

KG
11365
192

H. 38

Equatorial
Sept. 26th to Jan. 30th
1860-61

Sold by T. Groom & Co., Stationers, India Building, 82 State St., Boston.

KG 11365.192



KG 11365.192



Comparison Star b of June 21st

1860 Sept 26/27

Observations for determination of place of Comparison Star b of June 21st used for Comet. $+b = 10^{\text{th}}$ mag. follows
 $* a = 9^{\text{th}}$ 8^{s} and is $10'$ north of a

Zero of Pol. $84^{\circ} 25'$

b. follows a

236
5^h 8^m

16.2 beats

16.2 "

16.4 "

16.3

16.24

8.14

4.52 1
2 6 + 42 11

4 49 55

h 10 20 20

6 29 35

b South of a

Scale

10 20 0 26

10 38 0 43

9 54 0 1

9' 54"

9 55

9 53

9 56.0

b-a + 8.14

Refr.

c-a + 7 32.72

- 9 54.0

- 0.2

+ 3 31.5

+ 0.1

Rev. h mag 1860 + 0.01

c-a + 0.05

0.0

+ 0.7

M. Eq. 1860.0

b-a + 8.14

c-a + 7 32.72

- 9 56.2

+ 3 32.3

Comparison Star (c") of June 22

Star a

Micr. Wire	5	22	30.0	3	3
Scale wire	5	23	7.8		

Lalande star precedes c" by 41.8 and is 0' 20"	Wire Scale	21.5 209 53.5	6 3 4
--	---------------	------------------	-------

Star (c")	5	30	35.3	6 34
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c" north of a 3' 31"
c" follows a

Star a	5	36	26.0 58.6	2 47
--------	---	----	--------------	------

c"	5	43 44	59.0 31.5	6 19	7 33.0 7 32.9
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Star a	5	47 48	37.0 9.5		7 32.5 7 32.5 7 32.72
c"	5	55 4	9.5 42.0		

Comet - Stars

860 Sept. 26.27

Reduction of a 2^d from Sept. 26th to June 21st

Sept 26.

Sept 26/27 = 27.26

a

b

c"

G	346° 27'					
a	97 21		97 23		99 14	
H	85 8					
δ to γ	+12 7	9.9562	41 58	9.9539	42 11	9.9572
δ to α	83 48	9.9974	83 50	9.9975	85 41	9.9988
γ to α	21.32	1.3288		1.3288		1.3288
(C-20) to		9.0334		9.0311		8.8761
δ to α		0.1297		0.1287		0.1302
H to α	182 29	8.6368	182 31	8.6426	184 22	8.8816
δ to γ	18.77	1.2735		1.2735		1.2735
H to α		9.9996		9.9996		9.9967
δ to α		9.8265		9.8252		9.8270
i	+8.12	0.9096				
δ to α	47.61			1.284		
δ to α	19.16	1.2824	19.06	1.2802	19.27	1.2848
δ to α	-1.10	0.0410	-1.11	0.0410	-1.93	0.2853
δ to α	+2.30	0.3622	+2.29	0.3599	+1.60	0.2054
δ to α	-12.58	1.0996	-12.54	1.0983	-12.57	1.0992
δ to α	+6.02	0.7799	+6.04	0.7809	+6.02	0.7794
Δa	65.67		65.56		64.95	
$\Delta \delta$	-4.26		-4.21		-4.95	

Pentastemon *leptocarpus*

1860 Sept 22 - 19

Observations of *Pentastemon* *leptocarpus* made by
Mr. J. H. H. for June 22 - 1928
Gardner of the California Department

Pentastemon *leptocarpus* is found in
the low brushy country of the coast.

Pentastemon *leptocarpus* is found in

Pendulum Experiments

1860 Sept 26 - 27

Vibrations of invariable pendulum made by
 Wm Bond & Son for Lieut. J. C. Dox. Astronomer &
 Surveyor of the California Boundary

Pendulum suspended in Transit room
 the box firmly screwed against a brick wall.

• Suspension on Knife-edge No. 1 facing outwards

Right to Left.

Left to Right

~~32 45~~
 9
 21 34 30
 beats.
 7.3.
 27.2
 47.4
 67.3
 9
 21 36 45
 9.4
 29.6
 50.2
 70.0

9
 21 35 40 + 17.3
 27.4
 57.3
 77.2
 beats.
~~10.0~~
~~30.22~~

9
 21 40 0 5.4
 25.9

Pendulum E

1860 Sept. 26/27

Right to left

Left to Right

(Disturbance in room)

~~5.8~~~~3.5~~~~23.8~~

h m s
~~21~~ 42 40
 9

~~7.3~~

5.7

5.9

46.0

66.2

Left to Right

21 44 100

9

1.3

25.2

45.2

65.2

9
~~21~~ 45 20

7.3

27.4

47.3

67.3

21 46 30

9

5.5

25.6

45.7

65.8

Disturbance uncertain

~~21~~ 4 45 39

R. to L.

h m s
~~21~~ 49 0

5.4

45.4

65.3

One edge which precedes in R to L is used.

L. to R

h m s
~~21~~ 50 0

9

7.3

27.2

47.2

67.3

These are sure

R. to L.

h m s
 9 21 51 45

3.8

26.0

46.1

66.1

L. to R

h m s
~~21~~ 53 5

9

6.1

7.2

27.2

47.3

67.3

R. to L.

L. to R.

$$\begin{array}{r} 9 \\ 21 \overline{) 56} \quad 0 \quad 8.1 \\ 28.3 \\ 48.3 \\ 68.4 \end{array}$$

$$\begin{array}{r} 9 \\ 21 \overline{) 57} \quad 0 + 10.4 \\ 30.4 \\ 50.6 \\ 71.0 \end{array}$$

$$\begin{array}{r} 21 \overline{) 56} \quad 4.15 \quad 5.20 \\ 16.15 \quad 15.20 \\ 16.15 \\ 36.20 \end{array}$$

$$\begin{array}{r} 9 \\ 21 \overline{) 58} \quad 25 + 7.4 \\ 27.3 \\ 47.4 \\ 67.4 \end{array}$$

$$\begin{array}{r} 9 \\ 21 \overline{) 59} \quad 25 + 5.4 \\ 25.3 \\ 45.5 \\ 65.6 \\ 85.8 \\ 106.2 \\ 126.2 \end{array}$$

$$\begin{array}{r} 59 \quad 28.7 \\ 38.65 \\ 48.7 \\ 58.7 \end{array}$$
M $\frac{10}{22}$ 4^m Vibration

7.2

U. Jmr. 54.⁰1 54.⁰2
$$\left\{ \begin{array}{l} \text{R. to L} \\ \text{L. to R} \end{array} \right. \begin{array}{r} 10 \text{ h} \\ 22 \overline{) 12} \quad 0 + 7.8 \\ 13.6 \end{array}$$

$$\begin{array}{r} 10 \text{ h} \\ 22 \overline{) 12} \quad 5.5 + 5.8 \\ 11.7 \end{array}$$

$$\begin{array}{r} 12 \quad 2.9 \\ 14 \quad 3.75 \\ 48.15 \end{array}$$

$$\begin{array}{r} 10 \\ \text{R. to L} \\ \text{L. to R} \end{array} \begin{array}{r} 22 \overline{) 14} \quad 4 + 7.5 \\ 13.6 \end{array}$$

$$\begin{array}{r} 10 \\ 22 \overline{) 14} \quad 45 + 6.3 \\ 12.3 \end{array}$$

$$\begin{array}{r} \text{R. to L} \\ \text{L. to R} \end{array} \begin{array}{r} 22 \overline{) 14} \quad 4 + 7.5 \\ 13.6 \end{array}$$

M ¹⁰ ~~22~~ 19

U Thr. 54.02
L Thr. 56.2

Repeat all before run

Av 1.8

R to L ^h ^m ^s ^b
70 21 59 + 7.43
L to R. 13.41

(10) ^h ^m ^s ^b
70 22 30 + 7.4

R to L ^b
7.4
27.5
47.5
67.6
87.6
107.5
127.7
147.8

+
188.1
208.3
228.3
248.3
268.5
288.6
308.7
329.0

L to R
Chronometer 23.6

^h ^m ^s ^b
9 26 0 + 9.5

9 27 20

^h ^m ^s ^b
15.4

+ 7.6
27.6
47.8
67.7
87.8
107.8
127.9
147.9
167.9
188.1
208.2
228.3

R to L.

10 31 0 +

8
 6.4
 26.6
 46.5
 66.5
 86.5
 106.6
 126.7
 146.8
 166.9
 187.3
 207.4
 227.4

L to R.

10 33 0 +

2
 6.2
 26.2
 46.3
 66.4
 86.4
 106.4
 126.7
 146.7
 166.5
 186.6

10 ~~L to~~ R to L to R
 35 30 6.7
 12.8

~~At H d.~~

10 58 Arc. 1.2

Upper Thr. 54.8
55.2

30 + 7.5
13.5

7.4
13.6
R to L
7.5
27.6
47.6
67.8
87.8
107.8
127.8
147.9

L to R
35 + 4.2
24.3
44.4

84.4
104.5
124.7
144.6

R to L
8.3
28.4
48.4
68.4
88.5
108.6

$$\begin{array}{l} \text{L to R } 11 \frac{1}{4} 45 + 2 \\ 5.3 \\ 25.6 \\ 45.6 \\ 65.7 \\ 85.7 \\ 105.7 \end{array}$$

$$\begin{array}{l} \text{R to L } 11 \ 6 \ 0 + 9.4 \\ 29.6 \\ 49.8 \\ 70.2 \\ 90.4 \end{array}$$

$$\begin{array}{l} \text{L to R } 11 \ 7 \ 45 + 6.6 ? \\ 27.3 \\ 47.5 \\ 67.6 \\ 87.6 \\ 107.6 \end{array}$$

$$\begin{array}{l} \text{R to L } 11 \ 10 \ 0 + 3.6 \\ \text{L to R } 9.6 \end{array}$$

R to L

✱

$$11 \quad 21 \quad 0 \quad + \quad 9.2$$

29.2

49.2

69.2

89.2

109.4

L to R

$$11 \quad 22 \quad 35 \quad + \quad 5.6 \quad 54 \quad 55 \quad 56 \quad 57 \quad 63$$

25.7

45.7

65.8

85.8

105.9

R to L

L to R

$$11 \quad 24 \quad 45 \quad 7.3 \quad \underline{\quad}$$

13.3

R to L

$$11 \quad 25 \quad 30 \quad + \quad 7.4$$

27.3

47.2

67.1

87.0

106.9

L to R

$$11 \quad 27 \quad 0 \quad 5.4$$

25.3

45.5

65.6

85.5

105.5

R to L

11 28 30

7.8
27.9
48.0
68.1
88.4
108.4

~~L to R~~ R to L

~~11 28 50~~ 28
11 30 0 + 8.4

11 30 30 + 8.6 6.2 2.2 2.6 2.1
+ 14.6

11 30 50 8.6 - 1.4
8.6
14.8

11 31 10 9.0 - .3
15.1

L to R.

~~11~~
11 32 10 + 11.1
31.3
71.5
71.7
91.8
112.0

R. A. L

L. h. R.

11 35 20 11.2

31.3

51.1

71.2

91.2

111.3

117.4

11 36 40 11.8 ?

←

37.6

11 38 0

7.7

27.8

47.8

68.1

88.2

108.3

11 39 10

8.4

28.4

48.5

68.5

88.5

108.5

128.6

148.8

155.1

11 41 0

9.3

29.2

49.4

69.4

89.4

109.5

129.6

149.5

155.8

R to L L to R.

11 43 30 10.0 16.3
 56.4
 56.5
 76.6
 96.6
 116.8
 136.9
 156.9

11

R. to L. G.P.B. obs.
7 HJ. mark time

20 vibr	> 57	62.6	.24
10 vibr	> 58	22.6	.10
"		62.6	.03
"	59	2.7	.05
"		22.7	.08
"		42.8	
"	0	2.8	
"		23.0	
"		42.1	

R to L L to R

~~12 2 20 + 17.4 ?~~

12 3 0 + 19.3

12 3 30 19.3 25.2

12 4 0 19.2 25.3

12 5 30 19.6

12 6 0 19.8 26.0

12 7 0 + 0.2 6.5

12 8 0 0.6 6.8

~~12 9 0 + 0.5~~

12 9 40 1.4 7.5

At 12 14 55.0 upper
 51.8 lower

In 1^h 42^m 48^s of 236
 Pendulum hit 21.93 on 236.

Pendulum Experiments.

At 12^h 18^m ^{sid. time} P. reversed end for end, so that knife-edge is upward and facing outward.

~~12 53 10~~	R. L.	L. R.
	center	center
12 55 30	+ 7.4	+ 13.3
12 56 30	7.6	13.4
12 57 0	7.9	14.1

13 5 30	7.6	—
6 0	7.7	13.7
6 20	7.9	14.0

13 15 0	7.5	
15 50	7.8	
16 0	7.9	14.0

13 19 60	5.5	11.5
20 0	5.7	11.5
20 20	5.8	11.5

At 13 43	Upper Inc.	55.8
	Lower	55.5

13 43 30	7.6	13.8
44 0	8.0	13.9
44 40	8.2	—

At 14 47	Upper Inc.	56.0	Arc 0.7
	Lower	55.9	

14 48 20	7.8	14.0
50	8.0	14.1
49 40	8.1	14.2

~~14 51 10~~ ~~8.8~~ ~~14.8~~ ?

$\begin{array}{r} 14 \ 53 \ 20 \\ \quad \quad 50 \\ + \ 9.8 \ 15.9 \\ \hline 10.2 \end{array}$

At 15 33 ~~15 31 0~~ ~~5.4~~ Arc 0.45 Upper ~~56.3~~ Lower ~~56.3~~

$\begin{array}{r} 15 \ 31 \ 30 \\ \quad \quad 31 \ 50 \\ \quad \quad 32 \ 10 \end{array} \quad \begin{array}{r} 6.4 \ 12.5 \\ 6.5 \ 12.6 \\ 6.4 \ 12.8 \end{array}$

Pendulum sideways, so that face
 no. 3 is uppermost and in front.

At 15^h 41^m Arc. 3.2 Upper Tr. 57°0 Lower 57°1

$\begin{array}{r} 15 \ 44 \ 30 \\ \quad \quad 45 \ 00 \\ \quad \quad 45 \ 30 \end{array} \quad \begin{array}{r} 5.4 \ 11.3 \\ 5.3 \ 11.4 \\ 5.4 \ 11.3 \end{array}$

$\begin{array}{r} 15 \ 47 \ 50 \\ \quad \quad 48 \ 10 \\ \quad \quad 48 \ 30 \end{array} \quad \begin{array}{r} 6.2 \ 12.1 \\ 6.2 \ 12.2 \\ 6.3 \ 12.2 \end{array}$

$\begin{array}{r} 15 \ 54 \ 40 \\ \quad \quad 55 \ 20 \\ \quad \quad 55 \ 40 \end{array} \quad \begin{array}{r} 9.4 \ 15.4 \\ 9.5 \ 15.4 \\ 9.4 \ 15.4 \end{array}$

At 15 57 Arc. 2.6 U. Tr. 57°0 L. Tr. 57°7

$\begin{array}{r} 15 \ 58 \ 50 \\ \quad \quad 59 \ 10 \\ \quad \quad 59 \ 30 \end{array} \quad \begin{array}{r} 7.4 \ 13.3 \\ 7.4 \ 13.3 \\ 7.4 \ 13.3 \end{array}$

$\begin{array}{r} 16 \ 0 \ 40 \end{array} \quad \begin{array}{r} 7.8 \ 13.6 \end{array}$

At 16^h 50^m upper 57.0 Arc. 1.4
 down 56.4

16	50	50	6.4	12.5
	51	20	6.5	12.4
	51	40	6.6	12.5

At 17 33 upper 56.9 Arc. 0.9
 Lower 56.6

17	34	10	5.4	11.3
	34	30	5.4	11.4
	34	50	5.5	11.4

Reversed so that face 2 is uppermost and in front.

17	46	30	5.8	12.0
	47	10	6.0	12.1
	47	50	6.5	12.7

	52	0	9.4	15.2
	52	40	9.5	15.4
	53	10	+ 9.6	15.4

	55	10	10.3	16.2
	55	40	10.5	16.3
	56	0	10.8	16.8?

At 18 3 Arc = 2.2

18	4	0	5.6	11.4
	4	30	5.6	11.5
	4	50	5.7	11.5

19^h 20^m ^{up} Thr. 56.6 Lower 56.6

Arc 1.0

19	20	40	6.8	12.5
	21	20	6.7	12.5
	21	40	6.7	12.5

19 46 Arc. 0.75

19	49	20	6.8	12.5
		40	6.7	12.4
	50	0	6.9	12.4

Thr. Up. 56.6 Low 56.4

Set I was made with face 1 up and in front.

II " " 4 " "

III " " 3 " "

IV " " 2 " "

236 was fast at 9.0 2 5.75
18.6 6.00

Value of 1 vibration 1.003 605 in sidereal seconds - Set I
 .003 589 II
 .003 692 III
 1.003 537 IV

The probable error of each is about ± 0.000015 assuming the groups to have equal weight

Pendulum Experiments.

Set.	$\frac{1}{2}$ [Right to Left + Left to Right.]				Sidercal Time		Vibrations	Arc	Upper Thermometer	Lower Thermometer
	236			Beats						
I.	10	24	53	+	131.86	10 23 53.14	0.10	1.8	54.2	54.2
		31	51		134.66	30 52.54	+0.10			
	11	0	12		147.09	10 59 19.74	+0.01	1.2	54.8	55.2
		6	7		149.68	11 5 16.04	-0.02			
		20	43		156.39	19 55.38	-0.22			
		26	49		158.94	26 2.66	-0.14			
		29	16		159.64	28 30.01	-0.41			
		41	31		165.12	40 47.74	-0.10			
	12	3	4		174.27	12 2 25.31	-0.03			
		6	48		175.85	6 10.09	0.00			
	12	14								
									55.0	54.8
II.	12	56	30	+	10.68	12 54 29.49				
	13	5	58		14.77	13 3 59.53				
		14	56		18.88	12 59.58				
		19	54		20.58	17 58.43				
		43	50		30.97	41 59.61			55.8	55.5
	14	48	26		59.05	14 46 49.62		0.7	56.0	55.9
		52	56		60.90	51 20.55				
	15	31	16		77.53	15 29 48.85		0.45		
III.	15	45	0	+	8.35	15 42 58.25			57.0	57.1
		48	10		9.20	46 8.67				
		55	8		12.42	53 8.28		2.6	57.0	56.7
		59	8		14.35	57 9.24				
	16	51	2		37.48	16 49 14.79		1.4	57.0	56.4
	17	34	6		56.40	17 32 28.23		0.9	56.9	56.6
IV.	17	47	19	+	9.18	17 45 8.61				
		52	40		12.44	50 40.24				
		55	40		13.51	53 40.77				
	18	4	26		16.57	18 2 28.30		2.2		
	19	21	0		49.68	19 19 18.81		1.0	56.6	56.6
	19	49	14		61.71	19 47 38.82		0.75	56.6	56.6

For Ferguson's Planet

860 Sept. 28

Wash mt

Sept. 15. 402	23	4	37.3	-3	22.95	1.95	F
16. 354		3	46.1	3	29.90	6.70	F
21. 353	22	59	26.3	4	6.00	7.22	F
22. ~~432~~ 390		58	34.6	4	13.51		S
132							

Daily mt:

Sept 16	-53.8	7.30	30	14
19	52.0	7.28		0.50
22	50.0	(6.95?)	6.95	-2.0
2				

Sept. 28	10	22	58	46	-4	55.2
29	"		53	0	5	2.0

Meisse	22	1088	22	52	26	-5	1.7	double prove
1223			9	58	14	-5	0.2	

Occultation of Pleiades

860 Oct 3/4

236 is 2nd fast

12^h 52^m

Mean solar times of Emissions

No 2 (in order of R)	13 ^h y ^m	Obs'd at	By 236
.5	30	9' North 0 ^h 59 ^m 30 ^s - 10 ^s	0 ^h 59 ^m 20 ^s
7	37	2 " 34 00 - 9.5	1 33 50.5
17	53	4 " ~~34~~	
15-16	14 3	8 South	
18	7	7 North	
19	* 18	11 "	
31	12	0	
21	21	14 South	
η Tauri 34	48	8 "	
33	53	2 "	
37	15 25	9 North	
39	* 34	7 "	
g.s. 41	30	7 North	
42	48	15 South	
44	16 6	9 South	
46	16 9	9 North	
45	16 9	3 South	
48	16 20	7 North	
49	16 22	4 South	
		7 South	

236 fast 2nd 14.0

0 59 20

1 33 50.5

2 14.0

2 14.0

Im. (2)

0 57 6.0

(17) 1 31 36.5

Sidereal Time

Occultation of Pleiades

No 2 was observed at Im. by G.P.B. with Spr. Gov. 23rd Refractor
 Obs. preceded by D.D.D. - followed by B.B.B. Immersion was
 seen with certainty at moment indicated although the star
 was quite faint through overpowering effect of Cir. light

No 17 5th mag. - Im by Spr Gov. - after Long. D. good

Clouds prevented further observation

No. 2	0	58	7.8
B. and S. fast		1	1.6
Sidereal Time	0	57	6.2
	12	50	25.5
	12	6	40.7
		1	59.0

Mean Time 12 4 41.7 Immersion of Electra. (2)

No. 17	1	32	37.9
B. and S. fast		1	1.6
Sidereal Time	1	31	36.3
	12	50	25.5
	12	41	10.8

The rate of B. and S. being somewhat uncertain its error
 Mean Time 12 39 8.1 Immersion of Merope (17)

The rate of B. and S. being somewhat uncertain its error
 given above is taken from an observation of η Piscium, made
 between the two immersions. See Transit Book.

Pendulum Experiments.

1860 Oct. 6.

Vibrations of invariable Pendulum No. 9 (W. Bond and Son)
 Chronometer 236.

†
 I.H.S. observer.

A. Knife-edge no. 1 upwards and outwards.

At 12 21 Upper Thermometer 49°.0
 Lower " 47.0

Arc 2°.8

				R. to L.	L. to R.	Means
				Beats	Beats	
Sed. I.	12	24	0	9.6	15.5	
		24	50	9.7	15.7	
		25	20	9.8	15.7	
		26	0	9.8	15.8	
		26	30	9.8	15.8	
						<u>beats.</u>
						12 25 20 + 12.72

At 12 30 Arc. 2°.6

II.	12	30	20	11.8	16.8	
		31	20	11.4	17.2	
		31	50	11.3	17.2	
		32	10	11.3	17.2	
		32	30	11.4	17.2	
						12 31 38 + 14.18
						12 31 38 + 14.18

At 12 34 Upper Thermometer 48°.8
 Lower " 47.1

Pendulum Experiments.

1860 Oct 6

A (cont.) At 12^h 50^m Arc. 2^o.1
Set III.

				R. to L. Beats.	L. to R. Beats.
12	51	20	+	12.8	18.8
	52	20		13.1	19.1
	52	40		13.1	19.1
	53	10		13.2	19.2
	53	40		13.3	19.2

Means

12	52	38	+	Beats
				16.09

 At 12 55 Upper Thermometer 49.0
 Lower " 47.2

Set IV

13	8	10	+	7.3	+ 13.3
	8	50		7.3	13.3
	9	10		7.2	13.2
	9	30		7.2	13.4
	9	50		7.3	13.4

13 9 6 + 10.29

At 13 11 Arc. 1^o.63

Set V.

13	32	0		5.4	11.6
	32	40		5.6	11.7
	33	0		5.7	11.8
	33	40		5.8	11.9
	34	0		6.0	12.0

13 33 4 + 8.75

Set VI.

14	0	0		9.5	15.4
	0	20		9.6	15.6
	0	40		9.8	15.7
	1	0		9.8	15.7
	1	20		9.9	15.7

14 0 40 + 12.67

 At 14^h 6^m Arc 0^o.96
 48.4 Upper Thermometer
 46.6 Lower "

A continued.

Means.

IV. 15	24	20	7.5	13.3
	24	40	7.6	13.4
	25	0	8.2	13.9
	25	20	7.8	14.9
	25	40	8.1	14.0

At 15^h 30^m Alt. 0.5

Upper Therm.

15 25 0

Beats
+ 10.7848.0
46.6

B. Pendulum Reversed sideways — 2 in front uppermost.

At 15^h 48^m

Upper Therm.

48.4

(Arc. 2.7 at 15 32)

Lower "

47.0

Means.

I. 15	49	30	5.4	11.6
	49	50	5.4	11.7
	50	10	5.6	11.8
	50	40	5.5	12.0
	51	0	5.5	11.9

Beats
8.64

II. 15	54	30	6.0	12.2
	54	50	6.2	12.3
	55	10	6.4	12.4
	55	50	6.4	12.6
	56	10	6.5	12.5

15 55 18 + 9.35

III. 16	0	0	7.3	13.2
	0	20	7.4	13.3
	0	40	7.3	13.3
	1	0	7.3	13.3
	1	20	7.3	13.3

16 0 40 + 10.30

Pendulum Experiments

1860 Oct 6

B.

IV.	At 16 31			Arc. 1.53		Beats	Beats	Mean
	16	32	30			+ 7.3	+ 13.4	
		33	10			7.3	13.4	
		33	30			7.3	13.6	
		34	00			7.4	13.5	
		34	20			7.3	13.6	
								Beats
								16 33 30 + 10.41
V.	16	37	50			7.4	13.7	
		37	50			7.4	13.6	
		38	10			7.5	13.8	
		38	30			7.8	14.0	
		38	50			7.9	14.0	
								16 38 8 + 10.71

At 16^h 41^m Upper Therm. 48.3
 Lower " 47.2

VI	At 17 5			Arc 1.1		Beats	Beats	Mean
	17	12	40			7.6	13.8	
		13	0			7.4	13.8	
		13	20			7.7	13.8	
		13	40			7.7	14.0	
		14	0			7.6	13.8	
								17 13 20 + 10.72

VII	At 17 15			Arc. 1.03		Beats	Beats	Mean
	17	23	0			9.4	15.6	
		23	30			9.4	15.7	
		24	0			9.4	15.6	
		24	20			9.4	15.8	
		25	0			9.4	15.8	
								17 28 58 + 12.55

Pendulum Experiments

1860 Oct. 6

Mean

VIII.

				Beats	Beats
17	34	20	+	6.6	13.1
	35	10		6.8	12.9
	35	50		6.8	13.2
	36	20		7.0	13.2
	36	50		7.0	13.1

17 35 42 + 9.97

At 17 37 Arc. $0^{\circ}9$

Upper Therm. $48^{\circ}6$
 Lower " 47.1

~~At~~
 C. Reversed pend for end and sideways.

Face 3 uppermost and in front.

At 17 57 Upper Therm. 48.6
 Lower " 47.2

Arc. $2^{\circ}5$

				Beats	Beats
I.	18	0 20	+	9.4	15.3
		0 50		9.3	15.3
		1 10		9.3	15.3
		1 30		9.4	15.3
		1 50		9.4	15.2

18 1 8 + 12.32

II.	18	4 50	+	9.8	15.6
		5 10		9.8	15.6
		5 30		10.0	15.6
		5 50		9.9	15.7
		6 10		9.9	15.7

18 5 30 + 12.66

Pendulum Experiments

1860 Oct. 6.

At 18^h 19^m Arc. 1st 93

III.	18	19	40	+	7.3	+	13.3
		20	10		7.4		13.4
		20	30		7.3		13.5
		20	50		7.3		13.5
		21	20		7.4		13.5

18 20 30 + 10.39

IV.	18	25	20		7.9		13.8
		25	50		8.0		14.0
		26	10		8.0		14.0
		26	30		8.1		14.0
		27	0		8.1		14.1

18 26 10 + 10.99

V.	18	29	0		8.4		14.5
	~~18~~	29	20		8.6		14.7
		29	40		8.7		14.8
		30	0		8.4		14.6
		30	20		8.4		14.6

18 29 40 + 11.57

At 20^h 10^m Arc. 0th 7

VI.	20	14	10		9.5		15.8
		14	40		9.4		15.2
		15	0		9.4		15.1
		15	20		9.4		15.1
		15	50		9.4		15.2

20 15 0 + 12.38

At 20^h 17^m Up. Therm. 47th 6
Down — 46.3

VII.	20	21	20		10.0		16.0
			40		10.1		16.0
		22	0		10.2		16.1
			20		10.2		16.2
			40		10.2		16.1

20 22 0 + 13.11

Pendulum Experiments

18/10 Oct. 6

VIII.

20	28	50	+	7.3	13.2
	29	20		7.2	13.2
	29	40		7.3	13.1
	30	0		7.2	13.2
	30	30		7.2	13.2

D Reversed again to that face 4 in uppermost and in front.

At 21 12

47.5 Upper Therm.
46.4 Lower "
2.45 Arc

I.

21	13	20	+	9.4	15.3
	14	"		9.6	15.3
	14	20		9.5	15.2
	14	40		9.5	15.3
	15	0		9.5	15.3

21 14 16 + 12.40

II.

21	17	40		9.7	15.5
	18	0		9.9	15.9
	18	20		9.9	16.0
	19	20		10.0	16.0
	19	40		10.2	16.0

At 21 22

1.85 Arc.

21 18 40 + 12.91

III.

21	25	00		10.8	17.0
	26	00		11.1	17.1
	26	20		11.2	17.2
	26	40		11.1	17.2
	27	10		11.4	17.2

21 26 14 + 14.13

At 21 28

Upper Therm. 47.6
Lower " 46.3

Pendulum Experiments

1860 Oct. 6

IV.

			but	Quab
22	16	50	+ 9.2	+15.1
	17	10	9.2	15.2
	17	40	9.1	15.1
	18	10	9.3	15.3
	18	30	9.3	15.3

V.

22	33	20	10.6	16.4
	33	40	10.7	16.4
	34	10	10.5	16.4
	34	30	10.6	16.5
	35	0	10.7	16.4

22 17 40 + 12.21

At 22^h 37^m M. Tm. 47.2
 Low. Pm. 46.0

22 34 8 + 13.56

VI

23	1	20	10.2	16.1
	1	40	10.2	16.1
	2	0	10.2	16.1
	2	20	10.2	16.1
	2	40	10.2	16.2

At 23^h 36^m Arc. 0.52

23 2 0 + 13.16

23	36	20	10.3	16.1
	36	40	10.3	16.1
	37	00	10.2	16.2
	37	40	10.3	16.2
	38	0	10.3	16.2

At 23^h 38^m Upper Tension. 47.0
 Lower . 46.5

23 37 8 + 13.22

Pendulum Experiments - Reduction

	M	D	m	z	beats.	Period Time	Vibrations
A.	12	25	20	+	12.72	12 25 26.31	
		31	38	+	14.18	31	378
		52	38	+	16.09		1138
	13	9	2	+	18.29		2622
		32	58	+	20.75		4058
	14	0	34	+	24.67		5714
	15	24	48	+	36.78		10768
B.	15	50	14	+	8.64		
		55	18	+	9.35		304
	16	0	40	+	10.30		626
		33	28	+	14.41		2594
		38	6	+	14.71		2872
	17	13	16	+	18.72		4982
		23	54	+	20.55		5620
		35	36	+	21.97		6322
C.	18	1	8	+	12.32		
		5	30	+	12.66		262
		20	28	+	14.39		1160
		26	8	+	14.99		1500
		29	38	+	15.57		1770
	20	14	52	+	28.28		8084
		21	52	+	29.11		8444
		29	39	+	30.21		8902
D.	21	14	16	+	12.40		
		18	40	+	12.91		264
		26	14	+	14.13		718
	22	17	36	+	20.21		3800
		34	4	+	21.56		4788
	23	1	54	+	25.16		6458
		37	0	+	29.22		0584

In 1000 vibrations the pendulum lost of 236 in position A 1.008 ± 0.008
 " B 1.035 ± 0.011
 " C 0.991 ± 0.007
 " D 0.976 ± 0.009
 Mean 1.002 ± 0.0044

236 is gaining 1.6 daily = 0.019 in 1000 seconds.

Have the pendulum is rising on 236 in pos. A 1.027 ± 0.008
 B 1.054 ± 0.011
 C 1.010 ± 0.007
 D 0.995 ± 0.009

Ring-Micrometer (Five-foot Eq)

1860 Oct. 6

Ring-Mic. B. on the five-foot Eq.

Inner Ring.

a =
Southb = 7 Tauri
North236. In. 21 44.8
Out. 22 17.623 22 20.5
22 47.4In. 23 58.4
Out. 24 31.824 34.5
25 0.8In. 25 32.6
Out. 26 6.226 9.6
26 35.1In. 27 12.6
Out. 27 46.727 49.4
28 15.6

Ring - Micrometer - Five-foot Eq.

1860 Oct. 9th

Transits of Pleiadum Anon. 18 North }
 Anon 22 South } through Ring B, Inner

Diameter of Inner Ring.

Star

Chs.						In.	
236 -	22	5 ^m 40 ^s ✓	+	5. beats	+ 18. beats		
		6 10		7	16.	Out.	31.50 29.50
	22	6 50	+	5.5	+ 18.8		
		7 20		9.	17		31.75 29.1
	22	8 5	+	6.	+ 20.8		
		8 35		8.5	15.5		31.25 27.35
	22	9 20	+	6.4	+ 20.6		
		9 50		9.8	17.6		31.70 28.5
	22	11 15	+	0.6	+ 15.4		
		11 45		3.6	10.4		31.50 27.5
	22	12 30	+	5.0	+ 17.8		
		13 0		6.4	14.8		30.70 28.5
	22	13 30	+	1.0	+ 16.4		
		14 0		6.4	11.8		~~32.70~~ 27
	22	20 20	+	3.0	+ 18.0		
		20 50		6.6	13.4		31.80 27.7
	22	22 9	+	4.8	+ 21.0		
		22 30		9.2	15.6		32.20 27.3
	22	24 0	+	4.8	+ 21.0		
		24 30		9.4	17.2		

This last seems inconsistent

Ring = Micrometer Fire-foot.

1860 Oct. 9. Continued.

According to Bessel Astr. Untersuchungen I. p. 227

Anon 22 - Anon. 18 = in R. + $1^{\circ} 27' 52'' - 0.0074 (1 - 1840)$

in Dec - $13^{\circ} 26.85' - 0.007 (1 - 1840)$

Diff. App. from Runk. Naut. New const. by $a' (22-18)$ 7.545
 1860 Oct. 7 $23.2' (")$ 7.341 m
 $24.0' "$ invisible
 $24.8' "$ "

Pre.	-	13 26.85
Aa'	-	A.15
Ab'	+	0.06
	-	0.01
		- 13 26.95

Occultation of α Scorpii (Antares)

1860 Oct 16/17

G. P. Babb. 23 ft Refractor

J. A. S. res.

236

Immersion 13 36 21.0

236 fast . 2 33.5

Sidereal Time 13 33 47.5

Tempel's Comet?

1860 Nov ¹³/₁₄

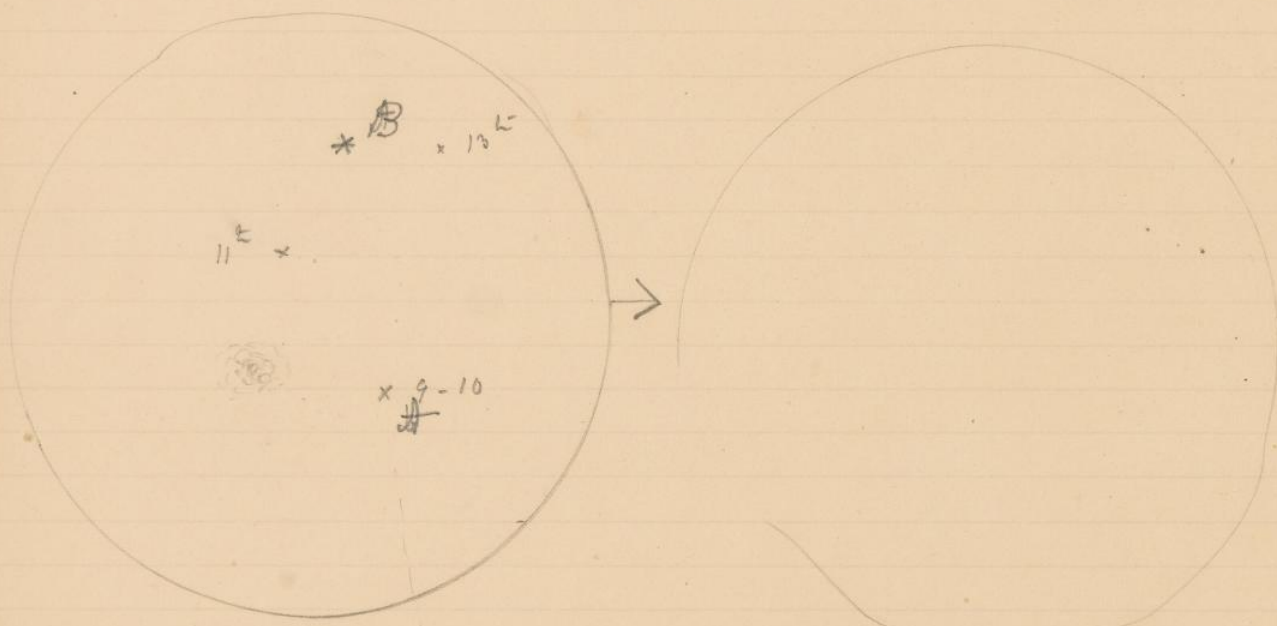
Disc by W. P. I. this morning near the pole

Shut Beginning after long D. B.

R.C. = $4^h 46^m 00^s$

At 236 $5^h 10^m$ $4''$ south of Star ^B of 8^m mag.
 (2' 30") sec. d following ^B B

Careful diagram

236 = $5^h 18^m$ 

Diff Dec B to A = $5' 40''$
 " R $25''$ sec δ

15
10

Comet moving fast towards
 and 3 of it

10
 x 9-10

Tempel's Comet?

1860 Nov 13/14

236 5 28 00

$$\begin{array}{r} 71.63 \\ - 539 \\ \hline 7702 \end{array}$$

5 34 33

Comet follows * B by 65 beats = 32.50^s
and is 15" South of it

B →
motion of Comet

Comet ^{mercedes} follows * B 24 1' S of it
236 5 39 30 654 beats = 327.0^s

Comet 5 52 28
Star B
B South of B

$$\begin{array}{r} 78.72 \\ 65.99 \\ \hline 12.73 \end{array}$$

3 4 5
6

B is 5' 41" South of it

* A on wire I 5 59 12
B " I 6 3 50

Wire II 6 6 54
" II 6 10 20

A on wire I 6 13 10
B 6 17 53

Tempel's Comet?

860 Nov 13/14

Star B.

Time	236	6	20	58
h. angle W	3	47	24	

Dec. $89^{\circ} 26'$

A and B are the only bright stars for
more than a field in any direction -

Nov 14.

Comet

1860 Nov 14

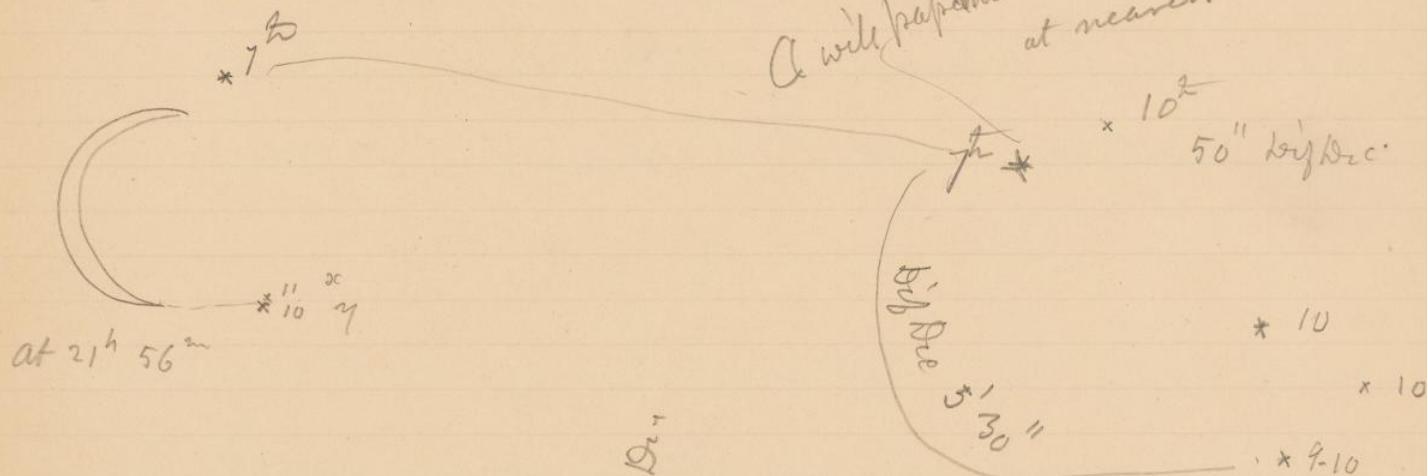
$$236 = \begin{matrix} h & m & s \\ 0 & 48 & 0 \end{matrix}$$

$$H = \begin{matrix} h & m & s \\ 1 & 54 & 0 \end{matrix}$$

$$\text{Dec } +266^{\circ} 25' + 86^{\circ} 25'$$

Occultations for Lieut Ives Texas Survey

1860 Nov 16



Im x 21 56 36.5 - 4 bars

Plan of stars are relatively correct in R 2 Dr.

236 = 21 51 32.5 - 4 bars
 " = 21 51 42.7 - "
 3' 50" centre

x Double 7"
 9 10 and 10

236 = 22 14 49.7
 2C = 22 2 00.0

236 = Post 21 52 about

x 10
 12

236 21 48 35 - 6 bars
 x 11-12

236 = 21 53 39.5 - 4 bars
 * 9-10

Occultations

1860 Nov. 20

22^h 14^m 4^s star 9 Mg (?) occulted near moon's
north limb Observed by Chronometer 236
Ht. Equatorial H. P. T.

At 22^h 18^m Star of 6th mag was 13' North of C. S. limb.

Disappearance obs. by Spring Governor

This star passed 30" S of C. S. north limb.

Star of 10th mag in same R with above & 15' north of it
was occulted - time noted on spring-governor #

$$EC = 22^h 40^m 51.1$$

$$236 = 22 \quad 42$$

$$236 \text{ fast of } EC \quad 1 \quad 51.9$$

$$E. C. \text{ fast} \quad 1 \quad 30.6$$

$$236 \text{ fast } 24 \quad 3 \quad 22.5$$

$$\text{Sid. Time} \quad 22 \quad 10 \quad 41.5$$

$$15 \quad 59 \quad 39.6$$

$$6 \quad 11 \quad 1.9$$

$$-1 \quad 0.8$$

$$6 \quad 10 \quad 1.1 \quad \text{Mean Time Cambridge}$$

Occultation.

1860 Nov. 20th

Occultation by G.P.B. see preceding page.

E.C. 22 43 47.8

fact 1 30.6

22 42 17.2

15 59 39.6

6 42 37.6

1 6.0

M. Solar. T. 6 41 31.6

Occultation.

1860. Dec 2.

Imm. of δ^1 Cancri (Chron. 1877)			^h 6	^m 53	^s 29.5	} Alt. Line Equatorial
$\Sigma C =$	6	45	0			
187 =	6	45	45.2			
			45.2			
ΣC for			58.4			
187 for	1		43.6			
				1	43.6	
				6	51	45.9
				16	46	58.3 2
				14	4	47.6
					2	18.4
Camb. m.s. of Imm.	14			2	29.2	

Micrometer

Dec 5th 1860

Owing to wearing of plates of micrometer
the wires have often been broken out of late - To run-
ally this I have had one of the wire plates cut down - &
to day fitted new wires.

Orion

1860 Dec 6

Have more than once noticed that there is a tendency in the nebulosity to dispose itself about the groups of bright stars in preference to other regions.

G. P. B.

Dec. 17 The occultation of α Aquarii was lost by clouds.

Occultation of Pleiades -

1860 Dec. 24

EC = 3 56 00
 236 = 3 58 25.3

Coincidence of 236 with

MTC 4 1 35

MTC 9 54 00.0
 Bow 236 9 50 19.7

MTC 9 45 00.0
 236 3 46.7+

High blustering wind & clouds drifting rapidly
 from north over moon - Clouds prevent our
 seeing the stars except by glimpses -

Occultation of Pleiades.

1860 Dec 24

Observed with Great Refractor with Spr. Geo.

Emission of Miropo time noted was 10^s too late
followed by D.B.

Immersion of 23

7th May " 27

" " Aleyone = 34 Time by EC 1^s too late

Noted with Bow. 236

$11^h 38^m 5^s - 39 \text{ beats}$

15.6

$11^h 37^m 49.4$

For Aleyone Im. EC about $5^h 55^m$

Im of 33 The signal which occurs before B.B.B.
is the right one - The other was no observation at all.

1^s is to be subtracted from time of signal

33 was near the N. limb

18.60 Dec 24

Occ of Aeyone obs. by H. P. T. with 5 foot Equatorial
and Chronometer 236

* Disap at $5^h 57^m 36^s$
 $236 \text{ fast} = .4 \quad 10 .7$
 Comb. sid. time = $5 \quad 53 \quad 25 .3$
 Sid. time m.n. = $18 \quad 13 \quad 42 .6$
 Sid int. from m.n. $11 \quad 39 \quad 42 .7$
 $\quad \quad \quad 1 \quad 54 .6$
 Comb m time $11 \quad 37 \quad 48 .1 - .5 = 11 \quad 37 \quad 47 .6$
 of Disappearance

Hourly Rate of EC + 0.12

EC fast at 2^h sid time
 $1^m \quad 45 .7$ EC fast $5^h 30^m 1^s \quad 46 .1$

Reap. of Electra, by G. P. B.

E. C. $5 \quad 39 \quad 15 .2$
 EC fast $1 \quad 45 .7$
 G. P. time of Reap $5 \quad 37 \quad 29 .5$
 $18 \quad 13 \quad 42 .6$
 $11 \quad 23 \quad 46 .9$
 $\quad \quad \quad 1 \quad 52$
 G. P. time of Em. $11 \quad 21 \quad 54 .9 - .4 = 11 \quad 21 \quad 54 .4$

Disap of 23 by G. P. B.

$5 \quad 48 \quad 45 .6$
 $\quad \quad \quad 1 \quad 45 .7$
 $5 \quad 46 \quad 59 .9$
 $18 \quad 13 \quad 42 .6$
 $11 \quad 33 \quad 17 .3$
 $\quad \quad \quad 1 \quad 53 .6$
 G. P. time Im $11 \quad 31 \quad 22 .9 - .5 = 11 \quad 31 \quad 23 .2$

Disap of 27 by b.p. B.

5	50	50	.7
	1	45	.7
5	49	5	6
18	13	42	.6
11	35	22	.4
	1	53	.9

b.m. time of Im 11 33 28 5 - .5 = 11 33 28.0

Disap of Aleyone by b.p. B.

5	55	12	.9
	1	45	.7
5	53	27	.2
18	13	42	.6
11	39	44	6
	1	54	.6
11	37	50	0

b.m. Time 11 37 49 0 - 0.5 = 11 37 48.5

Disap of 33 by b.p. B.

6	15	10	.7
	1	45	.7
6	13	25	.0
18	13	42	.6
11	59	42	.4
	1	57	.9

b.m. time 11 57 44 5 - 0.5 = 11 57 44.0

Disap of 50 by H.P.T.

7	42	16	.8				
	1	45	.7				
7	40	31	.1				
18	13	42	.6				
13	26	48	.5				
	2	12	.2				
b m time	13	24	36	3 - 0.7	= 13	24	35.6

Disap of 50 by H.P.T.

7	58	15	.1				
	1	45	.7				
7	56	29	.4				
18	13	42	.6				
13	42	46	.8				
	2	14	.8				
b m time	13	40	32	0 - 0.7	= 13	40	31.3

Summary of results

b mean time	Star	Observer	
11 ^h 37 ^m 47 ^s .6	Aleyone.	H.P.T.	
11 37 48.5	"	H.P.B.	
11 ^h 31 ^m 23 ^s .2	(23)	H.P.B.	
11 33 28.0	(27)	H.P.B.	
11 57 44.0	(33)	H.P.B.	
13 24 35.6	(50)	H.P.T.	
13 40 31.3	(53)	H.P.T.	
11 21 54.5	(2)	H.P.B.	Emersion

Immersion

A chart of the Pleiades, on the Sterographic projection, was constructed by H. P. T., and the moon's apparent place for 5 different hours was computed and projected on the chart. From these were obtained the times of Disapp. & Reapp. of 27 stars of the group. On account of the clouds only the Disapp. of 6 and the Reapp. of 1 could be observed.

The computed and observed times of Dis. & Reap. are herewith appended.

Observed Lamb. m time	Star (34)	Immersion Computed Lamb. m time
11 ^h 27 ^m 48.5		11 ^h 37 ^m
11 51 25.2	(23)	11 30
11 33 28.0	(27)	11 24
11 57 44.0	(37)	11 56
13 24 35.6	(50)	13 23
13 40 31.3	(53)	13 39
11 21 54.5	(2)	Immersion 11 21

for *Samia* (60)

1860 Dec. 28th

Computed Place at 5^h 36^m A.M. 1860

23^h 25^m 17^s - 3° 54.1'

Daily Change + 1^m 12^s + 6.17

Stars.

24

(W. 23.455 is in North Declination)

	W.	R. (1861.0)	Dec.	Mag.
a	23.491	23 24 59	- 3° 47.17	9
b	511	25 47	3 47.0	8
c	520	26 4	3 54.1	9

d 9.10 Angle of Position obs'd 83° 40'

a 23	53	52.8	8 52"	h from c 0.6	{ h 2 55
d	54	25.8	3 53	h of 11 mag	{ c 7 16
b	54	39.4	9 33		
e		5-	2 23		

(H. m)	i 0	19	46.5-?	4 53	22 = (33.0)
a		20	19.2	7 17	

e (9.10)	0	0	0.6	7 39
a	1	51.5	5 5-	
b	2	38.6	5 44	

j is 3' 4" north of & from it 6.2

k follows i 3.6 & north of it 2' 21"

f follows e 16.7 { e 7 36.7
f is very faint (11 mag) { f 3 23.3

g from d 9.0 & 4' 58" south of d
and 3' 24" south of c

g	0	11	24.1	2' 16"
c		12	3.5	5 44

Mean Places 1861.0

o	33	15.	11 mag	4'	23	24	13	-	3	56.9	=
		37	11. "	7		24	35		3	53.9	=
		25	10	4		25	23		3	56.9	-
	34	30	11	6		25	28		3	54.9	- +
d		31	10	8	(	25	33		3	52.9	)
		37	11	6		25	35		3	54.9	
		54	11	1		25	52		3	59.9	
c	35	5	9	7	(23	26	3		3	53.9	)

d	40	58	10	3'	23	25	32	perhaps	-	3	52.3
b	41	13	8	8		25	47				47.3
	41	30	9	1		26	4				54.3
	41	48	10.11	11		26	22				44.3
	42	30	11	6.5		27	4				48.8

Abundant during this set.
Mean Places 1861.0

d	23	25	32.7	-	3° 52' 40.11
e	23	8.6	3	45	9
f	23	25.3	3	49	22
g	25	24.2	3	57	36
h	26	3.4	3	58	27
i	24	26.0	3	50	6
j	24	19.8	3	49	2
k	24	29.6	3	47	45

The magnitudes here are too bright until the last set.

All these stars found right. 1860 Dec. 31.

1860 Dec. 31st for Titania (66)

Computed Place. for $\delta^h 44^m$ Cambridge

$23^h 28^m 56.5^s$ - $3^{\circ} 33.17'$

Stars for comparison

9.	23	31	35.	-	$3^{\circ} 43'.8$	
9. (2)		31	40	3	43.8	+ 5.55 + 2.6 found
9		34	6	3	35.7	

Star α near ϵ $2^h 5.0$ and within $1''$ or $2''$ Sec. of it

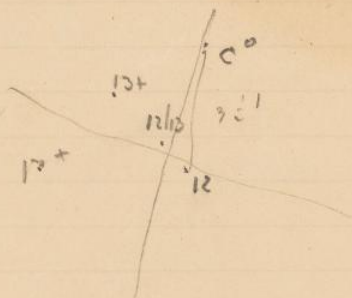
Star $\delta^{\circ} = \delta$ of day Dec. 28

δ°	15	5	2 ¹	
ϵ		39	5	12
		41	7	13
		43	8	12
	16	23	0	12
		51	7	$12\frac{1}{2}$
		54	5	$12\frac{1}{2}$
		36	1	12

δ°	254	2	21	1.8	8
α	$11\frac{1}{12}$	4	42		
δ	121	4	40	22	38
ϵ	10	7	40	from δ .	
δ°	1213	6	45	23	39
δ°	$11\frac{1}{12}$	8	19	24	49
X δ°	6	4		24	52

θ^0 8 2 46
 c $11/12$ 4 27

36 9.4 13.4
 44.8 49.0



θ 9 56
 e 7 25
 x * 5 57

39 9.8
 39 287
 41 21.3

J. Star 13th foll. θ 8.56 ~~2.5~~ 4' 42" at same reading or above

g. 13. foll e 4.5 red ca. 9'
 h. $11/12$ " 2.3 1 44
 i. 12 " 3.9 2 55
 j. $14/12$ preced 11.5 in 9 10 No. *

θ mid 3 4 5
 K m+2.5 39.6 13 me.
 e 50. ca
 l 5 47.4 $13/12$ * prec. 12.5 ca.
 m $11/12$ (9 26) 10' 7 44.5
 n $12/12$ (5 8) 6' 50
 X 1 50 2' 53

Comp. between m and g.

m 9 22 m precedes 8.4
 n 1 48

9 51 68.1 72.1

for Titania.

1860 Dec. 31. Jan 1. 1861

* (X) AR = 23 29 30 Dec - 3° 43.8

* (X) /	43	38.0
m	43	45.6

m is 7.5 north of (X)

m /	44	50.8
13 th Y	45	45.7

2' 18"
10 36

11.12	2	2	28.2
11.12	5	2	46.8
11.12	7	3	59.1
10	2	4	47.0

4' 00"
3 56
7 44
1 45

Y /	49	50.0
2	49	38.0

10 β /	51	34.0
10 γ	51	39.2
10.11 δ	52	27.6
10.11 α	54	28.0

9 44
9 28
9 36
7 26

β	2	h	n	p	mag
γ				30	11
				38	11
				49	11
		8		3	12
				7	12
		8		26	12

β	55	54.0
γ	55	59.8
	56	19.0
		24.0
		30

10
9.1
2
9

many 13 mags

37
44
44.5
57
4
10.5
29.1
44.0
58.1

9
8
5
9
4
8.5
6
3
11

measured

I.

10	36	12	10
	45	13	7
	50	11	4
	56	11	3.5
11	2	10	11
	10	13	6
	16	12	10
11	19	12	4

II.

11	43	11	(4)
	48	12	(8)
12	32	13	(8)
	42	13	(8)
	53	13	6
	58	12	7.5
13	6	12	6
	10	13	2
13	44	10	2

12	58	8.1
		15.0
x	58	48.0

2
6.5
7.5

29 2.7

<u>III.</u>					
14	15-	13	}	4	
	17	13		5	
	20	10		6	
				10-	
14	45-	13	}	1	This star missing Jan. 2 ^d
15	1	13		2	
	10	12		6.1 7.5	
				0.	
15	22	10	}	6	✓ (1)
		(10)			
					✓ (2)
<u>IV.</u>					
15	44	10	}	6+	star 1' no. of this
	49	12		7	
	58	10		6	
				8.	
16	5-	13	}	5.	star 13 th foll.
	14	10		2	
	21	11		4	
16	27	11			✓ (4)

Groups I II III IV were obs'd at the same declination

Jan 2, 1861

Jan 2, 1861

~~47.0~~

~~5.36~~

236 = 2^h

33^m 59.5"

1' 24" ✓

(1)

34 2.0

6 11 } ✓

(2)

34 26.8

7 19 } ✓

(3)

34 54.6

5- 7 } ✓

(4)

2 35- 39.0

HW

2 37 4.8

Dec - 3° 20'

Star (3)

2 31 9
 2 57 48
 23 33 21 - 3 20
 23 32 22 - 3 25.5 missing

Orion

1861 Jan 2

Thought I could recognize at least 9 distinct instances where the nebulosity of Orion was expressly associated with bright stars or groups sufficiently marked to arrest attention when directed to this particular aspect.

There are included within a region 30' on each side of trapezium. from Orion's a nebulous group. and a group north of trapezium - 1' more distant n of it than it is south & in nearly same R

Titania

1861 Jan. 4.
H. S. obs. A. H. rec.

Chron. 236

1	31	47.8	51.8	9	31"	a	W
	32	14.6	18.5	5	42	c	9.10
	32	35.5	39.6	10	21	b	W

38	3.0	10.2	2	38	d
	25.8	33.2	9	31	c

1	39	13.0		a
		16.4		d

1	43	44.4		d
1	45	14.0		p

48	1.7		8	2"	d	11
49	31.0		6	-	e	12
49	37.8 ?		1	45	f	9.10

$$n = W. 23 \begin{matrix} 795 \\ - \\ 809 \end{matrix}$$

1861.00

a	23	39	26.7	-2°	17.73
Q			30.1	-2	28.43
i			30.	-2	28.0
f		41	6.2	-2	34.71

Titania

1861 Jan. 4

AR on Spr. Gov.

g
e
h
f

$$\begin{array}{l} 19.6 = h - g \\ 19.4 \end{array}$$

g
o
h
f

Lost by pen.

g
e
h
f

B. D. B.

g
e
h
fg
e
h
f

h is the planet. (magnitude 12.0) ~~###~~ Dots after g

Titania

Jan 4. 1861

i passed about 10⁵ and is 1.5 north of it

i				9' 22"
p	2	43	45-	5- 56

One of them is perhaps c.

i				9	47
p		46	10	6	8

236 = 2 57 57 22^r 442

23		2° 5' 5"
		2.1

Planet's loc.	- 2° 30' 6"	at 7 ^h 48 ^m 40 ^s
23 41 6.2		7 30

Comp. 23 41 8. - 2 29.9

for Minicouque

1861 Jan 4.

Adolph's ephemeris

6 38 4 +0°49'14."

Stars from the Jones

9.2	h 1' "	a 0' 45' 15"	6 37 5 + 0° 51' 37"	10.11
9.2	36 59	45 35		
9.2	37 40	45 35		
10.5	38 24	48 38		
10.5	38 25	45 15	38 43	54 23 11.12
9.5	38 53	50 1	38 58	53 18 8

for Titania

1869 Jan 5thAt 5^h 31^m CambridgeComp. α 23^h 42^m 25.^s 4
 δ -2° 22' 22"

Waise	23.795	186.00	23 ^h 39 ^m 26.7	-2° 17' 73	9
	Rv.		+0.5	+0.07	
	23.809	"	40 14.9	2 16.94	8.9
	Rv.		+0.5	+0.07	

Reduction of Star W. 23. 809.

23	38	24.20	-2	28	55.4	α 23 39 19.4
	1	50.72		11	59.0	δ -2° 22' 93
23	40	14.92	-2	16	56.4	
		+0.60				

8.6191 n
8.9546 n
2.85853
9.99823

+2.70 0.4322
27 38.05
27 40.75
1 50.72

lg δ 8.011 n G 334 44
mlt (H) 9.702 n d 355 04
g 0.878 H. 345 31
ml (G+d) 9.937

f +15.62
red 0.000 g' +0.15
ml (H+d) 9.522 n h' -6.76
h 1.308
ml (H+d) 9.975 g' +6.53
ml δ 8.600 n N -0.76
i' -2.25

Pikania - ~~Longman Pass.~~

1861 Jan 5th

T. H. Tols.

A. H. rec. ~~is temp. with A.~~

Cook Reading 173° 40' East of J

B.	1	2	10.9	15.8
		4	17.4	22.5
	1	9	20.5	25.3
		11	21.9	32.9

Chris. 236. - Film. micrometer.

	AR			Sec "
b(236) 1	15	4.8	—	9 42
p'	17	18.6	22.7	
b	changed distance of wires			
	20	21.1	28.2	
p'	22	35.0	42.0	

p' is the planet.

+ 27 46.8

Too faint to obs. in declination

b	29	26.1	33.0
p'	29	39.9	46.7

236.	1 23	2 13.60
	1 53.2	15.27

b	1	36	18.5	25.3
p ₂		38	41.2	48.5

Pro. to 236. fast.	1 38	2 14.59
	4 23	14.48

b		40	37.0	43.8
p ₂		43	0.2	—

1 33 37	+ 2	14.54
19 2 6 23	40	15.52
6 31 31	23 42	30.06 R. (60)

b		45	8.8	15.6
p ₂		47	32.3	38.6

Am. m. 1	6 31	(to be corrected)
Long. + Accur.	43	23 42 29.67
Comp. R.	5 48 W.	23 42 30.4
	C-0	+0.6

b		48	59.0	5.8
p ₁		51	14.0	21.0

b	1	52	58.2	5.2
p ₁		55	13.5	20.8

1861 Jan 5

Cambr. m. 1 6 31 31 5 - 23 42 29.67 P.M.R.

for Titania

1861 Jan 11.

At 5^h 30^m CambridgeComputed. 23^h 51^m 12^s - 1° 31' 10"

W. ~~1019~~ 1019. 23 50 4.0 - 1° 25' 23" } 9th
 1057 23 52 2.1 - 1 21.24 } 9.
 Res. to app. 0.6 - 6"

At 19^h 49^m EL.

19 55 10.1 236
 EL. 1 42.2 slow
 236 4 32.9 fast.

22 57 50 + 14" 27' 5"

1861 Jan 12thAt 6^h 12^m Cambridge

Computed. 23 52 47 - 1° 21' 54"

1861 Jan. 13.

1 50.54 + 12 1.45
 23 50 11.55 - 1 33 26.8
 1861.0 23 52 2.13 - 1 21 25.35
 + 0.65 + 3.6
 23 52 2.79 - 1 21 21.8

Lo 23 51 6.8
 50 - 1 23.39 27.43

lg 010 8.3849w
 sin 00 8.5883w
 1.30223
 9.99968

22 46.076

1.30191
 85820

G 335 49
 2 358 1
 H. 339 36

lg 01 8.372w
 sin (lat) 9.644w
 0.694
 sin (lat) 9.983

tan 0.000
 sin (H + α) 9.581w
 h 1.306
 sin (H + α) 9.968
 sin 5 8.372w

f + 16" 59 g' + 7" 1
 g° + 0.82 N - 0.44
 1° - 7.71 01 - 3.06

Tania

1861 Jan 12. (probably)
J.H.S.

22.

12.37

Star
Planet

A.

2^h 35^m 52.8 56.56
36 40.7 44.5

A. B. C. were taken at an angle
173.° 40'

B.

2 37 6.0 9.9
37 53.8 58.2

D. E. F. G. H. at circle reading 199° 41'

C.

2 38 18.9 22.6
39 7.0 10.9

D.

2 43 1.4 6.2
53.6

Cl. ~~2 37 20~~ 17.975

N.

E.

2 44 9.1 13.3
44 57.0

2 44 12.5 17.650 2 45 6
46 13 48.100 2 37 56 48.050 +1° 31'
47 23 48.050 48 39 47.938 29 4
48 35 47.950 -0.52
47.418
by 9.799 -0.632 9.48
0.975
9.642
1.333

F.

2 45 23.2 27.4
46 11.3 15.5

G.

2 46 32.5 36.7
47 20.3 25.0

H.

2 47 45.1 49.3
48 32.9 37.4

2 46 30 Δ 0 - 21.5
2 37 56 Δ 2 + 48.08
Red. art. of Δ 2 - 3.2

Estimated magnitude 12.5.

Approximate place of (60) from obs. above.

C. M. F.

29 12 23^h 52^m 50.8
7 21

-1° 21' 38"

2 37 56

1861 Jan 11th for Titania.

Star from Argelander -

u 8.5 23 52 3. - 1° 15.3 - Weiske 23.1059
 3 9.0 55 #.8 - 1 15.6 " 1123

2-a +3 2.4 + 49." Weiske.

1861 Jan 11th

* app 23 52 - 2.78 - 1° 21' 21.8
 + 48.08 - 24.7

23 52 50.86 - 1 21 46.5

2 37 58
 - 4 34
 2 33 22
 19 24 41
 7 8 41
 1 10
 7 7 31 Camb. m.s.

Comparison Star for Comet 1860 III.

δ (1860.0) $10^h 22^m 20^s + 15^\circ 42' =$ Bessel's Sternverzeichnis
 $(+15^\circ)$ 2169 9.1

To be compared with.

2.5 $10^h 0^m 5^s + 15^\circ 51'$
 9.0 $4 30 15 33$

Both Bessel's stars.

1861 Jan. 21st for Melpomene

At $10^h 12^m$ Cambridge

$9^h 6^m 8.6 + 10^h 33' 12''$

Star	8.5	9^h	$2^m 13^s$	$+ 10^h 18.9$	K.
	9.0		$2^m 52^s$	$10^h 26.8$	
	9.5		$3^m 11^s$	$10^h 30.0$	
	9.2		$4^m 28^s$	$10^h 19.3$	
	9.2		$4^m 30^s$	$10^h 24.1$	
	8.7		$5^m 7^s$	$10^h 26.8$	

1861 Jan. 22

At $10^h 12^m$ Cambridge

Occultation.

Jan 20. 1861

Obs. by H.P.T.

Instrument, Great Eq.

Immersion E.C. = $2^h 28^m 1.9$ (by Eph. Gov.)

(Star of 6.5 mag.?)
About 5' South of Moon's
North Limb.

for Melpomene

861 Jan. 22.

H.S. observer.

At 10^h 12^mgr 5^m 8^s + 10 41.4

75-115 2.65

K(a) 8.7 9 2 17.5 + 10 45.7

1861.0 = Weiss II. 11.

(3) 9.4 2 53.3 44.3

Pinner Sternverzeichnis

Mant of magnitude 9.7 according to computation

Dec. 236

a 9 39
b 7 40+5 31 12.0 16.1
48. 52. corda

x. 5 8 34 5.7 9.9 - 4 31 + 2 53.75

>x a 7 43.2
<x b6 7 31.1 35.2
8 9.3 11.3>x x. 3 19 19 22.8 27.0 - 4 24.5 + 2 51.75
<x c>x c
<x d9 a 7 44
9.10 b 5 49
9.10 x 3 252^d lot.El.
7 29.8 33.7
8 5.8 9.8
19 21.2 — - 4 19 2 51.409 a 7 43
10 b 5 50
9.10 x 3 27
9 c 9 38
9.10 d 10 813 27.9 31.8
14 4.1 8.1
16 18.8 23.1 - 4 16 + 2 51.10
18 25.3 29.3
19 31.5 35.5

x is Melpomene

Magnification of scale very bad. The micrometer lamp would not
burn and I was obliged to use a hand lamp.

1860phao proj 1028

Melpomene.

1861 Jan 22

	Mg. S.	deg. A.	S-A	Stance
A	9.	8.7	+ 0.3	110.537 + (1.68264)
B	9.8	9.3	+0.5	2.85853
C	9.	9.2	-0.2	
D	9.5	9.3	+0.2	
			+0.2	

561111.5

$9.10^S =$ (Avg)
Melpomene = 9.3 estimated; it is between A and B, but nearer B;
is also between C and D, but nearer D.

From memory same night

$$\text{Melp.} = \frac{1}{2} \text{A} + \frac{1}{2} (\text{Mg B} - \text{Mg A})$$

$$= \text{D nearly.}$$

2" 9 1 17.3
 $\alpha + 10 \frac{50.00}{55.75}$
 $\sin \alpha 9.84703$
 $\log \alpha 9.27105$
 9.12889
 $\alpha \alpha 9.85191$
 11.33
 0.84382
 $2.71044 \sim$

$2 (186.10) 9 \quad 2 \quad 15.77 \quad 10 \quad 45 \quad 12.4$
 $+ 2.63$
 $9 \quad 2 \quad 18.74 \quad 10 \quad 45 \quad 33.7$
 $9.5 \quad 10.45 \quad 11.7$
 $4-0-0$
 Ret

$\log 9.279$
 $\sin(\alpha) 9.964$
 9.938
 $9.591 \sim$
 $\text{sec } \alpha 0.008$
 9.985
 0.300
 $9.405 \sim$
 9.271

1 57.90
-8 33.4

$\frac{6}{20} \quad \frac{0}{4} \quad \frac{0}{3}$
 $\frac{9}{51} \quad \frac{47}{127}$

$\delta + 18.4$
 $\gamma + 1.5$
 $\alpha + 19.6$
 $\beta - 3.4$
 $\alpha' - 0.9$
 $\delta' - 4.4$

9 50.00 Cambridge Mt.

Melpomene $\alpha \quad 9 \quad 5 \quad 10.45 \quad 20 \quad + 10 \quad 41' \quad 0.7$

Melpomene

861 Jan 22.

Red to Sid. Time (236 4^m 50^s fast - El. 17^s fast.)
 N.H. - 2.5 + 21"

5 29 18 +2 53.75 - 4' 31" (Chro. 2w)
 6 5 34 51.75 4 24.5 (Chro. 2w)
 10 4 51.40 4 19. (El. 1w)
 16 04 51.10 4 16 (El. 2w) Wt. R. 2.

chem R. 6 3 24 +2 51.82
 Dec. 0 14 - 4 22.6
 Red to 6 3 24 0.00 - 0.1
 Refr. + 1.1
 Vamp. + (1.1)

Reduced to 6 3 24
 Wt.
 +2 52.34 1 -4 19.0
 51.64 1 25.2
 51.88 1 21.3
 51.62 2 20.4
 2 51.82 -4 21.5

Planet - star 2 51.82 -4 20.5 recti
 Red to app. +2.63 - 8.7
 1861.00 9 2 15.83 10 45 43.8
 Planet's R. Dec. 9 5 10.27 +10 41 13.2

f. P. = 0.308 + 4.83

6 3 24
 20 8.3
 9 55 21
 1 38

9 53 43 Cambridge m.t.

Comparison with Schubert's ephemeris

9 53 43 - C. 9 5 9.21 +10 41 18.2
 - 23 42 O. 5 10.27 13.2
 - 11 57 P.m. -0.21 +13.4
 9 18.4 3.98749 9 4 C-0 -0.585 +1.6
 + 6.69 1.77466w
 9.05098w
 - 55.9 2.69636

for Titania.

Stars of comparison

6.2	$\odot$ 18 ^m 17 ^s + 1 ^o 9.7	K	= 44 Picium d R.	
8.3	18 50 1 10.3	K		
9.3	20 10 1 23.4	B		
a 9.4	20 26 1 28.4	B	Comp: with $\odot$ 24 20 + 1 21.9	K 8.8
9.4	22 19 1 19.5	B	" $\odot$ 25 34 + 1 23.1	K 8.8
✓ 8.8	24 43 1 41.5	K		
9.3	24 2 1 50.9	not obs.	Comp: with $\odot$ 22 2 + 1 51.7	K 9.0
8.8	27 33 1 54.6	not obs.	comp: with " " " "	" "
9.1	27 49 2 12.0	B		
6.8	30 12 2 22.2	K = 24. 161 / Pi. R.		
9.0	32 19 2 32.6	not obs.	Comp: with $\odot$ 35 41 + 2 34.4	B 8.9
9.0	34 54 2 42.2	B	comp: with $\odot$ 36 14 + 2 50.5	

Jan. 28. Planet's place at 5^h 33^m.

	$\odot$ 18 ^m 1 ^s + 1 ^o 8.0	
44 Picium	$\odot$ 18 18 + 1 10.2	
	+ 0.5	+ 4."
W. O. 307	$\odot$ 18 49 + 1 10.8	

for Helopomene.

1861 Jan. 29.

At 10^h 12^m 40^s.8 58 6 + 11 40.5

a	8 56 20	+ 11 42.5	L	8.5
b	57 49	11 48.5		9.0
c	9 0 4	11 43.6		9.5
d	0 26	11 42.5		9.5

~~3 10 30 39 39.2 43.3~~

Orion

1861 Jan 24th

Nearly clear sky Definition pretty good
 Could see κ by glimpses but no suspicion of κ

Now that attention is directed to the fact the impression of a diverging spiral like radiation of wisps of nebulosity from the bright region near θ is very certain.

There are
 one or two
 such near ϵ



The three groups of stars constituting the ~~three~~ stars of the sword handle of Orion
 i. e. θ and ι are foci of nebulous regions

The northernmost has about it a great mass of nebulosity which brightens up around several of the stars -

G. P. B.

for

for Litanica (60)

1861 Jan 20.

h. P.B. rts.
L.H.S. rec.~~3 10 1 39 39.2 43.3~~(60) 2. 0 21 20 1' 27.8 at 5^h 35^m Cambridge

Zero for wires 89" 37!

Chron. 236. Litanica 19th May. ref. star. E. C.

last

Star not taken
Planet3 30 41.7 47.4
31 45.5 54.4

B. D.

Star 3 31 31.3 36.6
Planet 32 36.2 40.83 32 22 32 21.8 27.3
33 25.7 31.6

Determinations with Filare Micrometer.

Short B. for time of culmination

Star 8^m 25
Same wire (60) 9.87 (long B.)

3 37 50.6

Star 8^m 62
(60) 10.11 (on 3.39)

3 40 22.4

Dets after (60)

Star 10^m 09
(60) 11.71

3 42 41.5

Titanica (60)

1860 Jan 30 continued.

Compared with Star

$\frac{1}{4}$					
$\frac{1}{1}$					
L	3	45	—	33.9	Star
P		46	33.8	36.8	Planet
B. B					

L	3	47	9.0	5.3	Star
P		48	5.3	—	Planet

3	46	19.4	24.6
	47	24.4	29.7

Planet appears a little fainter than a star $\frac{1}{4}$ mag.
 of the planet. and 2nd preceding.

Star y follows (60) $\frac{1}{4}$ mag. and 5.5 mag. is fainter than

(60).

The mag of Titanica = mag. x + $\frac{1}{2}$ (mag. y - mag. x)

For the star see following pages.

Titania

17 Jan 30.

Reduction of Obs. (Temp. 23°) $1'' = 9.806$

E.C.

Planet - Star

 $\Delta \alpha$ H.M. 4.57 + 15.9

3 31 48

+1 3.90

3 33 29

1 4.10

3 37 51

+15.9

3 40 22

14.6

3 42 41

+15.9

3 47 27

1 5.05

3 48 59

+1 5.35

E.C. 3 40 26

+1 4.60

3 40 18

+ 15.5

Red. to 3 40 18

+1 4.59

+ 15.5

or 28 26.69

+1 28 31.9

App. place of star.

El. fast. 45

3 39 33

2 11 39 35

6 59 58

1 9

6 58 49

Cambr. m. f.

⑥ R. P.M.

0 21 31.28

+1 28 47.4

+ 0.12

+ 2.2

6 58 49

- 21 57 46

- 23 42 49

6 13 30

D-6

21 25.9

1 28 27

+ 5.5

+ 23.11

5.775

Observed

Computed
Correction of Eph.

Titania.

1861 Jan 30.

At $6^h 58^m 49^s$ Comb. m. t.

Planet's d. $0^h 21^m 31.28^s$ $\delta + 1^\circ 28' 47.4''$ Observed.

Correction of Ephemeris.

+ 5.5 + 23.11

Red. to 340.28

331.48	1	4.49	+ 16.9
		4.57	14.6
		4.54	15.0
		<u>4.85</u>	
+ 1		4.59	+ 15.5

Final Reduction 1862 Jan.

0	20	26.10	+ 1 28 29.3
		1 0.97	+ 3.8
		<u>1 1 4.59</u>	+ 15.5
0	21	34.26	1 28 47.6

Star for Titania

1860 Jan 30.

Z. H. S. observer.

Scale.

E. G.

9/10 11 3 15

8' 22"

Star of comp. (a) 4

4 8.1 12.2

10/11 5 40

4 117

5 57.4 1.6

10 6 23

7 33

6 27.2 31.1

9

6 23

7 13.3 17.1

2 0

(b)

8 3.2 7.1

9/10

2 20-

8 22.5 26.3

3 22

(a)

9 16.4 20.4

BB.

9.10

7 28

Star of comp.

9.10 faint

3 51

9.

1 7

L. G. van Doren

9.10

9 9

8.9

2 28

Zero (not observed) 83° 39'

(a)

Star. ang. 3 44

Rfr.

+0.025 +0.60

Par.

0.322 5.64

4.61

Star of comparison compared with

Weisse $\delta = 0.393$ $\alpha = 0.420$ Δx

12.38 1.251 Weiss

12.5 1.25 Weiss

a-2

 Δx

-3 55.00

 $\Delta \delta$

+6 21.5

Rfr.

+0.02

+0.4

Temp.

-1.6

a-a

 Δx

-5 8.25

 $\Delta \delta$

+5 0.0

Rfr.

+0.01

+0.3

Temp.

-1.3

Star in Lania

$$\begin{array}{rcl}
 & \begin{array}{c} h \\ 0 \end{array} & \begin{array}{c} m \\ 22 \end{array} \begin{array}{c} s \\ 30.35 \end{array} + \begin{array}{c} h \\ 1 \end{array} \begin{array}{c} m \\ 10 \end{array} \begin{array}{c} s \\ 7.7 \end{array} \\
 & & 1 \quad 50.65 \quad + 11 \quad 58.2 \\
 c \quad 1861.0 & 0 & 24 \quad 21.00 + 1 \quad 22 \quad 5.9
 \end{array}$$

$$\begin{array}{rcl}
 & 0 & 23 \quad 43.73 + 1 \quad 11 \quad 33.2 \\
 & & 1 \quad 50.65 \quad + 11 \quad 57.8 \\
 c \quad 1861.0 & 0 & 25 \quad 34.38 + 1 \quad 23 \quad 31.0
 \end{array}$$

$$\begin{array}{rcl}
 \text{Pvt. to app.} & & + 0.60 \quad + 3.8
 \end{array}$$

$$\begin{array}{rcl}
 3 \quad b \quad \text{app.} & 0 & 24 \quad 21.60 + 1 \quad 22 \quad 4.7 \\
 a-b & & - 3 \quad 54.98 \quad + 6 \quad 20.3 \\
 d \quad \text{app.} & 0 & 25 \quad 34.98 \quad 1 \quad 23 \quad 34.8 \\
 & & - 5 \quad 46.24 \quad + 4 \quad 59.0
 \end{array}$$

$$\begin{array}{rcl}
 a(\text{app}) & 0 & 20 \quad 26.69 + 1 \quad 28 \quad 31.9 \\
 (\text{app}) & & (\text{app})
 \end{array}$$

$$\begin{array}{rcl}
 \text{Cont.} + a. 37 & + & 3.9 \\
 + a. 03 & - & 0.1 \\
 3 \quad 51.95 & 6 \quad 20.2 \\
 5 \quad 8.24 & 1 \quad 58.9 \\
 1 \quad 28.375 & & 31.1
 \end{array}$$

$$\begin{array}{rcl}
 8.411 \\
 9.461 \\
 9.962 \\
 9.983 \quad + 0.81 \\
 \quad + 0.42 \\
 0.001 \quad - 0.36 \\
 9.763 \\
 1.295 \\
 9.921 \\
 8.411
 \end{array}$$

$$\begin{array}{rcl}
 + 19.53 \\
 - 0.07 \\
 - 10.91 \\
 + 8.55 \quad + 3.9
 \end{array}$$

$$\begin{array}{rcl}
 & \begin{array}{c} h \\ 0 \end{array} \begin{array}{c} m \\ 23 \end{array} \begin{array}{c} s \\ 35.7 \end{array} & & \begin{array}{c} h \\ 0 \end{array} \begin{array}{c} m \\ 24 \end{array} \begin{array}{c} s \\ 39.0 \end{array} \\
 & & & + 1 \quad 17.53
 \end{array}$$

$$\begin{array}{rcl}
 h \quad 8.36535 & & 8.35326 \\
 h \quad 9.01880 & & 9.03080 \\
 & & 1.30222 \quad 1.30223 \\
 m \quad 9.99773 & & 9.99748
 \end{array}$$

$$\begin{array}{rcl}
 0.0453 & & 0.0485 \\
 46.0569 & & 46.0569 \\
 46.1022 & & 46.1054 \\
 92.2064 & & 92.2108 \\
 18.4409 & & 18.4422 \\
 1.29998 & & 1.29997 \\
 2.85628 & & 2.85601
 \end{array}$$

$$\begin{array}{rcl}
 \text{Pvt. to app.} & & \text{Pvt. to app.} \\
 1/2 \quad C + a. & &
 \end{array}$$

$$\begin{array}{rcl}
 G & 338 \quad h \\
 x & 6 \quad 13 \\
 H & 321 \quad 16
 \end{array}$$

$$\begin{array}{rcl}
 h \quad 8.382 \\
 m(H+x) & 9.433 \quad m \\
 g & 0.962 \\
 a(H+x) & 9.983
 \end{array}$$

$$\begin{array}{rcl}
 f \quad 0.000 \\
 m(H+x) & 9.728 \quad m \\
 h & 1.295 \\
 a(H+x) & 9.927 \\
 h \quad 8.382
 \end{array}$$

$$\begin{array}{rcl}
 f & 19.53 & g' + 8.81 \\
 g' & -0.01 & h' + 0.40 \\
 h' & -10.55 & i' - 5.36
 \end{array}$$



Nauica Ephemeris by J.H.S.

^h 12 Watch	α	δ	$\log A$
Jan 4	28 41 25.5	-1° 28' 9"	0.3760
5	42 51.2	19 53	
6	44 17.6	3.6 11 32	
7	45 44.6	3 6	
8	47 12.3	1 54 35	0.3830
9	48 40.7	45 59	
10	50 9.7	37 18	
11	51 34.4	28 32	
12	53 9.6	19 41	0.3897
13	54 40.5	10 46	
14	56 12.0	1 14	
15	57 44.0	0 52 43	
16	59 16.7	43 35	0.3962
17	0 0 49.9	34 22	
18	2 23.6	25 6	
19	3 58.0	15 46	
20	5 32.8	0 6 22	4.023
21	7 8.2	0 3 6	
22	8 44.2	12 38	
23	10 20.7	22 13	
24	11 57.6	31 57	4.083
25	13 33.1	41 33	
26	15 12.1	0 57 18	
27	16 51.6	1 1 7	
28	18 30.6	10 58	4.138
29	20 10.1	20 53	
30	21 50.1	30 57	
31	23 30.6	40 57	
Feb. 1	25 11.6	1 50 55	4.191
2	26 53.0	2 1 1	
3	28 34.9	11 10	
4	30 17.3	21 21	
5	0 32 0.2	31 35	0.4244

100.2

