .40$

Clock fast (at $1\frac{1}{2}$) $12^h 10^m$

Date 1868. Dec. 8.

Observer O. C. W.
Illumin'n East.Star α Piscium. β Arietis. 50° Cassiope.
Mag. $8^\circ 30'$ $21^\circ 10'$ $71^\circ 47'$ Wire a
" b
" c
" 1
" 2
" 3
" 4
" 5
" d
" e
" f

1	38	33.1	1	47	28.7	1	52	8.2
		37.0			32.4			19.9
		40.6			36.3			30.9
		44.2			40.0			42.5
		47.9			44.0			54.3

Sum		202.8			181.4			155.8	
Mean	1	38	40.56	1	47	36.28	1	52	31.16

Red'n to m		+ .39			+ .39			+ .39
n. tan. δ		- .30			- .22			+ .85
c. sec. δ		+ .13			+ .14			+ .41

T	1	38	40.78	1	47	36.59	1	52	32.81
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a				1	47	24.52	1	52	20.65
	1	38	28.67						

ΔT			12.09			12.07			12.16
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Date	1868.	Dec. 8.		Dec. 10
Observer		O. C. W.		A. S.
Illumin'n		East.		E.
Star		α Orionis	65 Ceti.	γ Pegasi
Mag.		22° 50'	8° 14'	14° 27'
Wire	a			
"	b			
"	c			
"	1	1 59 51.6	2 6 8.1	0 6 33.7
"	2	55.7	11.9	37.5
"	3	59.4	15.6	40.9
"	4	25 0 3.5	19.1	44.8
"	5	7.4	22.8	48.6
"	d			
"	e			
"	f			
Sum		297.6	77.5	205.3
Mean		1 59 59.52	2 6 15.50	0 6 41.06
Red'n to				
m		+ .39	+ .39	+ .39
n. tan. δ		- .20	- .31	- .24
c. sec. δ		+ .14	+ .13	+ .13
r				
T		1 59 59.85	2 6 15.71	0 6 41.34
a		1 59 41.75	2 6 3.54	0 6 29.05
ΔT		12.10	12.17	12.29

Date	1868 Dec. 10		
Observer	H. S.		
Illumin'n	E.		
Star	K Draconis & Cassiopea & Piscium		
Mag.			
δ	70° 31'	55° 49'	7° 11'
Wire	a		
"	b		
"	c		
"	1	0 33 4.3	0 56 13.0
"	2	0 27 58.4	10.9
"	3	218 2.4	17.0
"	4	13.2	20.2
"	5	24.2	23.4
"	d		24.1
"	e		27.8
"	f		
Sum		85.4	101.9
Mean	0 28 2.4	0 33 17.08	0 56 20.38
Red'n to			
m	+ .39	+ .39	+ .39
n. tan. δ	-1.37	+ .20	- .28
c. sec. δ	- .39	+ .23	+ .13
τ			
T	0 28 1.03	17.90	0 56 20.67
a	12 27 49.32	0 33 5.83	0 56 8.48
ΔT	11.71	12.13	12.14

Dec. 10, 1868 Illumination East
 c' by observation Dec. 11 +.13
 n of. Polaris 332 Cam. +.365
 Clock fast (at 0^h₁²) -12.18

Date	1868	Dec. 10	Dec. 10	Dec. 10
Observer		A. S.		A. S.
Illumin'n		E		
Star		32 Cam. foll.	Polaris	β Ceti
Mag.		84° 7'	88° 37'	18° 43' S.
Wire	a			
"	b			
"	c			
"	1	0 47 7.2	1 6 30.5	0 37 4.7
"	2	41.8	56.9	8.7
"	3	48 17.5	11 32.0	12.0
"	4	52.9	13 57.5	16.0
"	5	49 28.2	16 25.1	19.9
"	d			
"	e			
"	f			
Sum		87.6	142.0	61.3
Mean		0 48 17.52	28.40	0 37 12.26
Red'n to				
m		+ .39	+ .39	+ .39
n. tan. δ		- 3.88	+ 14.60	- .46
c. sec. δ		- 1.27	+ 5.32	+ .14
r				
T		0 48 12.76	48.71	0 37 12.33
a		12 47 6.78	37.75 36.43	0 37 0.15
ΔT		10.98	10.96	12.18

Date	1868	Dec. 10								
Observer	A. S.									
Illumin'n	E.									
Star	α Andromedae			γ Pegasi			α Cassiopeae			
Mag.	28° 22'			14° 27'			55° 49'			
δ										
Wire	a									
"	b									
"	c									
"	1	0	1	38.9	0	6	32.0	0	33	2.4
"	2			42.9			35.8			9.2
"	3			47.5			39.5			15.6
"	4			51.4			43.0			21.8
"	5			55.0			47.0			28.3
"	d									
"	e									
"	f									
Sum				235.7			197.3			77.3
Mean		0	1	47.14	0	6	39.46	0	33	15.46
Red'n to										
m				+ .39			+ .39			+ .39
n. tan. δ				- .11			- .14			+ .16
c. sec. δ				+ .15			+ .13			+ .23
τ										
T		0	1	47.57	0	6	39.79	0	33	16.24
a		0	1	36.78	0	6	28.99	0	33	5.69
ΔT				10.79			10.80			10.55

Dec. 15 1866 Illumination East
 $c' = +.13$ as determined Dec. 11
 $n = +.29$ from 21 Cassiopeae & 32 Canis
 block fast (at $0^{\frac{h_1}{4}}$) 10.571

Date	1868	Dec. 15	Dec. 18
Observer	A. S.	A. S.	A. S.
Illumin'n	E.	E.	E.
Star	21 Cassiopeiæ	32 Camelopardell.	32 Camelopardell.
Mag.			
δ	$74^{\circ} 16'$	$84^{\circ} 7'$	$84^{\circ} 7'$
Wire	a		
"	b		
"	c		
"	1	0 36 46.7	0 47 5.7
"	2	37 0.6	47 41.4
"	3	13.7	48 16.2
"	4	27.4	51.5
"	5	40.0	29 26.6
"	d		
"	e		
"	f		
Sum		68.4	87.7
Mean	0 37	13.68	0 48 17.54
Red'n to			
m		+ .39	+ .39
n. tan. δ		+ .77	- 3.09
c. sec. δ		+ .48	- 1.27
r			
T	0 37	15.32	0 48 13.57
a	0 37	4.52	12 48 2.83
ΔT		10.80	10.74
			9.29

Date	1868	Dec. 18				
Observer		A. S.				
Illumin'n		E.				
Star		ϵ Piscium		Polaris		α Piscium
Mag.		7° 11'		88° 37'		8° 30'
δ						
Wire	a					
"	b					
"	c					
"	1	0 56 40.8	1 6 27.0	1 38 31.0		
"	2	14.7	8 54.0			
"	3	18.2	11 27.1			
"	4	21.9	13 54.5			
"	5	25.7	16 22.5			
"	d					
"	e					
"	f					
Sum		91.3		125.1		
Mean		0 56 18.26	1 11 25.02			
Red'n to						
m		+39		+39		
n. tan. δ		-119		+10.60		
c. sec. δ		+13		+5.32		
r						
T		0 56 18.62		40.74		
a		0 56 8.45	1 11 31.58	1 38 28.61		
ΔT		10.17		9.16		

Dec. 18 1868 Illumination East
 $C' = +.13$ as determined Dec. 11
 $n = +.25$ by Polaris & 32 Cam
Clock fast (at $1\frac{1}{2}$) 10.11

Date	1868	Dec. 18	Dec. 19
Observer	A.S.	A.S.	
Illumin'n	E.	E.	
Star	β Arietis	α Arietis	β Ceti
Mag.			
δ	$20^{\circ} 10'$	$22^{\circ} 50'$	$18^{\circ} 43' \phi$
Wire	a		
"	b		
"	c		
"	1	1 47 26.3	1 59 49.6
"	2	30.3	53.3
"	3	34.0	57.3
"	4	37.9	2 0 1.3
"	5	41.8	5.0
"	d		
"	e		
"	f		
Sum	170.3	286.5	48.2
Mean	1 47 34.06	1 59 57.40	0 37 9.64
Red'n to m	+ .39	+ .39	+ .37
n. tan. δ	- .13	- .12	- .29
c. sec. δ	+ .14	+ .14	+ .14
r			
T	1 47 34.46	1 59 57.81	0 37 9.86
a	1 47 24.43	1 59 47.68	0 37 0.04
ΔT	10.03	10.13	9.82

Date	1868	Dec. 19										
Observer		A. J.										
Illumin'n		E.										
Star		32 Camelopard (foll.)			ϵ Piscium			Polaris				
Mag.		84° 7'			7° 11'			88° 37'				
δ												
Wire	a											
"	b											
"	c											
"	1	0	47	6.4	0	56	10.7	1	6	22.9		
"	2			40.2			14.0	1	8	53.0		
"	3		48	15.1			17.6		11	32.2		
"	4			49.7			21.3		13	57.6		
"	5		49	27.6			25.1		16	27.6		
"	d											
"	e											
"	f											
Sum				79.0			88.7			123.3		
Mean		0	48	15.80	0	56	17.74	1	11	24.66		
Red'n to												
m				+1.37			+1.37			+1.37		
n. tan. δ				-2.45			-1.18			+9.20		
c. sec. δ				-1.27			+1.13			+5.32		
τ												
T		0	48	12.45	0	56	18.06	1	11	39.55		
a		12	48	3.66	Reduced	0	56	8.39	Reduced	1	11	30.67
ΔT				8.79			9.67					8.88

Dec. 19 1868 Illumination East
 $c' = +1.13$ as determined Dec. 11
 $n = +.23$ by 32 learn. of Polaris
 Clock fast (at $1\frac{1}{2}$) 9^s.67

Date	1868	Dec. 19				
Observer		A. S.				
Illumin'n		E.				
Star		δ Cassiopeae	η Piscium	σ Piscium		
Mag.		$69^{\circ} 35'$	$14^{\circ} 40'$	$8^{\circ} 30'$		
Wire	a					
"	b					
"	c					
"	1	1 21 21.0	1 24 30.0	1 38 30.6		
"	2	30.8	33.9	34.2		
"	3	41.0	37.8	37.8		
"	4	51.7	41.5	41.3		
"	5	22 1.3	45.1	45.1		
"	d					
"	e					
"	f					
Sum		205.8	188.3	189.0		
Mean		1 21 41.16	1 24 37.66	1 38 37.80		
Red'n to						
m		+ .37	+ .37	+ .37		
n. tan. δ		+ .41	- .15	- .12		
c. sec. δ		+ .37	+ .13	+ .13		
r						
T		1 21 42.31	1 24 38.01	1 38 38.13		
a		1 21 32.90	1 24 28.35	1 38 28.60		
ΔT		9.41	9.66	9.53		

Date	1868	Dec. 19	Dec. 22	
Observer		A. S.	A. S.	
Illumin'n		E.	E.	
Star		β Arietis	32 Cam. (foll.)	Polaris
Mag.		20° 10'	84° 7'	88° 37'
δ				
Wire	a			
"	b			
"	c			
"	1	1 47 25.9		1 6 16.8
"	2	30.0		8 53.8
"	3	33.7		
"	4	37.4		13 45.2
"	5	41.4	0 49 27.9	16 15.0
"	d			
"	e			
"	f			
Sum		168.4		
Mean		1 47 33.68	0 48 17.00	1 11 17.60
Red'n to				
m		+ .37	+ .37	+ .37
n. tan. δ		- .12	- 3.19	+ 12.00
c. sec. δ		+ .14	- 1.27	+ 5.32
r				
T		1 47 34.07	0 48 12.91	1 11 35.29
a		1 47 24.42	12 48 4.31	Redund 1 11 28.06
ΔT		9.65	8.60	7.23

Date	1868	Dec. 22			
Observer	A. S.				
Illumin'n	E				
Star	α Piscium β Arietis δ Cassiopeae				
Mag.	$8^{\circ} 30'$ $20^{\circ} 10'$ $71^{\circ} 47'$				
Wire	a				
"	b				
"	c				
"	1	1 38 29.5	1 47 25.0	1 52 3.9	
"	2	33.4	28.8	15.7	
"	3	37.0	32.8	27.5	
"	4	40.6	36.4	38.5	
"	5	44.2	40.5	50.0	
"	d				
"	e				
"	f				
Sum		184.7	163.5	135.6	
Mean		1 38 36.94	1 47 32.70	1 52 27.12	
Red'n to					
m		+1.37	+1.37	+1.37	
n. tan. δ		-12.3	-1.16	+6.12	
c. sec. δ		+1.13	+1.14	+1.42	
r					
T		1 38 37.21	1 47 33.05	1 52 28.55	
a		1 38 28.57	1 47 24.40	1 52 20.07	
ΔT		8.64	8.65	8.48	

Dec. 22 1868 Illumination East
 $c' = +1.3$ determined Dec. 11.
 $n = +1.30$ near value given by 32 Cam,
 δ 50 Cassiopeae.

Clock fast (at $1\frac{3}{4}$) 8.565

Date	1868	Dec. 22	Dec. 28				
Observer		A. S.	A. S.				
Illumin'n		E.	E.				
Star		δ Ceti	α Piscium	β Arietis			
Mag.		8° 14'	8° 30'	20° 10'			
Wire	a						
"	b						
"	c						
"	1	2 6 4.4	1 38 27.0	1 47 22.2			
"	2	8.2	30.6	26.0			
"	3	11.9	34.3	30.0			
"	4	15.6	37.8	34.0			
"	5	19.2	41.6	37.6			
"	d						
"	e						
"	f						
Sum		59.3	171.3	149.8			
Mean		2 6 11.86	1 38 34.26	1 47 29.96			
Red'n to							
m		+ .37	+ .37	+ .37			
n. tan. δ		- .23	- .46	- .32			
c. sec. δ		+ .13	+ .13	+ .14			
r							
T		2 6 12.13	1 38 34.22	1 47 30.15			
a		2 6 3.46	1 38 28.51	1 47 24.34			
ΔT		8.67	5.71	5.81			

Date	1868	Dec. 28			
Observer	A. S. E.				
Illumin'n					
Star	50 Cassiopeae α Arietis α Draconis				
Mag.					
δ	71° 47' 22° 50' 65° 0'				
Wire	a				
"	b				
"	c				
"	1	1 52 0.8	1 59 45.3	2 0 37.9	
"	2	12.8	49.4	46.5	
"	3	24.6	53.2	55.0	
"	4	36.0	57.2	1 3.6	
"	5	47.3	2 0 1.1	12.1	
"	d				
"	e				
"	f				
Sum		121.5	266.2	275.1	
Mean		1 52 24.30	1 59 53.24	2 0 55.02	
Red'n to					
m		+ .37	+ .37	+ .37	
n. tan. δ		+ 1.28	- .29	- 1.84	
c. sec. δ		+ .42	+ .14	- .31	
r					
T		1 52 26.37	1 59 53.46	2 0 54.71	
a		1 52 19.77	1 59 47.68	14 0 48.07	
ΔT		6.60	5.88	6.64	

Dec. 28 1868. Illumination East.

$c' = +.13$ as determined Dec. 11
 $n = +.60$ by 50 Cass. δ & Draco

Clock fast (at $1\frac{3}{4}$) 5.80

Date	1868	Dec. 28	1869	Jan. 5.	
Observer		A. D.		O. C. W.	
Illumin'n		E.		East.	
Star		65 Ceti		51 Perse.	41 Eridani,
Mag.		8" 14'		31" 29'	13" 53'
δ					
Wire	a				
"	b				
"	c				
"	1	2 6 2.0	3 45 48.9	3 51 51.1	
"	2	5.6	53.2	54.9	
"	3	9.1	57.3	58.6	
"	4	13.0	46 1.7	52 2.4	
"	5	16.1	5.9	6.0	
"	d				
"	e				
"	f				
Sum		45.8	287.0	292.9	
Mean		2 6 9.16	3 45 57.4	3 51 58.58	
Red'n to					
m		+ .37	+ .36	+ .36	
n. tan. δ		- .46	- .15	- .58	
c. sec. δ		+ .13	+ .15	+ .13	
r					
T		2 6 9.20	3 45 57.76	3 51 58.49	
a		2 6 3.41	3 45 54.59	3 51 55.42	
ΔT		5.79	3.17	3.07	

Date	1869.	Jan. 5.								
Observer		O. C. W.								
Illumin'n		East.								
Star		Gr. 2320. L.C. γ Tauri.								
Mag.		$68^{\circ} 9'$			$15^{\circ} 18'$			$16^{\circ} 15'$		
δ										
Wire	a									
"	b									
"	c									
"	1	4	5	41.2	4	12	16.1	4	28	20.1
"	2			50.5			20.0			24.0
"	3		6	0.1			24.0			27.6
"	4			10.0			27.5			31.7
"	5			19.5			31.4			35.3
"	d									
"	e									
"	f									
Sum				1.3			119.0			138.7
Mean		4	6	0.26	4	12	23.80	4	28	27.74
Red'n to										
m				+36			+36			+36
n. tan. δ				-1.70			-.32			-.31
c. sec. δ				-.35			+14			+14
r										
T		4	5	55.57	4	12	23.98	4	28	27.93
a		16	5	55.06	4	12	20.86	4	28	24.84
ΔT				3.51			3.12			3.09

Jan. 5 1869 Illumination East
 c' as determined Dec. 11 +13
 n estimated +.50
 Clock fast (at 4^h) 3.14

Date	1869.	Jan. 5.	Jan. 7.	
Observer		O. C. W.	A. S.	
Illumin'n		East.	East.	
Star		ϵ Tauri.	ϵ Cassiope.	5 Urs. Min. ^{2.0}
Mag.		18" 53'	66" 49'	76" 16'
δ				
Wire	a			
"	b			
"	c			
"	1	11 20 54.0	2 18 2.7	2 27 20.7
"	2	57.8	12.0	36.2
"	3	21 1.7	21.1	57.5
"	4	5.5	30.3	28 6.5
"	5	9.3	39.4	22.0
"	d			
"	e			
"	f			
Sum		8.3	115.5	257.1
Mean		11 21 1.66	2 18 21.1	2 27 51.42
Red'n to				
m		+ .36	+ .36	+ .36
n. tan. δ		- .29	+ .43	- 1.50
c. sec. δ		+ .14	+ .33	- .55
r				
T		11 21 4.87	2 18 22.22	2 27 49.73
a		11 20 58.64	2 18 18.97	14 27 46.47
ΔT		3.23	3.25	3.26

Date	1869.	Jan. 7.								
Observer		A. S.								
Illumin'n		East.								
Star		γ Ceti.			3 Urs. Min. S.C. & Ceti.					
Mag.		$2^{\circ} 41'$			$74^{\circ} 41'$			$3^{\circ} 34'$		
δ										
Wire	a									
"	b									
"	c									
"	1	2	36	26.0	2	50	40.3	2	55	21.4
"	2			29.7			54.6			25.1
"	3			33.4		51	7.9			28.7
"	4			37.0			21.6			32.3
"	5			42.7						35.9
"	d									
"	e									
"	f									
Sum				166.8						113.3
Mean		2	36	33.36	2	50	8.0	2	55	28.66
Red'n to										
m				+ .36			+ .36			+ .36
n. tan. δ				- .26			- 1.37			- .25
c. sec. δ				+ .13			- .49			+ .13
r										
T		2	36	33.59	2	50	6.50	2	55	28.90
a		2	36	34.82	11	51	3.45	2	55	26.05
ΔT				2.77			3.07			2.85

Jan 7 1869 Illumination East
 $c' = +.13$ as determined Dec. 11
 $n = +.30$ from class. of 5 Urs. Minor
 Clock fast (at 3^h) $\cdot 2^{\text{m}} 51^{\text{s}}$

Date	1869, Jan. 7.	Jan. 13
Observer	A. S.	A. S.
Illumin'n	East.	E.
Star	48 Cephei. & Persei.	5 Urs. Min.
Mag.	77° 15' 49° 24'	76° 16'
Wire	a	
"	b	
"	c	
"	1	3 14 57.5 2 27 19.7
"	2	56.2 34.7
"	3	3 3 57.8 49.9
"	4	4 8.0 28 5.7
"	5	24.0 20.6
"	d	
"	e	
"	f	
Sum		250.6
Mean	3 3 57.21 3 15 1.71 2 27 50.12	
Red'n to		
m	+ .36	+ .36 + .44
n. tan. δ	+ 1.05	+ .08 - 1.50
c. sec. δ	+ .59	+ .20 - .55
r		
T	3 3 53.21 3 15 2.35 2 27 48.57	
a	3 3 51.03 3 14 57.55 14 27 47.05	
ΔT	2.18	2.80 1.46

Date	1869 Jan. 13				
Observer	A. S.				
Illumin'n	E.				
Star	β Urs. Min.	α Ceti	48 Cephei		
Mag.	74° 41'	3° 34'	77° 15'		
δ					
Wire	a				
"	b				
"	c				
"	1	2 50 39.6		3 3 17.5	
"	2	53.4		34.0	
"	3	51 7.0	2 55 27.6	50.1	
"	4	20.7	31.2	4 6.9	
"	5	34.3	34.7	22.6	
"	d				
"	e				
"	f				
Sum		35.0		251.1	
Mean	2 51	7.00	2 55 27.55	3 3 50.22	
Red'n to					
m		+ .44	+ .44	+ .44	
n. tan. δ		- 1.37	- .25	+ 1.05	
c. sec. δ		- .49	+ .13	+ .59	
r					
T	14 51	5.58	2 55 27.87	3 3 52.30	
a	14 51	3.84	2 55 25.98	3 3 50.55	
ΔT		1.74	1.89	1.75	

Jan. 13 1869, Illumination East
 c' assumed +.13 as determined Dec. 11.
 n from β Urs. Min & 48 Cephei +.30
 Clock fast (at $3^h \frac{1}{2}$) 15.91

Date	1869	Jan. 13		
Observer		A. S.		
Illumin'n		E.		
Star		α Persei	η Tauri	ζ Persei
Mag.		49° 24'	23° 42'	31° 29'
δ				
Wire	a			
"	b			
"	c			
"	1	3 14 49.4	3 40 36.1	3 45 47.5
"	2	55.2	40.0	51.8
"	3	15 0.5	44.0	55.9
"	4	5.9	47.9	46 0.4
"	5	11.4	51.8	4.3
"	d			
"	e			
"	f			
Sum		2.4	219.8	279.9
Mean		3 15 0.48	3 40 43.96	3 45 55.98
Red'n to				
m		+ .44	+ .44	+ .44
n. tan. δ		+ .08	- .14	- .09
c. sec. δ		+ .20	+ .14	+ .15
τ				
T		3 15 1.20	3 40 44.40	3 45 56.28
a		3 14 59.46	3 39 42.33	3 45 54.57
ΔT		1.74	2.07	1.97

Date	1869 Jan. 13	Jan. 16
Observer	A. S.	A. S.
Illumin'n	E.	E.
Star	Urs. Min. γ ' Eridani	α Ceti
Mag.	78° 12'	13° 53' S. 3° 34'
δ		
Wire	a	
"	b	
"	c	
"	1	3 48 11.0 3 51 49.5
"	2	28.6 53.2
"	3	46.3 57.0 2 55 27.0
"	4	49 3.9 52 0.8 36.6
"	5	21.8 4.4 34.0
"	d	
"	e	
"	f	
Sum	234.6	284.9
Mean	3 48 46.32	3 51 56.98 2 55 26.91
Red'n to		
m	+ .44	+ .44 + .41
n. tan. δ	- 1.71	- .35 - .27
c. sec. δ	- 0.64	+ .13 + .13
r		
T	3 48 44.41	3 51 57.20 2 55 27.18
a	15 48 43.01	3 51 55.34 2 55 25.94
ΔT	1.40	1.86 1.24

Date	1869	Jan. 16			
Observer		A. S.			
Illumin'n		E.			
Star		48 Cephei	5 Arietis	2 Persei	
Mag.		77° 15'	20° 33'	49° 24'	
δ					
Wire	a				
"	b				
"	c				
"	1	3 3 15.7	3 7 15.7	3 14 48.5	
"	2	31.1	19.6	54.1	
"	3	47.3	23.3	59.7	
"	4	4 4.0	27.1	15 5.2	
"	5	18.2	31.0	11.0	
"	d				
"	e				
"	f				
Sum		236.3	116.7	298.5	
Mean		3 3 47.26	3 7 23.34	3 14 59.70	
Red'n to					
m		+ .41	+ .41	+ .41	
n. tan. δ		+ 1.12	- .17	+ .08	
c. sec. δ		+ .59	+ .14	+ .20	
r					
T		3 3 49.38	3 7 23.72	3 15 0.39	
a		3 3 50.32	3 7 22.61	3 14 59.38	Reduced
ΔT		Forecast .94	1.44	1.01	

Jan. 16, 1869
 Illumination East
 C' +.13 as determined Dec. 11
 n +.32 from 7th obs. Meris
 (observation of 48 Cephei incorrect)
 Clock fast (at 3 $\frac{1}{4}$) 1.44

Date	1869 Jan. 16	Jan. 17.
Observer	A. S.	A. S.
Illumin'n	E.	East.
Star	γ^2 U. Min.	δ Persei
Mag.		α Ceti.
δ	$72^\circ 18'$	$47^\circ 22'$
		$3^\circ 34'$
Wire	a	
"	b	
"	c	
"	1	3 20 33.2
"	2	44.8
"	3	57.0
"	4	21 9.5
"	5	21.2
"	d	
"	e	
"	f	
Sum	285.7	187.1
Mean	3 20 57.14	3 33 37.42
Red'n to		
m	+ .41	+ .41
n. tan. δ	- 1.30	- .06
c. sec. δ	- .43	+ .19
r		
T	13 20 55.82	3 33 37.96
a	15 20 54.56	3 33 36.88
ΔT	1.26	1.08

.96

Date	1869.	Jan. 19.								
Observer		A. S.								
Illumin'n		East.								
Star		48 Cephei.	2 Persei.				γ^2 Ura. Min.			
Mag.		77° 15'	49° 24'				72° 18'			
Wire	a									
"	b									
"	c									
"	1	3	3	19.4	3	14	48.0	3	20	33.9
"	2			32.2			53.8			45.0
"	3			48.2			59.2			57.0
"	4		4	5.1		15	5.0		21	8.4
"	5			21.6			10.6			31.0
"	d									
"	e									
"	f									
Sum				246.5			296.6			285.3
Mean		3	3	49.3	3	14	59.32	3	20	57.16
Red'n to										
m							+1.1			
n. tan. δ							+1.07			
c. sec. δ							+2.0			
r										
T					3	15	.00			
a		3	3	57.07	3	14	59.24	15	20	54.79
ΔT							.76			

Jan. 19. 1869.
 Illumination East.
 $C' = +13$ as determined Dec. 11.
 $n = +.27$ from 48 Cephei + γ^2 Ura. Min.
 Clock fast at $3\frac{1}{3}$ hours .89

Date	1869.	Jan. 19	Jan. 23.
Observer		A. S.	A. S.
Illumin'n		East.	East.
Star		γ Persei	δ Cephei.
Mag.		47" 22'	23" 42'
δ			77" 15'
Wire	a		
"	b		
"	c		
"	1	3 33 26.3	3 39 35.0
"	2	31.8	38.9
"	3	36.9	42.9
"	4	42.3	46.7
"	5	47.8	50.6
"	d		
"	e		
"	f		
Sum		185.1	214.1
Mean		3 33 37.02	3 39 42.82
Red'n to			
m		+4.1	+4.1
n. tan. δ		+0.05	-1.3
c. sec. δ		+1.9	+1.4
τ			
T		3 33 37.67	3 39 43.24
a		3 33 36.82	3 39 42.26
ΔT		.85	.98

Date	1869.	Jan. 23.								
Observer		A. S.								
Illumin'n		East.								
Star		β Arietis.		α Persei.				γ ² Urs. Minor. S.C.		
Mag.		21° 33'		49° 24'				72° 18'		
Wire	a									
"	b									
"	c									
"	1				3	14	46.7	3	20	32.6
"	2						52.3			44.6
"	3	3	7	21.6			57.9			52.3
"	4			25.4	15		8.6	21		8.0
"	5			29.3			9.2			20.2
"	d									
"	e									
"	f									
Sum							289.7			281.7
Mean		3	7	21.57	3	14	57.94	3	20	56.34
Red'n to										
m				+31			+31			
n. tan. δ				-.13			+06			
c. sec. δ				+14			+20			
r										
T		3	7	21.85	3	14	58.51			
a		3	7	22.57	3	14	59.24	15	20	55.08
ΔT				.66			.73			

Jan. 23. 1869.
 Ill. East.
 $c' = +.13$ as determined Dec. 11.
 $n = +.25$ from β Uro. Min. + 4² hrs. min.
 Clock slow at 3 1/2 hours

Date 1869. Jan. 23.

Observer A. S.
Illumin'n East.Star δ Persi. of Lami. δ Persi.
Mag. $47^{\circ}22'$ $23^{\circ}42'$ $31^{\circ}29'$ Wire a
" b
" c
" 1
" 2
" 3
" 4
" 5
" d
" e
" f

3	33	24.9	3	39	33.3	8	45	44.8
		30.3			37.2			49.0
		35.4			41.3			53.3
		40.9			45.3			57.5
		46.2			49.2		46	1.9

Sum		177.7			206.3			266.5
Mean	3	33	35.54	3	39	41.26	3	45
								53.30

Red'n to m			+31			+31		+31
n. tan. δ			+64			-12		-07
c. sec. δ			+19			-14		+15

 τ

T	3	33	36.08	3	39	41.59	3	45	53.69
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a	3	33	36.74	3	39	42.21	3	45	54.39
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ΔT			.66			.62			.69
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Jan. 23 from Note Dec. 13, 1880. The results for clock error
 clock show by Astr. time stars seem to be
 δ Persi. +0.66 at 3^h 7^m
 δ Persi. 0.73 15
 δ Persi. 0.66 34
 γ Lami. 0.62 40
 γ Persi. 0.69 46
 γ Erid. 0.58 52
 Mean +0.66 at 3^h 32^m sid. time

Date	1869. Jan. 23.	Feb. 13
Observer	A. S.	A. S.
Illumin'n	East.	E.
Star	Star. Min. of Eridani	γ Eridani
Mag.		
δ	$78^{\circ} 12'$	$13^{\circ} 53'$
Wire	a	
"	b	
"	c	
"	1	3 48 10.6 3 51 47.0 3 51 36.0
"	2	28.4 50.9 39.8
"	3	46.1 54.5 43.6
"	4	49 3.0 58.2 47.3
"	5	49 21.4 52 1.9 51.0
"	d	
"	e	
"	f	
Sum	229.4	272.5 217.7
Mean	3 48 46.88 3 51 54.50 3 51 43.54	
Red'n to		
m		+31 +.49
n. tan. δ		-29 -.58
c. sec. δ		+13 +.14
τ	3 51 54.64	
T		3 51 43.59
a	15 48 43.98 3 51 55.22 3 51 54.88	
ΔT		.58 11.29

Feb. 13 1869
 Illumination East
 c' determined +.14
 w assumed +.50
 Clock slow (at 4^h) 11^s.28

With Coast Survey transit

Date	1869	Feb. 13	April 9	April 9
Observer		A. S.	A. S.	W.
Illumin'n		E.	W.	
Star		γ . 2320	ϵ Leonis	μ Leonis
Mag.		68° 9'		
δ				
Wire	a			
"	b			
"	c			
"	1	4 5 28.1	9 37 44.5	9 44 38.0
"	2	37.9	47.3	46.2
"	3	47.8	50.1	44.0
"	4	57.3	53.0	47.0
"	5	6 7.0	55.8	50.0
"	d			
"	e			
"	f			
Sum		238.1	250.7	220.2
Mean		4 5 47.61	9 37 50.14	9 44 44.04
Red'n to				
m		+ .49	+ .27	+ .27
n. tan. δ		- 1.70		
c. sec. δ		- .38		
τ				
T		4 5 46.02	9 37 50.41	9 44 44.31
a		16 5 57.29	9 38 25.32	9 45 19.12
ΔT		11.27	9 38 25.32 34.91	9 45 19.12 34.81

With Coast Survey transit.East Transit.

Date	1869	April 9	April 9	April 10
Observer		A. S.	A. S.	A. S.
Illumin'n		E.	E.	E.
Star		α Leonis	γ' Leonis	ϵ Leonis
Mag.		12° 36'	20° 30'	24° 22'
δ				
Wire	a			
"	b			
"	c			
"	1	10 0 43.7	10 12 5.0	9 37 41.0
"	2	46.3	7.7	45.3
"	3	49.0	10.4	49.3
"	4	51.9	13.0	53.2
"	5	54.7	15.8	57.1
"	d			
"	e			
"	f			
Sum		245.6	10 12 51.9	245.9
Mean		10 0 49.12	10 12 10.38	9 37 49.48
Red'n to m		+ .30	+ .32	+ .35
n. tan. δ				- .14
c. sec. δ				+ .16
r				
T		10 0 49.42	10 12 10.70	9 37 49.86
a		10 1 24.37	10 12 45.59	9 38 25.31
ΔT		34.95	34.89	35.73

Date	1869 April 10	April 10	April 10
Observer	A. S. E.	A. S. E.	A. S. E.
Illumin'n			
Star	11 Cephei d. c.	μ Leonis	79 Draconis
Mag.			
δ	$70^{\circ} 42'$	$26^{\circ} 37'$	$73^{\circ} 5'$

Wire	a
"	b
"	c
"	1
"	2
"	3
"	4
"	5
"	d
"	e
"	f

	9 39	2.0	9 44	-	9 50	14.0
	9 39	13.5		34.9	9 50	26.5
		24.2		39.0		39.1
		35.0		43.1		50.8
		46.0		47.0		51 3.4
				51.2		

Sum	120.7	215.2	193.8
Mean	9 39 24.14	9 44 43.04	9 50 38.76

Red'n to

m

n. tan. δ c. sec. δ

+	.35	+	.35	+	.35
-	1.17	-	.13	-	1.30
-	.52	+	.19	-	.518

T

a

 ΔT

9 39 22.80	9 44 43.45	9 50 37.23
21 39 58.54	9 45 19.11	21 54 12.85
35.74	35.66	35.62

April 10 1869 Ill. East
 c' by observation + .17
 n from 11 Cephei 79 Draconis 32 Urs. Major 9 Draconis + .31
 ΔT at 10^h + 35.63

Date	1869	April 10	April 10	
Observer		A. S.	A. S.	
Illumin'n		E.	E.	
Star		α Leonis	32 Urs. Maj.	γ' Leonis
Mag.		12° 36'	65° 46'	20° 30'
δ				
Wire	a			
"	b			
"	c			
"	1	10 0 41.0	10 7 36.6	10 12 1.9
"	2	44.9	44.9	5.7
"	3	48.6	54.0	9.6
"	4	52.2	8 2.7	13.5
"	5	53.9	11.4	17.4
"	d			
"	e			
"	f			
Sum		242.6	269.6	48.1
Mean		10 0 48.52	10 7 53.92	10 12 9.62
Red'n to m		+ .35	+ .35	+ .35
n. tan. δ		- .21	+ .41	- .17
c. sec. δ		+ .18	+ .41	+ .18
r				
T		10 0 48.84	10 7 55.09	10 12 9.98
a		10 1 24.36	10 8 30.58	10 12 45.58
ΔT		35.52	35.49	35.60

Date	1869 April 10	April 15
Observer	A.S.	A.S.
Illumin'n	E.	E.
Star	γ Draconis	ρ Leonis
Mag.	$76^{\circ} 23'$	$9^{\circ} 59'$
δ		$6^{\circ} 54'$
Wire	a	28 38 37.0
"	b	47.9
"	c	59.0
"	1	10 22 46.8
"	2	48.1 15.9
"	3	23 2.0 19.7
"	4	17.9 23.4
"	5	32.5 27.0
"		48.1
"	d	28.0
"	e	39.0
"	f	50.3
Sum	87.3	98.4
Mean	10 23 17.46	10 25 19.68
Red'n to		
m	+ .35	+ .35
n. tan. δ	+ 1.00	- .28
c. sec. δ	+ .72	+ .17
τ		
T	10 23 19.53	10 25 19.97
a	10 23 55.39	10 25 55.61
ΔT	35.86	35.64
		36.82

Date	1869	April 15			
Observer		A. S.			
Illumin'n		E.			
Star		ϵ Urs. Maj.	σ^2 Urs. Maj.	1 Draconis	
Mag.		418" 33'	67° 40'	81° 54'	
Wire	a	8 48 41.6	8 56 36.4		
"	b		57 5.1		
"	c	49 14.3	33.9		
"	1	8 49 25.6	8 57 52.9	9 16 39.9	
"	2		58 2.7	17 5.3	
"	3		36.0	32.0	
"	4		41.8	58.0	
"	5		21.4	18 23.5	
"	d		58.4		
"	e	50 14.8	59 19.1		
"	f	32.2 31.9	47.7		
Sum	5 middlewires	184.8	60.3	158.7	
Mean		8 49 36.36	8 58 12.06	9 17 34.74	
Red'n to					
\bar{m}		+ .35	+ .35	+ .35	
n. tan. δ		+ .08	+ .40	+ 2.21	
c. sec. δ		+ .26	+ .45	+ 1.21	
r					
T		8 49 37.05	8 58 13.26	9 17 35.51	
a		8 50 13.83	8 58 50.16	9 18 12.51	
ΔT		36.78	36.90	37.00	

April 15 1869 Illumination East
 ϵ observed April 10 +.17
 n from σ^2 Urs. Maj., 1 Drac., β Cephe., 11 Cephe. +.36
 ΔT (at $9\frac{1}{2}^h$) +36.83

Date	1869	April 15								
Observer		A. S.								
Illumin'n		E.								
Star		α Hydrae	δ Urs. Maj.	β Cephei						
Mag.		8° 6' S.	52° 16'	69° 59'						
δ										
Wire	a		9	22	28.0					
"	b				46.0					
"	c		23		4.0					
"	1	9	20	25.1	9	23	15.8	9	26	1.6
"	2			28.9			21.6			10.5
"	3			32.6			27.8			22.0
"	4			36.0			33.7			31.9
"	5			40.0			39.5			42.8
"	d						51.5			
"	e					24	9.2			
"	f						27.1			
Sum	5 middle wires		162.6		138.4		108.8			
Mean		9	20	32.52	9	23	27.68	9	26	21.76
Red'n to										
m			+ .35		+ .35		+ .35			
n. tan. δ			- .38		+ .14		- 1.31			
c. sec. δ			+ .17		+ .19		- .50			
r										
T		9	20	32.66	9	23	28.36	9	26	20.30
a		9	21	9.59	9	24	5.24	21	26	56.93
ΔT			36.93		36.88		36.63			

Ill. E. Wires a b c d e f reduced to mean of 5 middle wires.

	α Hydrae	δ Urs. Maj.	δ Urs. Maj.	δ Urs. Maj.	β Cephei	μ Leonis	μ Leonis
a	36.5 1.07 = 36.14	36.26 1.51 = 36.26	36.27 1.51 = 36.27	36.39 1.51 = 36.39	36.22 1.12 = 36.22	36.18 1.12 = 36.18	36.22 1.12 = 36.22
b	25.6 1.07 = 25.35	25.49 1.51 = 25.49	25.46 1.51 = 25.46	25.41 1.51 = 25.41	25.40 1.12 = 25.40	25.41 1.12 = 25.41	25.41 1.12 = 25.41
c	14.6 1.07 = 14.36	14.61 1.51 = 14.61	14.51 1.51 = 14.51	14.44 1.51 = 14.44	14.41 1.12 = 14.41	14.42 1.12 = 14.42	14.42 1.12 = 14.42
d	14.5 1.07 = 14.36	14.60 1.51 = 14.60	14.62 1.51 = 14.62	14.52 1.51 = 14.52	14.47 1.12 = 14.47	14.48 1.12 = 14.48	14.48 1.12 = 14.48
e	25.2 1.07 = 25.25	25.46 1.51 = 25.46	25.49 1.51 = 25.49	25.29 1.51 = 25.29	25.29 1.12 = 25.29	25.29 1.12 = 25.29	25.29 1.12 = 25.29
f	36.8 1.07 = 36.44	36.74 1.51 = 36.74	36.36 1.51 = 36.36	36.23 1.51 = 36.23	36.25 1.12 = 36.25	36.25 1.12 = 36.25	36.25 1.12 = 36.25
Mean of outside wires	+ .53 1.07 = + .52	+ .19 1.51 = + .13	+ .12 1.51 = + .05	- .05 1.51 = - .03	- .01 1.12 = - .01	+ .20 1.12 = + .18	- .04 1.12 = - .04

Mean values, Illumination East: a 36.29; b 25.36; c 14.47; d 14.54; e 25.30; f 36.42.

Date	1869	April 15		
Observer		A. S.		
Illumin'n		E.		
Star		η Cephei	μ Leonis	λ Leonis
Mag.		70° 42'	26° 37'	11° 14'
δ				
Wire	a	9 37 33.4	9 44 1.4	10 41 8.7
"	b	38 6.6	13.8	20.0
"	c	39.3	25.9	31.0
"	1	9 39 1.3	9 44 33.9	10 41 38.6
"	2	11.9	37.8	42.2
"	3	23.3	41.9	45.9
"	4	34.4	46.0	49.7
"	5	45.3	50.0	53.2
"	d	40 6.9	58.3	42 0.8
"	e	40.2	45 10.5	11.8
"	f	41 13.0	22.8	23.0
Sum	5 middle wires	116.2	209.6	229.6
Mean		9 39 23.24	9 44 41.92	10 41 45.92
Red'n to				
m		+ .35	+ .35	+ .35
n. tan. δ		- 1.36	- .15	- .26
c. sec. δ		- .51	+ .19	+ .17
r				
T		9 39 21.72	9 44 42.31	10 41 46.18
a		21 39 58.84	9 45 19.04	10 42 23.00
ΔT		37.12	36.73	36.82

Date	1869	April 15	April 17
Observer		A. S.	A. S.
Illumin'n		E.	E.
Star		ϵ Cephei	ϵ Leonis
Mag.		65° 30'	52° 16'
δ			24° 23'
Wire	a	4	
"	b		
"	c		
"	1	10 44 6.7	9 23 15.6
"	2	15.6	21.4
"	3	24.3	27.1
"	4	33.0	33.3
"	5	41.8	39.0
"	d		
"	e		
"	f		
Sum		122.4	136.4
Mean		10 44 24.48	9 23 27.28
Red'n to m		+ .35	+ .35
n. tan. δ		- 1.12	+ .14
c. sec. δ		- .41	+ .28
r			
T		10 44 23.30	9 23 28.05
a		22 45 0.04	9 24 5.19
ΔT		36.74	37.14

April 17 1869.
 Illumination East
 c' assumed +.17
 n assumed +.36
 Clock slow (at $9\frac{1}{2}$) $37^s.23$

Date	1869	April 17	April 19	
Observer		A. S.	A. S.	
Illumin'n		E.	E.	
Star		μ Leonis	ϵ Hydrae	Urs. Maj.
Mag.		26° 37'	6° 54'	48° 33'
δ				
Wire	a			
"	b			
"	c			
"	1	9 44 33.3	8 39 5.5	8 49 21.8
"	2	37.7	9.0	30.5
"	3	41.2	12.8	35.8
"	4	45.5	16.4	41.0
"	5	49.5	20.1	46.6
"	d			
"	e			
"	f			
Sum		207.2	64.5	178.7
Mean		9 44 41.44	8 39 12.90	8 49 35.74
Red'n to				
m		+ .35	+ .52	+ .52
n. tan. δ		- .15	- .48	+ .16
c. sec. δ		+ .19	+ .17	+ .26
r				
T		9 44 41.83	8 39 13.41	8 49 36.68
a		9 45 18.99	8 39 50.50	8 50 13.72
ΔT		37.16	37.39	37.04

April 19 1869
 c' assumed + .17
 n assumed + .36
 Clock slow (at $8\frac{1}{4}$) 37.21

Date	1869	April 22					
Observer		A. S.					
Illumin'n		E.					
Star		ϵ Hydrae		ι Urs. Maj.		κ Cancri	
Mag.		6° 54'		48° 33'		11° 11'	
δ							
Wire	a						
"	b						
"	c						
"	1	8 39 5.6	8 49 24.7	8 59 54.3			
"	2	9.4	30.2	58.0			
"	3	12.8	35.6	9 0 1.4			
"	4	16.5	41.0	5.4			
"	5	20.1	46.5	9.0			
"	d						
"	e						
"	f						
Sum		64.4	178.0	8.1			
Mean		8 39 12.88	8 49 35.60	9 0 1.62			
Red'n to m		+ .60	+ .60	+ .60			
n. tan. δ		- .32	+ .09	- .12			
c. sec. δ		+ .17	+ .26	+ .17			
r							
T		8 39 13.29	8 49 36.55	9 0 2.27			
a		8 39 50.45	8 50 13.65	9 0 39.26			
ΔT		37.16	37.10	36.99			

April 22. 1869 Illumination Cast
 ϵ' assumed + .17
 n from 1 Drae. $\frac{1}{3}$ depth. + .40
 clock slow (at 9^h) 37.12

Date	1869	April 22						
Observer		A. S.						
Illumin'n		E.						
Star		α Draconis	δ Urs. Maj.		β Cephei			
Mag.		81° 54'	52° 16'		69° 59'			
δ								
Wire	a							
"	b							
"	c							
"	1	9 16 38.8	9 23 14.9	9 26 0.0				
"	2	17 4.1	20.8	10.8				
"	3	30.0	26.8	21.6				
"	4	55.5	32.8	32.0				
"	5	18 21.4	38.6	42.6				
"	d							
"	e							
"	f							
Sum		149.8	133.9	107.0				
Mean		9 17 29.96	9 23 26.78	9 26 21.10				
Red'n to								
m		+ 1.60	+ .60	+ .60				
n. tan. δ		+ 2.45	+ .15	- 1.46				
c. sec. δ		+ 1.21	+ .28	- .50				
r								
T		9 17 34.22	9 23 27.81	9 26 26.04				
a		9 18 11.56	9 24 5.06	21-26 57.38				
ΔT		37.34	37.25	37.34				

Date	1869	April 26		
Observer		A. S.		
Illumin'n		E.		
Star		12 Can. Ven.	δ Virginis	α Virginis
Mag.		39° 2'	4° 50' p.	10° 29' p.
δ				
Wire	a			
"	b			
"	c			
"	1	12 49 7.6	13 2 26.5	13 17 33.9
"	2	12.2	30.1	37.8
"	3	16.8	33.9	41.3
"	4	21.6	37.4	45.0
"	5	26.1	41.0	48.8
"	d			
"	e			
"	f			
Sum		84.3	168.9	206.8
Mean		12 49 16.86	13 2 33.78	13 17 41.36
Red'n to m		+ .68	+ .68	+ .68
n. tan. δ		- .04	- .40	- .44
c. sec. δ		+ .22	+ .17	+ .17
r				
T		12 49 17.72	13 2 34.23	13 17 41.77
a		12 49 55.05	13 3 11.53	13 18 19.13
Δ T		37.33	37.30	37.36

April 26 1869 Illumination East

c' assumed +.17 n assumed +.40

clock slow (at 13^h) 37^s.33

Date	1869	April 28		
Observer		A. J.		
Illumin'n		E.		
Star		α Leonis	32 Urs. Maj.	γ' Leonis
Mag.		12° 36'	65° 46'	20° 30'
δ				
Wire	a			
"	b			
"	c			
"	1	10 0 39.0	10 7 33.6	10 11 59.8
"	2	42.7	42.2	12 3.9
"	3	46.4	51.0	7.7
"	4	50.2	8 0.1	11.4
"	5	53.9	8.8	15.4
"	d			
"	e			
"	f			
Sum		232.2	255.7	38.2
Mean		10 0 46.44	10 7 51.14	10 12 7.64
Red'n to				
m		+ 68	+ 68	+ 68
n. tan. δ		- 32	+ 62	- 25
c. sec. δ		+ 18	+ 41	+ 18
r				
T		10 0 46.98	10 7 52.85	10 12 8.25
a		10 1 24.13	10 8 29.90	10 12 45.35
ΔT		37.15	37.05	37.10

April 28 1869 Illumination East

c' assumed +.17
n from 9 Drac. & 226 Cephei +.17

Clock slow (at 10^h 14^m) 37^s.07

Date	1869	April 28		
Observer		A. S.		
Illumin'n		E.		
Star		9 Draconis	226 Cephei	1 Leonis
Mag.		76° 23'	76° 33'	11° 14'
δ				
Wire	a			
"	b			
"	c			
"	1	10 22 43.1	10 28 53.4	10 41 37.9
"	2	58.6	29 7.6	41.7
"	3	23 14.0	22.0	45.4
"	4	29.6	36.1	49.0
"	5	44.6	50.8	52.7
"	d			
"	e			
"	f			
Sum		69.9	109.9	226.7
Mean		10 23 13.98	10 29 21.98	10 41 45.34
Red'n to				
m		+ 68	+ 68	+ 68
n. tan. δ		+ 15.1	- 22.5	- 33
c. sec. δ		+ 72	- 68	+ 17
r				
T		10 23 16.89	10 29 19.73	10 41 45.86
a		10 23 54.19	22 29 57.04	10 42 22.85
ΔT		37.30	37.31	36.99

Date	1869 April 29			
Observer	A. S.			
Illumin'n	E.			
Star	ϵ Leonis	η Cephei	μ Leonis	
Mag.	24° 23'	70° 42'	26° 37'	
Wire	a			
"	b			
"	c			
"	1	9 37 39.4	9 39 2.4	9 44 33.0
"	2	43.4	12.8	37.3
"	3	47.3	24.0	41.3
"	4	51.3	35.0	45.2
"	5	55.2	46.4	49.4
"	d			
"	e			
"	f			
Sum	236.2	120.6	206.2	
Mean	9 37 47.24	9 39 24.12	9 44 41.24	
Red'n to				
m	+68	+68	+68	
n. tan. δ	-22	-177	-20	
c. sec. δ	+19	-52	+19	
τ				
T	9 37 47.89	9 39 22.51	9 44 41.91	
a	9 38 25.02	21 39 59.77	9 45 18.82	
ΔT	37.13	37.26	36.91	

April 29 1869 Illuminations East

c assumed +.17 m assumed +.47

Clock slow (at 8 $\frac{1}{2}$) 37.02 (mean of ϵ & μ Leonis)

Date	1869	May 5			
Observer		A. S.			
Illumin'n		E.			
Star		α Leonis	32 Urs. Maj.	γ^1 Leonis	
Mag.		12° 36'	65° 46'	20° 30'	
δ					
Wire	a				
"	b				
"	c				
"	1	10 0 39.0	10 7 33.4	10 11 59.8	
"	2	42.8	42.3	12 3.6	
"	3	46.3	51.0	7.6	
"	4	50.0	59.9	11.4	
"	5	53.8	8 8.5	15.4	
"	d				
"	e				
"	f				
Sum		231.9	255.1	37.8	
Mean		10 0 46.38	10 7 51.02	10 12 7.56	
Red'n to					
m		+ .56	+ .56	+ .56	
n. tan. δ		- .14	+ .26	- .11	
c. sec. δ		+ .33	+ .78	+ .34	
r					
T		10 0 47.13	10 7 52.62	10 12 8.35	
a		10 1 24.03	10 8 29.62	10 12 40.25	
ΔT		36.90	37.00	36.90	

May 5 1869. Illumination East
 c' determined by observation +.33 (seeing bad)
 n from γ Draconis & 226 Cephei +.26
 Clock slow (at 10 $\frac{11}{11}$) 36^s.93

Date	1869	May 5		
Observer		A. S.		
Illumin'n		E.		
Star		γ Draconis	ρ Leonis	226 Cephei
Mag.		76° 23'	9° 59'	75° 33'
δ				
Wire	a			
"	b			
"	c			
"	1	10 22 43.1	10 25 10.3	10 28 53.4
"	2	58.9	14.9	29 7.5
"	3	23 13.6	17.7	22.0
"	4	29.3	21.3	36.5
"	5	44.4	24.9	57.3
"	d			
"	e			
"	f			
Sum		69.3	88.2	110.7
Mean		10 23 13.86	10 25 17.64	10 29 22.14
Red'n to				
m		+1.56	+1.56	+1.56
n. tan. δ		+1.64	-1.15	-1.96
c. sec. δ		+1.36	+1.33	-1.28
r				
T		10 23 16.42	10 25 18.38	10 29 20.46
a		10 23 53.66	10 25 55.82	22 29 57.62
ΔT		37.24	36.94	37.16

Date	1869	May 10		
Observer		A. S.		
Illumin'n		E.		
Star		α Leonis	α Urs. Maj.	δ Leonis
Mag.		11° 14'	62° 28'	21° 14'
δ				
Wire	a			
"	b			
"	c			
"	1	10 41 36.8	10 54 42.5	11 6 22.7
"	2	40.6	50.5	26.5
"	3	44.2	58.0	30.2
"	4	48.0	55 6.4	34.1
"	5	51.6	14.0	38.0
"	d			
"	e			
"	f			
Sum		221.2	291.4	151.5
Mean		10 41 44.24	10 54 58.28	11 6 30.30
Red'n to				
m		+ .75	+ .75	+ .75
n. tan. δ		- .16	+ .23	- .12
c. sec. δ		+ .34	+ .71	+ .35
r				
T		10 41 45.17	10 54 59.07	11 6 31.28
a		10 42 22.71	10 55 37.81	11 7 7.01
ΔT		37.54	37.84	37.73

Date	1869 May 10		
Observer	A. S.		
Illumin'n	E.		
Star	α Cephei	λ Draconis	γ Leonis
Mag.	67° 23'	70° 3'	0° 6' S.
δ			
Wire	a		
"	b		
"	c		
"	1	11 22 35.6	11 29 29.7
"	2	28.7	33.4
"	3	38.2	36.9
"	4	47.5	40.6
"	5	57.0	44.1
"	d		
"	e		
"	f		
Sum	190.7	283.5	184.7
Mean	11 12 38.14	11 22 56.70	11 29 36.94
Red'n to m	+ .75	+ .75	+ .75
n. tan. δ	- .76	+ .43	- .21
c. sec. δ	- .86	+ .97	+ .33
τ			
T	11 12 37.27	11 22 58.85	11 29 37.81
a	23 13 15.11	11 23 36.68	11 30 15.42
ΔT	37.84	37.83	37.64

May 10, 1869. Illumination East.
 c' assumed +.33
 n from α Cephei & λ Drac. +.23
 block slow (at 11^h) 37.64

Date	1869	May 17			
Observer		A. S.			
Illumin'n		E.			
Star		α Virginis	γ Draconis	γ Virginis	
Mag.		$9^{\circ} 28'$	$78^{\circ} 21'$	$0^{\circ} 4'$	
δ					
Wire	a				
"	b				
"	c				
"	1	11 57 49.1	12 4 49.2	12 12 29.5	
"	2	53.0	5 8.1	33.3	
"	3	56.4	24.9	36.9	
"	4	58 0.2	42.9	40.5	
"	5	3.8	6 1.5	44.1	
"	d				
"	e				
"	f				
Sum		282.5	126.6	184.3	
Mean		11 57 56.50	12 5 25.32	12 12 36.76	
Red'n to					
m		+ .75	+ .75	+ .75	
n. tan. δ		- .07	+ .39	- .09	
c. sec. δ		+ .33	+ 1.64	+ .33	
r					
T		11 57 57.51	12 5 28.10	12 12 37.74	
a		11 58 33.11	12 6 3.68	12 13 13.31	
ΔT		35.60	35.58	35.57	

May 17 1869 Illumination East
 c assumed +.33 (apparently too large)
 n from γ Draconis 21 Cass. +.10
 Clock slow (at 12^h) 35.59

Date	1869	May 17	May 22
Observer		A. S.	A. S.
Illumin'n		E.	E.
Star		β Corvi	32 Camel. foll.
Mag.		22° 41' S.	74° 16'
δ			84° 8'
Wire	a		12 41 40.4
"	b		43 27.7
"	c		45 13.3
"	1	12 26 48.0	12 36 0.0
"	2	51.8	13.1
"	3	55.7	26.4
"	4	59.5	39.6
"	5	27 3.4	53.0
"	d		12 49 55.7
"	e		51 43.3
"	f		53 28.6
Sum		278.4	132.1
Mean		12 26 55.68	12 36 26.42
Red'n to			12 47 35.16 (5 wires)
m		+ .75	+ .74
n. tan. δ		- .43	+ 2.12
c. sec. δ		+ .36	+ 3.23
r			
T		12 26 56.66	12 36 25.60
a		12 27 31.86	0 37 1.23
ΔT		35.20	35.63

Date	1869	May 22					
Observer		A. S.					
Illumin'n		E.					
Star		δ Virginis	Polaris		α Virginis		
Mag.		$4^{\circ} 50' S.$	$88^{\circ} 36'$		$10^{\circ} 29'$		
Wire	a	13 2 0.0					
"	b	11.0					
"	c	21.8					
"	1	13. 2 29.2	13 5 26.7		13 17 36.8		
"	2	32.8	7 59.1		40.4		
"	3	36.4	10 27.0		44.0		
"	4	40.1	12 49.4		47.6		
"	5	43.7	15 29.6		51.4		
"	d	13 2 51.0					
"	e	3 2.0					
"	f	12.9					
Sum		182.2	13 1.8		220.2		
Mean	<i>of 5 middle wires</i>	13 2 36.44	13 10 26.36		13 17 44.04		
Red'n to							
m		+ .74	+ .74		+ .74		
n. tan. δ		= .24	- 10.04		- .26		
c. sec. δ		+ .33	- 13.54		+ .34		
τ							
T		13 2 37.27	13 10 3.55		13 17 44.86		
a		13 3 11.45	<i>Reduced</i> 1 10 38.12		13 18 19.08		
ΔT		34.18	34.57		34.22		

May 22 1869 Illumination East
c' assumed + .33
n from 32 Com. of Polaris + .24
 Clock slow (at $13\frac{1}{3}$) $34^s.20$

Date	1869	May 22					
Observer		A. S.					
Illumin'n		E.					
Star		α Cassiopeae	δ Virginis	η Urs. Maj.			
Mag.		69° 35'	0° 4'	49° 58'			
δ							
Wire	a		13 26 57.2	13 40 51.9			
"	b		27 2.0	41 8.6			
"	c		13.0	25.6			
"	1	13 20 36.8	13 27 20.3	13 41 37.2			
"	2	47.0	24.0	42.8			
"	3	57.2	27.5	48.4			
"	4	21 7.8	31.0	54.1			
"	5	18.0	34.7	59.8			
"	d		13 27 41.8	13 42 11.0			
"	e		52.8	27.9			
"	f		28 3.8	44.8			
Sum		286.8	137.5	242.3			
Mean of 5 middle wires		13 20 57.36	13 27 27.50	13 41 48.46			
Red'n to							
m		+ .74	+ .74	+ .74			
n. tan. δ		- .86	- .22	+ .07			
c. sec. δ		- .95	+ .33	+ .51			
r							
T		13 20 56.29	13 27 28.35	13 41 49.78			
a		1 21 30.06	13 28 2.50	13 42 24.05			
ΔT		33.77	34.15	34.27			

Illumination East

Mean of outside wires earlier than mean of middle wires (reduced to equator)

32 Cam. + 0.03 δ Virg. - 0.01 δ Virg. + 0.07 η Urs. Maj. + 0.10

Mean + 0.05

Date	1869	June 1						
Observer		A. S.						
Illumin'n		E.						
Star		α Draconis		α Bootis		5 Urs. Minor.		
Mag.		65° 0'		19° 52'		76° 17'		
Wire	a							
"	b							
"	c							
"	1	14 0 0.8	14 9 1.6	14 26 47.0				
"	2	9.6	5.5	27 2.6				
"	3	17.7	9.2	17.5				
"	4	26.3	13.2	52.7				
"	5	35.2	17.0	48.5				
"	d							
"	e							
"	f							
Sum		89.6	46.5	88.3				
Mean		14 0 17.92	14 9 9.30	14 27 17.66				
Red'n to								
m		+ .92	+ .92	+ .92				
n. tan. δ		+ .43	- .19	+ 1.12				
c. sec. δ		+ .76	+ .34	+ 1.35				
r								
T		14 0 20.03	14 9 10.37	14 27 21.05				
a		14 0 52.43	14 9 42.53	14 27 53.23				
ΔT		32.40	32.16	32.18				

June 1, 1869, Illumination East.
 c' observed +.32
 m by approximation, from 5 Urs. Min. & 6 Urs. Min. +.35

Block slow (at 15 h) 32^s.11

Date	1869	June 1			
Observer		A. S.			
Illumin'n		E.			
Star		β Urs. Min.	β Bootis	μ Bootis	
Mag.		74° 42'	40° 55'	37° 50'	
δ					
Wire	a				
"	b				
"	c				
"	1	14 50 7.5	14 56 19.4	15 18 57.7	
"	2	21.4	24.0	56.3	
"	3	34.8	28.9	19 4.0	
"	4	48.6	33.7	5.6	
"	5	57 2.4	38.5	10.0	
"	d				
"	e				
"	f				
Sum		174.7	144.5	4.6	
Mean		14 50 34.94	14 56 28.90	15 19 0.92	
Red'n to					
m		+ .92	+ .92	+ .92	
n. tan. δ		+ .96	- .61	- .05	
c. sec. δ		+ 1.21	+ .42	+ .41	
r					
T		14 50 38.03	14 56 30.23	15 19 2.20	
a		14 51 10.13	14 57 2.31	15 19 34.24	
ΔT		32.10	32.08	32.04	

Date	1869	June 1	June 3		
Observer		A. S.	A. S.		
Illumin'n		E.	E.		
Star		α Serpenti	5 Urs. Min.	ϵ Bootis	
Mag.		6° 50'	76° 17'	27° 38'	
δ					
Wire	a				
"	b				
"	c				
"	1	15 37 10.2	14 27 26.1	14 39 14.6	
"	2	13.9	41.5	18.8	
"	3	17.5	56.1	22.9	
"	4	21.2	28 11.8	26.9	
"	5	24.9	27.0	30.9	
"	d				
"	e				
"	f				
Sum		87.7	282.5	114.1	
Mean		15 37 17.54	14 27 56.50	14 39 22.82	
Red'n to					
m		+ .92	+ .92	+ .92	
n. tan. δ		- .28	+ .86	- .10	
c. sec. δ		+ .32	+ 1.35	+ .36	
r					
T		15 37 18.50	14 27 59.63	14 39 24.00	
a		15 37 50.66	14 27 53.13	14 39 17.45	
ΔT		32.16	6.50	6.55	

Date	1869	June 3			
Observer		A. S.			
Illumin'n		E.			
Star		α^2 Librae	β Urs. Min.	β Bootis	
Mag.		15° 30' S.	74° 42'	40° 55'	
δ					
Wire	a				
"	b				
"	c				
"	1	14 43 38.0	14 50 45.6	14 56 58.1	
"	2	41.9	51 0.4	57 2.8	
"	3	45.7	13.5	7.7	
"	4	49.3	27.4	12.4	
"	5	53.1	40.7	17.2	
"	d				
"	e				
"	f				
Sum		228.0	67.6	38.2	
Mean		14 43 45.60	14 51 13.52	14 57 7.64	
Red'n to					
m		+ .92	+ .92	+ .92	
n. tan. δ		- .32	+ .74	- .01	
c. sec. δ		+ .33	+ 1.20	+ .42	
r					
T		14 43 46.53	14 51 16.38	14 57 8.97	
a		14 43 39.83	14 51 10.06	14 57 2.30	
ΔT		6.70	6.32	6.67	

June 3 1869 Illumination East
 c' assumed + .32
 or from 5 Urs. Min. & 48 Cephei + .27
 Clock fast (at 15^h) 6.71

Date	1869	June 3		June 5
Observer		A.S.		A.S.
Illumin'n		E.		E.
Star		48 Cephei	μ Bootis	β Bootis
Mag.		77° 15'	37° 50'	40° 55'
δ				
Wire	a			
"	b			
"	c			
"	1	15 3 19.7	15 19 30.8	14 56 58.3
"	2	37.4	35.2	57 3.1
"	3	53.5	39.8	7.9
"	4	4 10.0	44.5	12.6
"	5	26.6	49.0	17.4
"	d			
"	e			
"	f			
Sum		267.2	199.3	30.3
Mean		15 3 53.34	15 19 39.86	14 57 7.86
Red'n to				
m		+ .92	+ .92	+ .92
n. tan. δ		- 1.44	- .04	- .01
c. sec. δ		- 1.45	+ .41	+ .42
r				
T		15 3 54.37	15 19 41.15	14 57 9.19
a		3 3 44.89	15 19 34.24	14 57 2.28
ΔT		6.48	6.91	6.91

Date 1869 June 5
 Observer A. S.
 Illumin'n E.
 Star 48 Cephei β Librae μ^1 Bootis
 Mag. $77^\circ 15'$ $8^\circ 54' \delta$ $37^\circ 50'$
 δ

Wire a
 " b
 " c
 " 1
 " 2
 " 3
 " 4
 " 5
 " d
 " e
 " f

15	3	21.0	15	9	58.0	15	19	30.8
		37.3		10	1.7			35.1
		54.2			5.2			39.8
	4	10.2			9.0			44.3
		27.0			12.6			48.9

Sum
 Mean

		269.7			26.5			198.9
15	3	53.94	15	10	5.30	15	19	39.78

Red'n to

m

n. tan. δ

c. sec. δ

		+ .92			+ .92			+ .92
		- 1.60			- .32			- .04
		- 1.45			+ .32			+ .21

r

T

15	3	54.81	15	10	6.22	15	19	41.07
----	---	-------	----	----	------	----	----	-------

a

3	3	45.05	15	9	59.35	15	19	34.22
---	---	-------	----	---	-------	----	----	-------

ΔT

		6.76			6.87			6.85
--	--	------	--	--	------	--	--	------

June 5 1869 Illumination East.
 c' assumed 4.32
 n from 48 Cephei γ^2 Urs. Min. + .30
 Clock fast (at 15 $\frac{41}{6}$) 6.88

Date	1869 June 5	June 9	
Observer	A. S.	A. S.	
Illumin'n	E.	E.	
Star	γ^2 Urs. Min.	δ Virginis	Polaris
Mag.			
δ	$72^\circ 18'$	$11^\circ 50' S.$	$88^\circ 36' 23''$
Wire	a		
"	b		
"	c		
"	1	15 20 40.6 13 3 10.8 13 6 30.3	
"	2	52.9	14.4 8 59.2
"	3	21 4.5	18.0 11 28.7
"	4	16.5	21.5 13 56.3
"	5	28.5	25.3 16 23.6
"	d		
"	e		
"	f		
Sum	23.0	90.0	138.1
Mean	15 21 4.60 13 3 18.00 13 11 27.62		
Red'n to			
m	+ .92	+ .88	+ .88
n. tan. δ	+ .67	- .30	- 12.55
c. sec. δ	+ 1.05	+ .32	- 13.10
r			
T	15 21 7.24 13 3 18.90 13 11 2.85		
a	15 21 0.49 13 3 11.32	Reduced	1 10 51.98
ΔT	6.75	7.62	10.87

June 9 1869 Ill. East.
 C' assumed + .32
 " " " + .30
 Clock fast (at $13\frac{1}{4}$) 7.57

Date 1869 June 9
 Observer A. S.
 Illumin'n E.

Star α Virginis γ Cassiop. δ Virginis
 Mag. $10^{\circ} 29' 4''$ $69^{\circ} 38'$ $0^{\circ} 4'$

Wire a

" b

" c

" 1

" 2

" 3

" 4

" 5

" d

" e

" f

Sum

Mean

Red'n to

m

n. tan. δ c. sec. δ τ

T

a

 ΔT

13	18	18.3	13	21	19.4	13	28	1.7
		22.0			29.9			5.5
		25.6			40.1			9.0
		29.3			50.5			12.5
		33.0		22	0.5			16.3
Sum								
		128.2			200.4			45.0
13	18	25.64	13	21	40.08	13	28	9.00
Red'n to m								
		+ .88			+ .88			+ .88
n. tan. δ								
		- .33			- 1.08			- .27
c. sec. δ								
		+ .33			- .92			+ .32
τ								
13	18	26.52	13	21	38.96	13	28	9.93
a								
13	18	18.96	13	21	31.13	13	28	2.40
ΔT								
		7.56			7.83			7.53

Date	1869 June 12			
Observer	A. S.			
Illumin'n	E.			
Star	ζ Virginis	η Urs. Maj.	η Bootis	
Mag.				
δ	$0^{\circ} 4'$	$49^{\circ} 58'$	$19^{\circ} 3'$	
Wire	a			
"	b			
"	c			
"	1	13 28 2.8	13 42 19.3	13 48 27.9
"	2	6.4	24.9	31.6
"	3	9.9	30.5	35.6
"	4	13.7	36.4	39.4
"	5	17.1	42.0	43.3
"	d			
"	e			
"	f			
Sum	49.9	153.1	177.8	
Mean	13 28 9.98	13 42 30.62	13 48 35.56	
Red'n to				
m	+ .88	+ .88	+ .88	
n. tan. δ	- .30	+ .09	- .19	
c. sec. δ	+ .32	+ .49	+ .34	
τ				
T	13 28 10.88	13 42 32.08	13 48 36.59	
a	13 28 2.38	13 42 23.72	13 48 28.06	
ΔT	8.50	8.36	8.53	

June 12 1869 Illumination East.
 c' assumed + .32
 n from 50 Cass. δ 2 Drae. + .33 $\frac{1}{3}$
 Clock fast (at 13 $\frac{3}{4}$) 8^h.49

Date

1869 June 12

Observer

A. S.

Illumin'n

E.

Star

50 Cassiopeae & Draconis & Bootis

Mag.

 δ

71° 47'

65° 0'

19° 52'

Wire

a

"

b

"

c

"

1

13 52 4.2 14 0 41.6 14 9 42.2

"

2

15.8 49.9 46.2

"

3

27.5 58.6 50.0

"

4

39.0 1 7.2

"

5

50.7 15.4

"

d

1

"

e

"

f

Sum

137.2

292.7

Mean

13 52 27.44 14 0 58.54 14 9 49.98

Red'n to

m

+ .88

+ .88

+ .88

n. tan. δ

- 1.32

+ .41

- .18

c. sec. δ

- 1.02

+ .76

+ .34

 τ

T

13 52 25.98 14 1 0.59 14 9 51.02

a

1 52 17.49 14 0 52.10 14 9 42.46

 ΔT

8.49

8.49

8.56

Date	1869	June 16						
Observer		A. S.						
Illumin'n		E.						
Star		α^2 Librae		β Urs. Min.		β Bootis		
Mag.								
δ		$15^\circ 30' S.$		$74^\circ 42'$		$40^\circ 55'$		
Wire	a							
"	b							
"	c							
"	1	14 43 41.5	14 50 48.7	14 57 1.4				
"	2	45.2	51 3.3	6.1				
"	3	49.0	16.1	11.0				
"	4	52.8	30.0	15.6				
"	5	56.5	43.9	20.5				
"	d							
"	e							
"	f							
Sum		245.0	82.0	54.6				
Mean		14 43 49.00	14 51 16.40	14 57 10.92				
Red'n to								
m		+ .88	+ .88	+ .88				
n. tan. δ		- .37	+ .85	- .01				
c. sec. δ		+ .33	+ 1.21	+ .42				
r								
T		14 43 49.84	14 51 19.34	14 57 12.21				
a		14 43 39.80	14 51 9.44	14 57 2.19				
ΔT		10.04	9.90	10.02				

June 16 1869 Illumination East.
 c' assumed +.32
 n from β Urs. Min. by 48 Cephei +.31
 Clock fast (at 15^h) 10^s.02

Date 1869 June 16

Observer

Illumin'n

Star

Mag.

 δ

Wire

a

"

b

"

c

"

1

"

2

"

3

"

4

"

5

"

d

"

e

"

f

Sum

Mean

Red'n to

m

n. tan. δ c. sec. δ τ

T

a

 ΔT

48 Caphei

77° 15'

 β Librae80° 54' ϕ μ Bootis

37° 50'

15	3	25.1	15	10	1.0	15	19	33.8
		41.8			4.9			38.4
		58.6			8.5			42.9
4		14.0			12.0			47.6
		30.8			15.9			52.0

		290.3			42.3			214.7
15	3	58.06	15	10	8.46	15	19	42.94

		+ .88			+ .88			+ .88
		- 1.65			- .33			- .04
		- 1.45			+ .32			+ .41

15	3	55.84	15	10	9.33	15	19	42.19
3	3	45.90	15	9	59.35	15	19	32.16
		9.94			9.98			10.03

Date	1869 June 19		
Observer	A. S.		
Illumin'n	E.		
Star	ϵ Cassiopeae	γ Bootis	5 Urs. Min.
Mag.	66° 48'	52° 27'	76° 17'
δ			
Wire	a		
"	b		
"	c		
"	1	14 18 11.6	14 20 42.9
"	2	20.5	49.0
"	3	29.8	54.8
"	4	39.0	21 0.6
"	5	48.4	6.5
"	d		
"	e		
"	f		
Sum	14 18 149.3	14 20 273.8	14 27 298.4
Mean	14 18 29.86	14 20 54.76	14 27 59.68
Red'n to			
m	+ .95	+ .95	+ .95
n. tan. δ	- 1.04	+ .12	+ 1.02
c. sec. δ	- .81	+ .52	+ 1.35
r			
T	14 18 28.96	14 20 56.35	14 27 3.00
a	2 18 18.08	14 20 45.46	14 27 52.15
ΔT	10.88	10.89	10.85

June 19 1869, Illumination East.
 c' assumed +.32
 n from ϵ Cass. & 5 Urs. Min. +.32
 Clock fast (at 14^h $\frac{1}{2}$) 10^s.95

Date 1869 June 19

Observer A. S.

Illumin'n E.

Star

Mag.

 δ ϵ Bootis $27^{\circ} 38'$ α^2 Librae $15^{\circ} 30' S.$ β Urs. Min. $74^{\circ} 42'$

Wire

a

"

b

"

c

"

1

"

2

"

3

"

4

"

5

"

d

"

e

"

f

Sum

Mean

Red'n to

m

n. tan. δ c. sec. δ

r

T

a

 ΔT

14 39 18.9 14 43 42.2 14 50 44.6

23.0

46.1

51 3.4

27.3

49.9

17.6

31.1

53.7

31.0

35.3

57.5

44.8

135.6

249.4

86.4

14 39 27.12

14 43 49.88

14 51 17.28

+1.95

+1.95

+1.95

-1.12

-1.38

+1.88

+1.36

+1.33

+1.21

14 39 28.31 14 43 50.76 14 51 20.32

14 39 17.34 14 43 39.79 14 51 9.27

10.97

10.99

11.05

Date 1869 June 23

Observer

A. S.

Illumin'n

E.

Star

5 Ophiuchi

 η Herculis κ Ophiuchi

Mag.

 $10^{\circ} 18' S.$ $39^{\circ} 11'$ $9^{\circ} 35'$ δ

Wire

a

"

b

"

c

"

1

"

2

"

3

"

4

"

5

"

d

"

e

"

f

Sum

Mean

Red'n to

m

n. tan. δ c. sec. δ

r

T

a

 ΔT

16	30	2.9	16	38	28.0	16	51	34.0
		6.8			32.8			37.8
		10.3			37.4			41.3
		14.0			42.1			45.0
		17.8			46.8			48.7

16	30	51.8	16	38	187.1	16	51	206.8
		10.36			37.42			41.36

		+ .95			+ .95			+ .95
		- .35			- .03			- .24
		+ .33			+ .41			+ .32

16	30	11.29	16	38	38.75	16	51	42.39
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16	29	58.85	16	38	26.28	16	51	29.95
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		12.44			12.47			12.44
--	--	-------	--	--	-------	--	--	-------

June 23 1869 Illumination East.
 c' assumed +.32 n assumed +.32
 Clock slow (at $16^h \frac{2}{3}$) $12^s.45$

Date	1869 June 23	June 28
Observer	A. S.	A. S.
Illumin'n	E.	E.
Star	α Herculis	ϵ Urs. Min.
Mag.		δ Urs. Min.
δ	$33^{\circ} 46'$	$82^{\circ} 15'$
		$86^{\circ} 36'$
Wire	a	
"	b	
"	c	
"	1	16 56 50.6 16 58 49.6 18 12 54.1
"	2	55.0 59 16.2
"	3	59.4 43.4
"	4	57 3.9 17 0 10.6
"	5	8.2 36.6 16 58.9
"	d	
"	e	
"	f	
Sum	297.1	216.4
Mean	16 56 59.42	16 59 43.28
		18 14 56.58
Red'n to		113.00
m	+ .95	+ .95
n. tan. δ	- .08	+ 2.07
c. sec. δ	+ .38	+ 2.37
		+ 5.57
		+ 5.40
r		
T	16 57 0.67	16 59 48.67
		18 15 7.55 T-m
a	16 56 48.02	16 59 36.70
		18 14 54.64
ΔT	12.65	11.97
		12.91

Date	1869 June 28									
Observer	A. S.									
Illumin'n	E.									
Star	1 Aquilae & Lyrae 51 Cephei									
Mag.	8° 20' S. 38° 40' 87° 14'									
Wire	a									
"	b									
"	c									
"	1	18	28	12.5	18	32	35.6	18	35	47.6
"	2			16.1			40.3		37	2.3
"	3			19.8			44.8		38	18.0
"	4			23.5			49.6		39	32.1
"	5			27.1			54.3		40	47.6
"	d									
"	e									
"	f									
Sum				99.0			224.6			87.6
Mean		18	28	19.80	18	32	44.92	18	38	17.52
Red'n to										
m										
n. tan. δ				-.37			-.04			-7.61
c. sec. δ				+.32			+.41			-6.67
τ										
T - \bar{m}		18	28	19.75	18	32	45.29	18	38	3.24
a		18	28	6.76	18	32	32.44	6	37	50.08
$\Delta T + \bar{m}$				12.99			12.85			13.16

June 28 1869 Illumination East.
 c' assumed +.32 n from 51 Cephei, 50 Drac. +.35
 $\Delta T + \bar{m}$ (at $18\frac{2}{3}$) - 12.94

If $\bar{m} = +.95$, block fast 13.89
 $\bar{m} = +1.05$ June 29. Corresponding correction for clock 13.99

Date	1869 June 28			
Observer	A. S.			
Illumin'n	E.			
Star	β Lyrae	δ Sagittarii	δ Draconis	
Mag.				
δ	$33^{\circ} 13'$	$26^{\circ} 27' S.$	$75^{\circ} 17'$	
Wire	a			
"	b			
"	c			
"	1	18 45 20.9	18 47 15.9	18 50 22.4
"	2	25.3	19.9	37.2
"	3	29.5	23.8	51.1
"	4	34.0	28.0	51 5.1
"	5	38.0	31.9	19.7
"	d			
"	e			
"	f			
Sum	147.7	119.5	255.5	
Mean	18 45 29.54	18 47 23.90	18 50 51.10	
Red'n to				
m				
n. tan. δ	- .08	- .49	+ 1.01	
c. sec. δ	+ .33	+ .36	+ 1.26	
r				
T - \bar{m}	18 45 29.78	18 47 23.77	18 50 53.37	
a	18 45 16.78	18 47 10.83	18 50 40.26	
$\Delta T + \bar{m}$	13.00	12.94	13.11	

The mean of the 11 wires } should be very near the mean }
 of the 5 by chronograph } observations of April 15 & May 22. }
 1869 Date July 3

Eye and ear observations
 Chronometer H. 208 fast of S. Clock 4^m 37.^s 45

Observer
 Illumin'n

γ Draconis γ^2 Sagittarii 1 Aquilae
 $51^\circ 30'$ $30^\circ 25' S.$ $8^\circ 20' S.$

Wire	a	17	57	30.2	18	1	36.8	18	32	23.2
"	b			47.8			49.5			34.1
"	c		58	5.0		2	2.3			45.0
"	1			16.9			14.0			52.5
"	2			22.8			14.7			55.8
"	3			28.5			19.0			59.5
"	4			34.5			22.8	33		3.5
"	5			40.1			27.5			6.7
"	d			52.0			35.9			14.5
"	e	59		9.5			48.5			25.5
"	f			26.8		3	0.8			36.5
Sum				314.1			208.8			656.8
Mean		17	58	28.55	18	2	18.98	18	32	59.71
	See cor.		4	37.45		4	37.45		4	37.45
Red'n to		17	53	51.10	17	57	41.53	18	28	22.26
m										
n. tan. δ				+ .12			-.52			-.37
c. sec. δ				+ .51			+ .37			+ .32
r										
T - \bar{m}		17	53	51.73	17	57	41.38	18	28	22.21
a		17	53	36.46	17	57	26.11	18	28	6.84
$\Delta T + \bar{m}$				15.27			15.27			15.40

July 3 1869 Illumination East.

c' assumed + .32 n from γ Draconis } γ^2 Sag. + .35

$\Delta T + \bar{m}$ (at 18^h) - 15.30

If $\bar{m} = +1.05$, Clock fast 16.35

If eye & ear observations are, as before, 15 late

Clock fast 16.20

[In 1 Aquilae & 2 Pyrae, the outside wires disagree with the middle wires. If the middle wires are taken these stars will agree with γ Draconis & γ^2 Sag.]

Eye & ear observation
 Chron. H. 208 fast of
 South Clock 4^m 37.45

Eye & ear, observations
 Chron. B. 236 slow of S. Clock
 1^m 26.90.

Date	1869	July 3	July 5	
Observer		A.S.	A.S.	
Illumin'n		E.	E.	
Star		γ Lyrae	15 Draconis	η Herculis
Mag.		38° 40'	69° 3'	39° 11'
δ				
Wire	a	18 36 38.5		16 36 28.0
"	b	52.5		42.0
"	c	37 6.3	Focus bad	56.2
"	1	15.7	16 26 44.5	37 5.4
"	2	20.3	54.5	10.3
"	3	24.5	27 4.5	14.9
"	4	29.5	16.3	19.5
"	5	34.0	24.9	24.0
"	d	43.4		33.5
"	e	57.4		48.0
"	f	38 11.5		38 2.0
Sum		273.6	23.7	164.8
Mean		18 37 24.87	16 27 14.74	16 37 14.98
	Leas cor.	4 37.45	Add 1 26.90	1 26.90
Red'n to		18 32 47.42	16 28 31.64	16 38 41.88
m				
n. tan. δ		- .04	+ .34	- .02
c. sec. δ		+ .41	+ .90	+ .41
r				
T	- \overline{m}	18 32 47.79	16 28 32.88	16 38 42.27
a		18 32 32.47	16 28 17.71	16 38 26.20
ΔT	+ \overline{m}	15.32	15.17 Focus bad	16.07

Eye & ear

Date	1869	July 5			
Observer		A.S.			
Illumin'n		E.			
Star		α Cam.	κ Ophiuchi	δ Herculis	
Mag.		66° 7'	9° 35'	33° 46'	
δ					
Wire	a		16 49 42.2	16 54 53.5	
"	b		53.1	55 6.4	
"	c		50 4.4	19.5	
"	1	16 39 34.5	11.5	28.5	
"	2	43.5	15.3	33.0	
"	3	52.5	18.9	36.8	
"	4	40 4.2	22.6	41.3	
"	5	10.3	26.0	45.5	
"	d		34.0	54.5	
"	e		44.8	56 7.7	
"	f		56.0	20.8	
Sum		262.0	208.8	410.5	
Mean		16 39 52.40	16 50 18.98	16 55 37.05	
	Add	4 26.90	1 26.90	1 26.90	
Red'n to m		16 41 19.30	16 51 45.88	16 57 3.95	
n. tan. δ		-.63	-.17	-.05	
c. sec. δ		-.91	+1.32	+1.38	
r					
T - \bar{m}		16 41 17.76	16 51 46.03	16 57 4.28	
a		4 41 1.52	16 51 29.95	16 56 47.99	
$\Delta T + \bar{m}$		16.24	16.08	16.29	

July 5 1869 Illumination East.

c' assumed +.32 n from Gr. 9661 / 3D ear +.22

 $\Delta T + \bar{m}$ (at 17^h) - 16.16

Eye Star

Date	1869	July 5			
Observer		A.S.			
Illumin'n		E.			
Star		α Herculis	β Ophiuchi	Sp. 966	
Mag.		14° 33'	24° 3' S.	74° 57'	
Wire	a	17 6 54.0			
"	b	7 5.0			
"	c	16.5			
"	1	24.0	17 17 5.8	17 20 34.8	
"	2	27.8	9.7	48.8	
"	3	31.3	14.0	21 2.6	
"	4	34.7	18.0	16.5	
"	5	39.0	22.1	30.5	
"	d	46.5			
"	e	58.0			
"	f	8 8.8			
Sum		345.6	69.6	13.2	
Mean	Add	17 7 31.42	17 17 13.92	17 21 2.64	
		1 26.90	1 26.90	1 26.90	
Red'n to		17 8 58.32	17 18 40.82	17 22 29.54	
m					
n. tan. δ		- .14	- .30	- 1.02	
c. sec. δ		+ .33	+ .35	- 1.23	
r					
T - \overline{m}		17 8 58.51	17 18 40.87	17 22 27.29	
a		17 8 42.41	17 18 24.61	5 22 11.13	
ΔT		16.10	16.26	16.16	

		Eye & ear		Chronograph	
Date		1869 July 5		July 10	
Observer		A. S.		A. S.	
Illumin'n		E.		E.	
Star		β Draconis		Gr. 966	β Draconis
Mag.					
δ		$52^{\circ} 24'$		$74^{\circ} 57'$	$52^{\circ} 24'$
Wire	a	17 25 19.6			
"	b	37.5			
"	c	55.5			
"	1	26 7.5	17 22 2.8	17 27 36.4	
"	2	13.5	16.4	42.5	
"	3	19.4	31.0	48.4	
"	4	25.2	44.8	54.6	
"	5	31.2	59.0	28 0.3	
"	d	42.8			
"	e	27 1.3			
"	f	19.0			
Sum		212.5	154.0	242.2	
Mean		17 26 19.32	17 22 30.80	17 27 48.44	
	Add	1 26.90			
Red'n to		17 27 46.22			
m					
n. tan. δ		+ .09			
c. sec. δ		+ .52	- 1.23	+ .52	
r					
T - \bar{m}		17 27 46.83			
a		17 27 30.68	5 22 11.44	17 27 30.63	
$\Delta T + \bar{m}$		16.15			

Date

July 10

Observer

A. S.

Illumin'n

E.

Star

 α Draconis μ Herculis ψ^1 Draconis

Mag.

 δ $68^\circ 49'$ $27^\circ 48'$ $72^\circ 13'$

Wire

a

"

b

"

c

"

1

"

2

"

3

"

4

"

5

"

d

"

e

"

f

Sum

Mean

Red'n to

m

n. tan. δ c. sec. δ

r

T - \bar{m}

a

 $\Delta T + \bar{m}$

17	37	43.5	17	41	31.6	17	44	13.6
		53.8			36.1			25.5
	38	3.8			39.9			36.9
		13.6			44.0			49.4
		23.6			48.1		45	0.4

		18.3			199.7			185.8
17	38	3.6	17	42	39.4	17	44	37.16

- .06

+ .36

+ 1.05

17 42 40.24

17	37	46.51	17	41	21.96	17	44	20.12
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18.28

Date	July 10			July 16					
Observer	A. S.			A. S.					
Illumin'n	E.			E.					
Star	γ Draconis			γ^2 Sagittarii					
Mag.				α Scorpii					
δ	$51^\circ 31'$			$30^\circ 25' S.$					
				$26^\circ 8' S.$					
Wire	a								
"	b								
"	c								
"	1	17	53	42.8	17	57	36.0		
"	2			48.4			40.2		
"	3			54.3			44.3		
"	4		52	0.2			48.7		
"	5			55.5			52.8		
"	d								
"	e								
"	f								
Sum		271.2			222.0				
Mean		17	53	54.24	17	57	44.40		
					16	21	47.04		
Red'n to									
m									
n. tan. δ	+1.05			—					
c. sec. δ	+1.52			+1.37					
r									
T — \bar{m}	17	53	54.81		16	21	47.13		
a	17	53	36.42	17	57	26.13	16	21	24.89
$\Delta T + \bar{m}$	18.39			22.24					

Date 1869 July 16

Observer A. S.

Illumin'n E.

Star

Mag.

 δ 15 Draconis ζ Ophiuchi η Herculis
69° 3' 10° 18' S, 39° 11'

Wire

a

"

b

"

c

"

1

"

2

"

3

"

4

"

5

"

d

"

e

"

f

Sum

Mean

	16	28	18.0	16	30	13.4	16	38	38.7
			28.4			17.0			43.2
			38.0			20.8			48.0
			48.6			24.4			52.4
			58.5			28.1			57.2

Red'n to

m

n. tan. δ c. sec. δ

			191.5			103.7			239.5
	16	28	38.30	16	30	20.74	16	38	47.90

 τ

T

a

 ΔT

	16	28	39.52	16	30	20.86	16	38	46.29
	16	28	17.27	16	29	58.79	16	38	26.08
			22.25			22.07			22.21

July 16 1869. Illumination East
 c' assumed +.32
 n from α Scorpii & 15 Drac. +.19
 $\Delta T + \bar{m}$ (at 16 $\frac{1}{2}$) 22.20
 If $\bar{m} = 1.09$ $\Delta T = -23.29$

Date	1869 July 21			
Observer	A. S.			
Illumin'n	E.			
Star	β Librae	μ^1 Bootis	γ^2 Urs. Min.	
Mag.				
δ	8° 54' S.			
Wire	a			
"	b			
"	c			
"	1	15 10 17.7	15 19 50.0	15 20 58.8
"	2	21.4	54.7	21 10.9
"	3	24.9	59.1	22.1
"	4	28.8	20 3.8	34.2
"	5	32.3	8.3	46.8
"	d			
"	e			
"	f			
Sum		125.1	295.9	112.8
Mean		15 10 25.02	15 19 59.18	15 21 22.56
Red'n to				
m		+ 1.09		
n. tan. δ		- .19		
c. sec. δ		+ .32		
r				
T		15 10 26.24		
a		15 9 59.03		
ΔT		27.21		

July 21 1869 Illumination East.

c' assumed + .32 n assumed + .19

Clock fast (at 15 $\frac{1}{3}$) 27.518

Right ascensions from British Almanac.
Am. Eph. missing.

Date	1869	July 21	July 25
Observer		A. S.	A. S.
Illumin'n		E.	E.
Star		α Cor. Bor.	α Lyrae
Mag.			51 Cephei
δ		$27^{\circ} 10'$	$38^{\circ} 40'$

Wire	a
"	b
"	c
"	1
"	2
"	3
"	4
"	5
"	d
"	e
"	f

Sum		177.5	5.1	178.5
Mean	15 29	35.50	18 33	1.02, 18 38

Red'n to		+ 1.09	+ 1.09	+ 1.09
m				
n. tan. δ		- .07	- .04	- 6.95
c. sec. δ		+ .37	+ .41	- 6.87

τ				
T	15 29	36.89	18 33	2.48
a	15 29	9.74	18 32	32.38
ΔT		27.15		30.10

July 25 1869 Ill. East.

c assumed +.32 n assumed +.32

Block fast (at $18\frac{1}{2}$) 30.10

Date	1869	July 29		
Observer		A. S.		
Illumin'n		E.		
Star		ρ Capricorni	α Cygni	32 Vulpeculae
Mag.		18° 14' S	44° 49'	27° 34'
δ				
Wire	a			
"	b			
"	c			
"	1	20 21 50.3	20 37 22.3	20 49 25.0
"	2	54.1	27.2	29.0
"	3	58.0	32.3	32.0
"	4	22 1.7	37.5	37.1
"	5	5.5	42.6	41.3
"	d			
"	e			
"	f			
Sum		289.60	164.9	165.4
Mean		20 21 57.92	20 37 32.38	20 49 33.08
Red'n to				
m		+1.19	+1.19	+1.19
n. tan. δ		- .19	+ .03	- .12
c. sec. δ		+ .34	+ .45	+ .36
r				
T		20 21 59.26	20 37 34.05	20 49 34.51
a		20 21 25.39	20 37 06.8	20 49 1.04
ΔT		33.87	33.37	33.47

July 29 1869 Illumination East
 c' assumed +1.32 on assumed +1.32
 Right ascensions from English Nautical Almanac
 Clock fast (at 20^h 5^m) 33.57

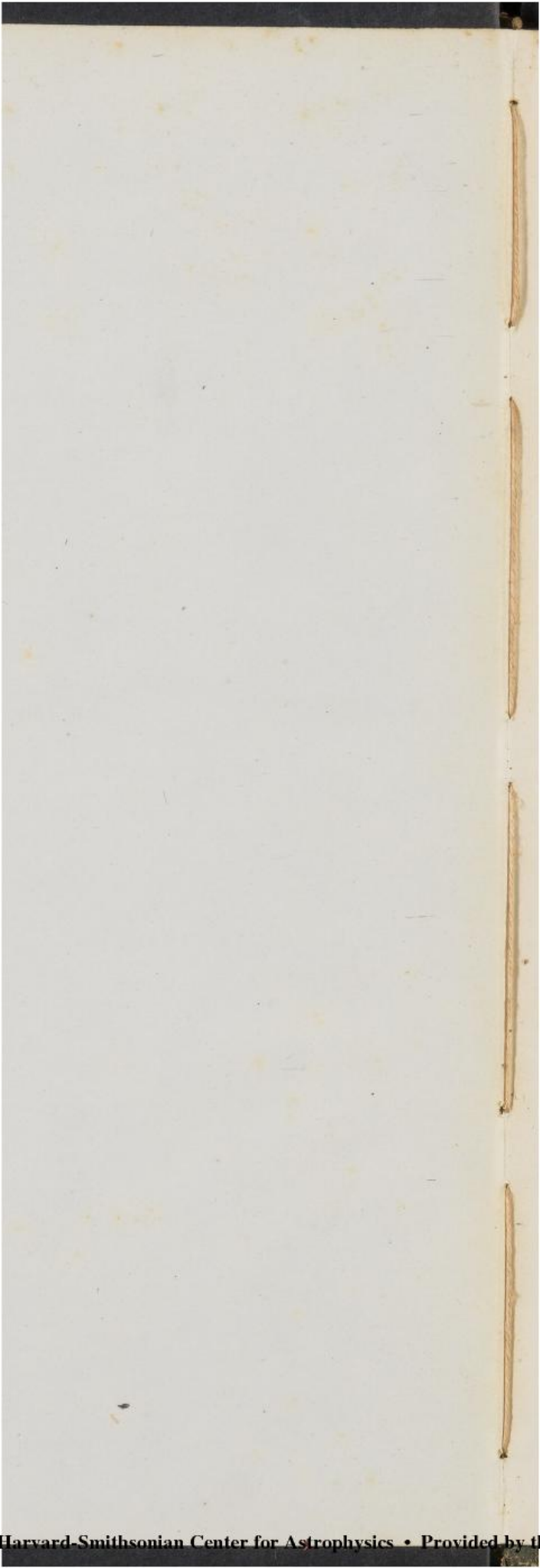
Date	1869	Aug. 14					
Observer		A. S.					
Illumin'n		E.					
Star		51 Cephei	β Lyrae	5 Aquilae			
Mag.		87° 14'	33° 13'	13° 41'			
δ							
Wire	a						
"	b						
"	c						
"	1	18 36 34.6	18 45 52.4	19 0 2.9			
"	2	37 51.2	56.8	6.8			
"	3	39 3.4	46 1.0	10.3			
"	4	40 21.7	5.3	14.3			
"	5	41 34.8	9.8	18.0			
"	d						
"	e						
"	f						
Sum		25.7	5.3	52.3			
Mean		18 39 5.14	18 46 1.06	19 0 10.46			
Red'n to							
m		+1.09	+1.09	+1.09			
n. tan. δ		-13.69	-1.16	-1.42			
c. sec. δ		-6.67	+1.38	+1.33			
τ							
T		18 38 45.87	18 46 2.37	19 0 11.46			
a		6 38 0.04	18 45 16.56	18 59 25.28			
ΔT		45.83	45.81	46.18			

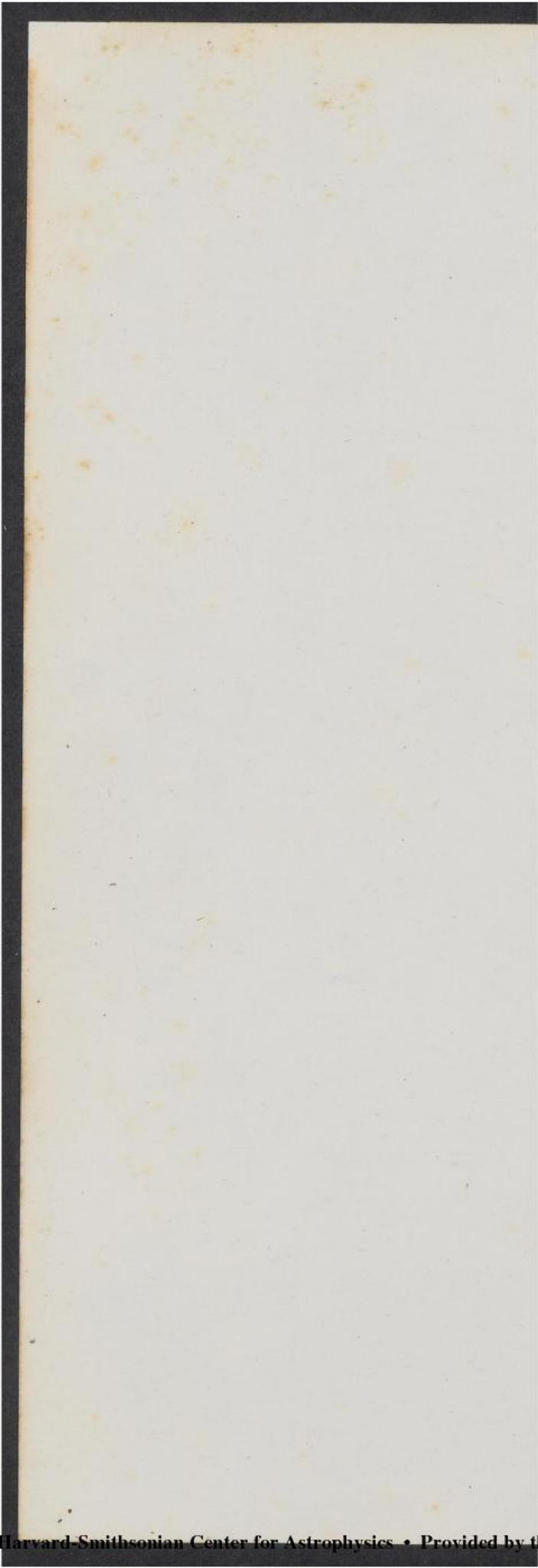
Aug. 14 1869. Illumination East.
 c' assumed +.32 n estimated +.63
 clock fast (at 19^h) 46.00

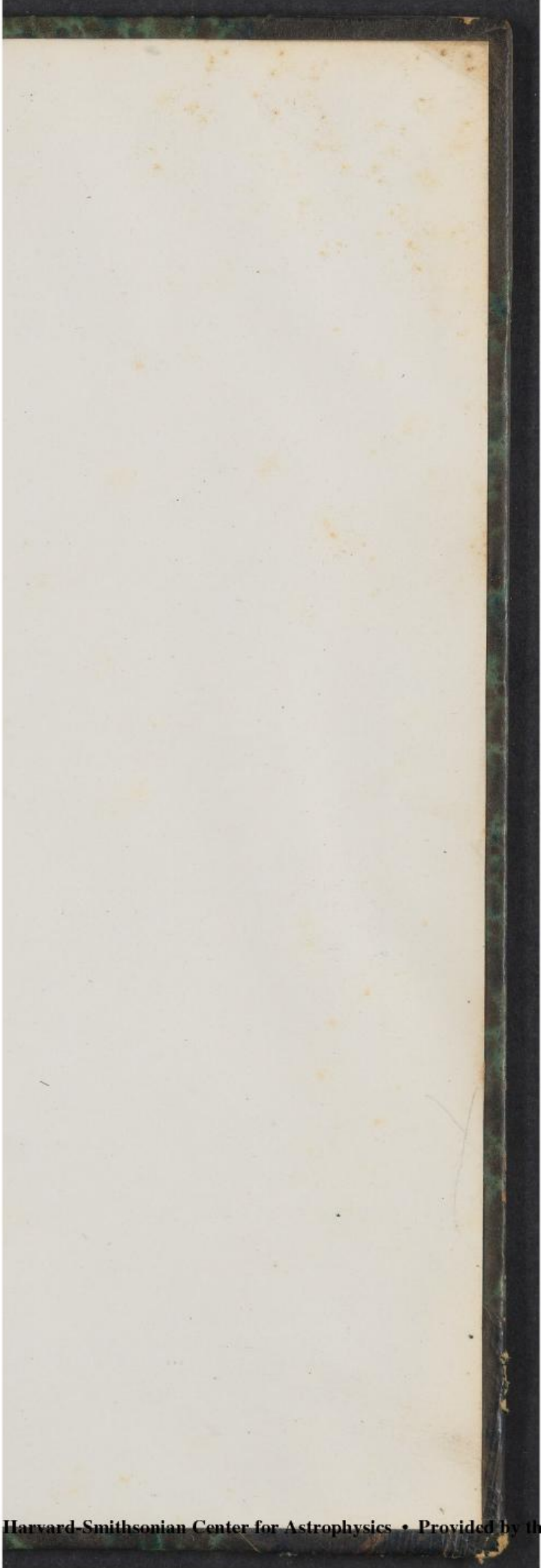
Date	1869	Aug. 22			
Observer		A. S.			
Illumin'n		E.			
Star		γ Draconis	μ Sagittarii	S Urs. Min.	
Mag.		51° 31'	21° 5' S.	86° 37'	
Wire	a				
"	b				
"	c				
"	1	17 54 15.3	18 6 42.7	18 13 20.4	
"	2	21.4	46.8	14 20.3	
"	3	27.0	50.3	15 22.0	
"	4	32.8	54.1	16 22.3	
"	5	38.8	58.0	17 23.4	
"	d				
"	e				
"	f				
Sum		135.3	251.9	108.4	
Mean		17 54 27.06	18 6 50.38	18 15 24.68	
Red'n to					
m		+ 1.03	+ 1.03	+ 1.03	
n. tan. δ		+ .16	- .60	+ 7.33	
c. sec. δ		+ .52	+ .36	+ 5.73	
r					
T		17 54 28.77	18 6 54.17	18 15 35.77	
a		17 53 35.46	18 5 57.78	18 14 41.72	
ΔT		53.31	53.39	54.05	

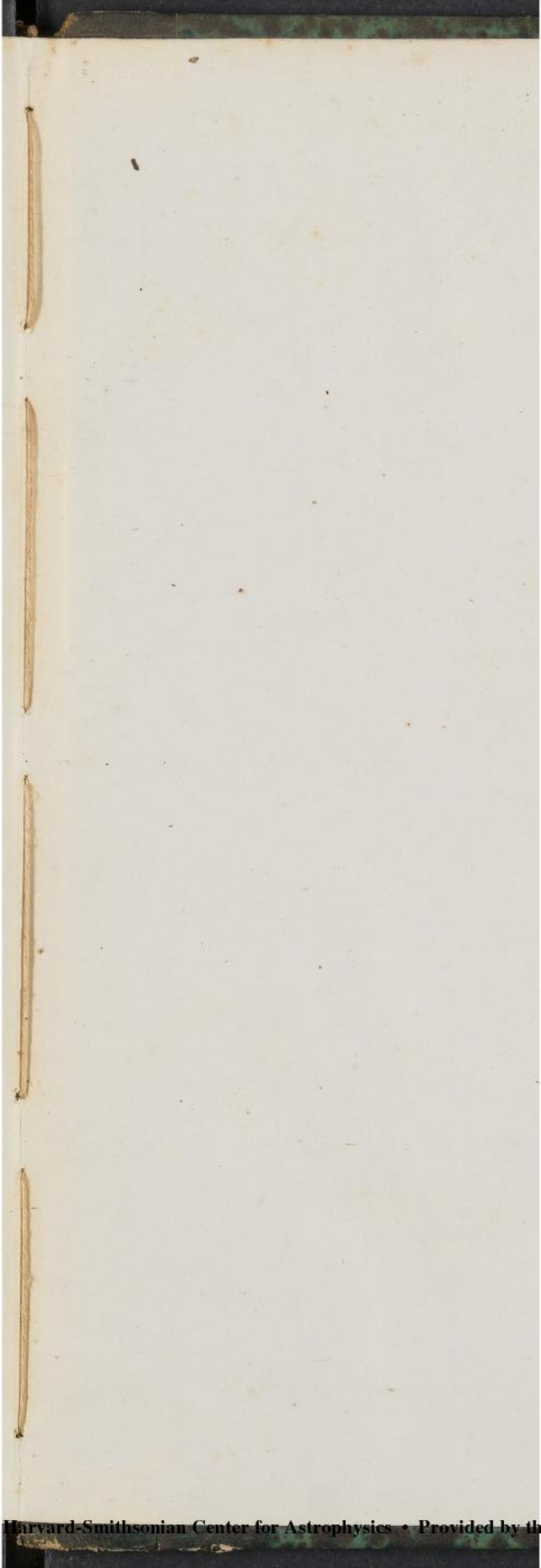
Aug. 22 1869 Illumination East.
c determined Aug. 21 1869 + .34
n from S Urs. Min. & 51 Cephei + .46
 Clock fast (at 18^h $\frac{1}{3}$) 53.542

Date	1869	Aug. 22		
Observer		A. S.		
Illumin'n		E.		
Star		α Lyrae	γ Cephei	β Lyrae
Mag.				
δ		$38^{\circ} 40'$	$87^{\circ} 14'$	$33^{\circ} 13'$
Wire	a			
"	b			
"	c			
"	1	18 33 14.9	18 36 43.6	18 46 0.0
"	2	19.4	37 59.6	4.4
"	3	24.0	39 14.1	8.7
"	4	28.8	40 27.9	12.8
"	5	33.5	41 41.5	17.0
"	d			
"	e			
"	f			
Sum		120.6	66.7	42.9
Mean		18 33 24.12	18 39 13.34	18 46 8.58
Red'n to				
m		+ 1.03	+ 1.03	+ 1.03
n. tan. δ		- .05	- 10.00	- .11
c. sec. δ		+ .44	- 7.09	+ .41
τ				
T		18 32 25.54	18 38 57.18	18 46 9.96
a		18 32 32.01	6 38 3.17	18 45 16.45
ΔT		53.53	54.01	53.46









1868224, print, 1888