

KG
11365
190

H.36

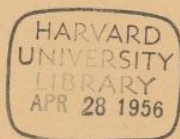
Equatorial
June 24th 1860.
to
July 4th 1860.

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KG 11365.190



KG-11365.190



Comet

1860 June 24th Com. Sunday evg-

The sky still obscured by a dense redish haze so that scarcely a star can be seen within 20° of the horizon West and North-west - the Moon 5 days old. Comet at alt of 5° or 6° barely visible to the naked eye but is bright in the telescope - far brighter than any star that can be found within half an hour or more following in R. & within $\pm 6'$ in Dec. It is evidently darker

in its axis - & the apparent left hand branch is brightest & broadest But I think the other is now relatively brighter than it was on the 22nd

.147 5' axis tail

19 35

4' from nucleus

19 35
39 39
20 04
19 6.4

Extreme Outside width of tail

It is cloudy & there is no possible opportunity of seeing the fainter nebula.

= 3'

σ
 24.62
 39.39
 14.77
 14.48
 $1' \text{ from nucleus}$
 $= \text{width in } p$
 $= 14.48$
 very difficult to measure
 But the figure has been carefully
 drawn

The nebulosity extends from nucleus towards the Sun
 not above $15''$ Apex immediately about nucleus tends to
 side preceding axis of tail prolonged

By this diagram
 effusion towards a has 228° greater
 angle of pos than axis

axis

Carnot.

June 24, 1860

G. P. B. obs.

Telescope set in the
in the following way.

H.C. = 8 33' 26"

Dec. C. = 42° 21' 0"

^h 15-	^m 30	^s 58.0	1. wire	} microm.	First obs. is doubtful, the others good.
	31	9.8	2. wire		
	31	41.3	1st wire of scale		

Scale,
5' 14"

* 15-	40	10.6	1. wire	a star of 9 mag.	8	10
				obs with Sp. Gov. or 2 wires		

Stars barely visible
on the scales.

* 15-	41	48.0		about	0	30
-------	----	------	--	-------	---	----

		B. D.				
* 15-	50	0.6	} a star of 8 mag	4	20	Dec not good
	50	12.6				
	50	40.8				
	50	49.7				

* 15-	55	53.0	1. wire	} some mag as prec. Star.	0	40	? Dec very uncertain
		55.2	2. wire				

* 16	20	11.0	2. wire	about	- 0	30	about (obs on Sp. Gov. first 2 wires)
------	----	------	---------	-------	-----	----	---------------------------------------

Comet 1860 III. - Rutherford

1860 June 24 - ~~1860~~

E.C.

Copy
scale
5' 14"

Comet.

15 31 30.1 31.26
42.0
32 13.6
19.2

15 40 42.9
55.1

8 10

R. 2133

a

15 50 33.0
45.0
51 16.1
21.9

4 20

R. 2203.

b

15 56 25.4
37.6
57 8.4
13.7

0 40

R. 2246

c

16 20 32.1
43.5

- - 0. 20

Doubtful
(J.H. 15)~~Comet's apparent~~Comet - a
Rutherford
Ref.

- 9 12.95 -
0.11

- 2' 56"
- 2.0

Comet - b
Ref.

- 19 2.78
+ 0.03

+ 0.54
+ 0.6

Comet - c
Ref.

- 24 55.05
+ 0.17

+ 4 34
+ 3.0

Reduction of Star Places

June 24.

2133 R.

1836	7	3	27.82	+ 42° 20' 8".3
To 1860.0	+ 1		41.76	- 2 13.3
To App.	+		1.52	+ 3.6

2203 R. 1836

To 1860.0

To App.

7	13	18.14	42 16 41.0
+ 1		41.33	- 2 33.2
+		1.54	+ 3.5

2246 R.

7	19	10.88	42 13 27.5
+ 1		41.03	- 2 44.7
+		1.53	+ 3.4

Apparent places

7	5	11.10	+ 42 17 58.6
7	15	01.01	42 14 14.3
7	20	53.44	42 10 46.2

Capella

α² Gem

46	21.13	7	25	39.73
56	22.58	7	25	41.22
	+ 1.45			+ 1.49

45 51 2.7 32 11 29.2

45 51 6.7 32 11 31.7

+ 4.0 + 2.5

2133 R.

2	7	4	18.14	99.62	5	42	19.04	99.59	26	5	42	19.04	99.59	26	5	42	19.04	99.59	26
---	---	---	-------	-------	---	----	-------	-------	----	---	----	-------	-------	----	---	----	-------	-------	----

- 9.6123

0.06808

Aa - 0.027 - 0.36

Bb - 1.769 + 3.76

Cc + 3.245 - 4.19

Sd + 0.076 + 4.41

2203 R.

2° 7 14 9 99.7686

42 15.5 99.807

- 9.5023

Aa - 0.031 - 0.35

Bb - 1.745 + 4.32

Cc + 3.231 - 4.83

Sd + 0.087 + 4.36

2246 R.

7 20 1 9.97298

12 12.2 9.95753

- 9.5341

Aa - 0.033 - 0.34

Bb - 1.728 + 4.64

Cc + 3.200 - 5.20

Sd + 0.094 + 4.32

1860 June 24.

Comet's apparent place.

By	2133	6 55 58.04	42 15 0.5 + Motion in 20. ^{Sec} W. 2
	2203	58.26	8.95 - 1
	2246	58.56	2.25 - 1

Mean 6 55 58.29 42 15 10.9 + Motion in 7 ⁵
8.3 Mean incl. of

El. 15 34 56
- 7

15 31 49

fact 49

15 31 0

6 13 45

Cambridge m. 49 17 15

1860 June 25^L

Differences of Right Ascension

Comet - a + 0 54.75 at 14 44 56
57.37 51 8

El. 14 36 16.0
27.9
59.8
37 5.2

Comet - b - 2 21.55 At 14 36 22
- 6 18.15 44 36
15.35 50 48
43 56

38 37.5
49.5

Comet - c - 3 1.97 14 36 42
2 58.78 44 56
2 58.12 51 8

39 18.2
30.2
40 2.0
7.6

Declination on next page

14 26 5.85 4.02
6.12 2.52 2.79
4.0

Stars for Tuttle's Comet

1860 June 25th Not clear but tranquil good observations =

Comet.

At 7^h Cambr

7^h 6^m + 42° 3'

B. Z. 492

1860.0

a	8.9	7	4	48	+ 42°	1.9
b	8		8	1		2.7
c	8		8	41		7.1

c is also found in Rümker. (= 2170 R)

246 = At 14 32 2.6 5' 0"

H. L. 7 24 47.

Star. 14 34 14.7 5 35 }
 " 10 0 }

14 20 00
 1 00
 14 19 00
 7 6

By Chronometer same obs'd by Spr. Gov. as well.

Comet. 14 35 49.8 5 5
 36 1.7
 36 33.4
 36 38.9

Star b 1 38 10.8 5 39
 2 38 22.9

c 3 38 51.7 10 7 3.7
 4 39 3.7 2.0
 38.3 1.9
 41.0 2.1

B. B.

Comet 1860. III.

1860 June 25.

Set II.

14 43 35.3
47.6
44 18.4
24.2

44 30.0
42.0
45 13.6
18.9

46 48.2
47 0.1

47 28.6
40.6
48 12.6
17.8

Set III

49 44.9 57.10
56.8 57.20
50 28.2 57.50
33.5 57.60

14 50 42.0
54.1
51 25.7
31.1

S

0 54.7
56.4
58.2
54.7

Differences of Declination

Comet - a 14 44 56 + 10."
14 51 8 + 5"

Comet - 2 14 36 42 - 34"
44 56 - 40
51 8 - 46

Comet - c 14 36 42 - 5 2
44 56 - 5 8
51 8 - 5 13.5

El. 54.52 fast

2 58.6
58.6
59.0
58.9

Declination in 14.14' 11.75"
0.81
4.5

~~Set III~~

Turn over

B. J. ✓

Star a

14 43 8.8
20.9 $\frac{1}{2} \frac{11}{3}$ ~~57.9~~
57.4

Comet

14 44

2 13

47.2
52.3

Star b.

1 14 46 21.7
2 33.7

2 53

c

1 14 47 2.4
2 14.1
3 47.2 }
4 51.6 }

7.21

B. D. B.

Star a

14 49 18.4
30.3
50 2.7
7.2

2 18

Comet

14 50 15.6
27.5
51 59.3
4.6

2 23

Turn over

Comet 1860. III

1860 June 25th continued.

14 52 57.4

53 9.4

53 38.2 58.2

50.1 58.0

54 21.9 56.2

27.2 56.1

Star b.

14 52

30.8
42.7

3' 9"

Star c

53

11.7
23.5

736 or 37

54

55.4
0.9

Reading Log of J.

Ames 1864 III

860 June 25th

(a) B.2	7	2	55.17	42	4	47.3
			- 35.54		+	17.3
			- 0.02		-	0.0
1825.0	7	2	19.61	42	5	4.6
		2	28.07		- 3	12.2
1860.0	~~7~~	4	47.68	42		152.4
	7	4	47.68	42		152.4

(6) B.F.	7	6	8.33	42	5	44.1
			- 35.53		+	18.5
			- 0.02		+	0.1
1825.0	7	5	32.78	42	6	2.7
		2	27.93		-	3 24.7
1860.0	7	8	0.71	42	2	41.0
			0.71			

(c) B. F.	7	6	48.72	42	10	12.7
			- 35.53			+ 18.8
			- 0.04			+ 0.1
1845.0	7	6	13.15	42	10	31.6
Proceeding		2	28.00		- 3	23.6
Quicker 2170.	7	6	59.39	42	9	27.1
B-R			+ 0.07		-	0.7
Proceeding		p	41.46		2	20.4
1860.0 B.	7	8	41.15	42	7	8.0
R			40.92		7	6.0

h m s	95304	1.1602
7 3 34	9.9517	
42 3.5	9.95533	4.2306
	23747	
	9.41605	
	0.06451	5.492
	0.73970	

7647	9.98130	1.1651	1561
124.29	9.95555	4.2355	265
	9.45833	5.762	
	0.06299		
	0.76056		

7 7 27	9.98092	1.1582
42 8 8	9.95667	5.818
	9.46752	203.63
	0.06373	0.0
	0.76474	

7750	9.98068	1.1571
428.3	9.95655	4.2277
	9.46490	5.8550
	0.06373	
	0.76712	

Sum of Stars

77 5
 G 343 24
 L 106 46
 H 175 47
 S 42 46 9.956
 50 10 20 0.000
 90 10 1.207

K. d 0.129
 L. H. 2 -9.989
 h 1.310
 +9.337
 9.826

f 35.35
 g 14.6
 h 26.8
 23.15
 +1.54
 g' - 0.05
 h' + 2.95
 i' + 0.50
 + 3"4

Apparent Plan of a 7 4 49.22 42 1 59.8
 8 - a +54.76 }
 Refr. - + 10.0 }

b 7 8 2.25 42 2 44.4
 -2 17.93 - 40.5
 - 0.01 - 0.2

c 7 8 42.54 42 7 10.1
 -2 58.69 - 5 8.4
 - 0.05 - 0.9

7

Hor. by. 7.39.
 Time 14 44 56 El. By a 7 5 43.98 42 2 5.8
 first 55 2 44.31 2 3.7
 14 44 1 c 43.80 2 0.8

Cambr. in. t. 6 17 33
 8 26 28 7 5 44.03 42 2 3.4

1860 June 25

* Approximate. See col. 1

Comet

1860 June 25 Strong tail

236 $14^{\circ} 58'$ Not clear
Apex of envelope 125° Comet plain to naked-eye $14^{\circ} 53'$ Zero dir. 39.40 Zero pos. $33^{\circ} 47'$

Apex envelope

 $38^{\circ} 51'$

Limit of light towards sun

Zero 37.72
 39.40
 1.68

 $15^{\circ} 1' 36''$ A star of 7^{th} mag in bright

3.4
 164.6

side of tail

236 $15^h 4^m 2^s$

13.4

nucleus preceds X

X is $10'$ north of nucleus

& at 15^h is near centre of preceding
branch of tail which branch
is say $1'$ broad

Tail is here $5' 30''$
broad $10'$ from nucleus

extreme

 $15^h 15^m$ Star X is

on outer edge of horse outside

pre branch $15^h 26$ is just out

By this sketch dif. ang. pos. cancelled
maps at a & tail = 241°
Mean $\frac{231}{236}$

Direction of R.

nucleus good

A cancelled map
is faintly seen
projecting on
pre side of
nucleus.

envelope too decided but the
indications of a dark line
are constantly
suggested.

The hollow of axis decided
but there is a haziness on
all sides of nucleus even
opposite to Sun. Though there
faint & diffuse.

Richards thought fainter on tail
outline

X is in pre branch

By this sketch dif. ang. pos.
Bright maps pre. & tail = 236°

Good

Comet

1860 June 25th

Receding Edge of Tail
 Points on preceding
 edge of tail -

236 15 30 0.5
 H.C. 8 21 30

Dec. 42 32

236 15 32 9.5
 H.C. 8 22 20

Dec. 42 06 24

236 15 35 19.7
 H.C. 8 26 50

Dec. 42 34 00

236 15 38 08
 H.C. 8 28 45

Dec 43 09 30

Transit width of tail at 236 15" 41" 11.5"
 10' from nucleus - in R. 236 15" 41" 56.2
 Not very good.

Axis of the Tail

236	15" 43" 00	Aug pos	143° 40'
	15 47" 00		142 35

June 25 1860



Stars for Tuttle's Comet.

1860 June 26.

$$A \ 8^h \text{ Ambr.} \quad 109^\circ 5' + 41^\circ 43'$$

$$= 7^\circ 15' 36''$$

$$B. Z. \ 492. \ 9^h \ (7 \ 10 \ 44.30) \ (41 \ 43 \ 34.6) \ a$$

$$8^h \ (7 \ 11 \ 51.70) \ (41 \ 40 \ 52.0) \ b$$

$$1860.0 \ a \ 7 \ 12 \ 38 \ +41 \ 40.3$$

$$b \ 7 \ 13 \ 45 \ +41 \ 37.5$$

$$El. \ 14 \ 46 \ 54.0$$

$$47 \ 3.9$$

$$35.2$$

$$40.4$$

$$49 \ 32.8$$

$$42.5$$

$$50 \ 13.8$$

$$19.2$$

Reduce to El. $14^\circ 58' 4''$

$$52 \ 33.9$$

$$43.7$$

$$53 \ 14.6$$

$$19.9$$

$$54 \ 3.2$$

$$13.0$$

$$46.0$$

$$49.4$$

$$56 \ 43.5$$

Comet 1860 III (Tuttle)

1860 June 26thG. P. B. obs.
T. H. S. rec.

Comet. ²³⁶
~~14 49~~ 14 58 27.8
 7 38 40
 41 41'
 + 9.25
 + 5.71

Compare with Star α Star $\alpha = 2$

Star (236) α 14 46 27.7?
 37.8
 47 9.4 3' 28"
 14.3

Star $\alpha' = R. Z. 492.$

Return to

Comet. 14 49 6.8
 16.8
 47.8 3 28
 53.3

Star α' 14 52 7.8 1 53 Minute
 17.6?
 48.6
 53.7

Star 53 37.1 5 15
 52 49.0
 54 17.8
 23.2

Comet. 56 17.6 5' 10" (11 min) 18? Clouds

15 0 33.8
 43.5
 1 14.7
 19.9

2 2.8
 12.8
 43.7
 49.3

4 48.3
 58.2
 5 29.7
 35.3

15 6 46.8
 58.7
 7 28.3
 33.6

9 8.1

10 22.7
 32.7

11 4.1
 9.6

15 11 19.4 Last two end lines
 24.8

Comet 1860. III. (Little)

1860 Jan 26th

7.8th at 15 0 7.57 1' 50"^H
 17.57
 48.6
 53.8

Comet at 15 4 43
 M.L. 7 46 35
 + 41 42

X 1 36.7 514
 46.1
 17.6
 23.1

Comet.

4 22.2 4 57
 32.1
 5 3.3
 8.7

C B. B. Instrument with 2 fixed M.L. 7 48 40
 Comet 15th 6th 20.6 1 "
 30.6 5 3
 7 2.2
 7.4

2nd min 8 42 6' 45"

Iv. 9 56.3
 II. 10 6.4 5 28
 10 43.3

9th min
 0

to

10 52.

M.D. B.

1 10 } Two stars
 1 157 } Two last min

El. 15 15 28.7
 16 38.5
 9.8
 15.3

II. 15 16 7.3

15 22 27.4
 37.2

15 23 21.9

15 23 52.1
 24 1.8
 ~~24~~ 32.9
 38.3

15 26 5.4
 15.1

15 26 20.7
 30.2

15 28 13.3
 23.0
 54.3
 59.7

15 29 38.5
 48.6

Comet 1860 III (Tuttle)

1860 Feb. ~~Continued (Data for comet)~~

Stars Continued

Instrument fixed as before.

8th or 9th

15

15

2.6

4 23

Cloudy.

12. -

43.6

45.9

1st lost

4. about,

Second wire

41.3

lost

lost

1

15

22

1.4

3 13±

2

11.2

1

22

55.6

0.23

2

1

23

25.8

3 14

2

25.7

3

24

6.6

4

11.8

faint

1

25

39. -

2.±

2

48.8

faint

1

25

54.

7.±

2

26

4.1

8th

1

15

27

47.1

4 50

2

58.9

3

28

28.2

4

33.2

1

29

12.3

2 17

2

22.4

3

20.4

lost

15 31 42.3
52.2

32 34.9

44.8

33 16.1
21.5

32 51.9

33 1.8

~~33~~ 33.1

— 38.4

35 28.3

I 45 29.7

II 39.4

~~45~~

I 46 10.6

II 20.2

III 51.2

IV 56.5

Star continued

15 31 16.3 340
26.1

7/8

8.—
18.6
50.
55.

6 24

8.

(32) 25.6
35.—
(34) 6.7
12.1

3 30

Right.

1st
w.

—

8.

+ L

15 42 folly 7'50.

8.9

15 45 3.5
13.4

1 19

7.8

45 44.5
54.2
46 24.
30.

242

A

Set on a bright star

246 H 15 54 11

H.C. 8 30 15

Da. +37 48.3

Cont 1860. III

E.L. 14 58 4
 feet 55
 14 57 9
 — 6 19 19.3

M.J. Lamb. — 2 11.4
 8 35 38

Comet III 1860

June 26th 1860

Openings among dense clouds allowed the Comet to be seen at intervals - But the sky was not at any time clear. & the Moon half-full fills the haze with light

By this sketch def. ang. pos.
Bright maps at 10 x tail = 206

dark halo ^{1"} to ^{2"} broad.

envelope eccentric



K.

defined outline
not sharply



The apex of envelope a a' a''
is 18" from nucleus



The envelope suspected yesterday evening is now distinguished with certainty & the above is a tolerably correct delineation

The nucleus presents a very curious change since last evening (the change is beyond any question real)

It is now an elongated ^{spindle shaped} streak some 10" or 15" ^{long} ~~broad~~ by 3" broad. <  better above

There is a quantity of luminosity projected towards
H On the right-hand side the outlines are difficult to distinguish. But the same seen on previous dates much expanded.

Comet III 1860

June 26th 1860

Openings among dense clouds allowed the Comet to be seen at intervals - But the sky was not at any time clear. & the Moon half-full fills the haze with light

By this sketch def. any pos.
Bright maps at h & tail = 206

The apex of envelope 'a a' a'
is 18" from nucleus

dark halo 1" to 2" broad.

envelope eccentric

K.

defined outline

not sharply



The envelope suspected yesterday evening is now distinguished with certainty & the above is a tolerably correct delineation

The nucleus presents a very curious change since last evening (the change is beyond any question real) It is now an elongated, ^{spindle shaped} streak some 10" or 15" ^{long} ~~broad~~ by 3" broad. < ~~the~~ better above

There is a quantity of luminosity projected towards
H On the right hand side the outlines are difficult to distinguish. But the same seen on previous dates much expanded.

Comet III 1860 (Book H 36) 2nd

June 26th 1860

Openings among dense clouds allowed the Comet to be seen at intervals - But the sky was not at any time clear. & the Moon half-full fills the haze with light

By this sketch def. ang. pos.
bright maps at H & tail = 206

The apex of envelope 'a a' a'
is 18" from nucleus

dark halo 1" to 2" broad.

envelope eccentric



K...
not sharply defined



The envelope suspected yesterday evening is now distinguished with certainty & the above is a tolerably correct delineation

The nucleus presents a very curious change since last evening (the change is beyond any question real)
It is now an elongated, streak ^{spindle shaped} some 10" or 15" ^{long} ~~broad~~
by 3" broad. < better above

There is a quantity of luminosity projected towards
H On the right hand side the outlines are difficult to

d' = ...

Comet 111 1860 (P. 4 30) 1860

June 22 1860

Spinning around some small distance to the
to be seen at intervals. For the day was not so fine
clear. The other half of the day the sun was light
The apex of envelope, 2.5"

is 18" from nucleus

dark halo 1/2" from

envelope, 2.5"

The envelope is
greatly varying in
with pointed out
the above is a sketch
most distinct

The nucleus presents a very curious change
but varying (the change is rapid and frequent)
It is now an elongated, streak some 10" or 12" long

by 2" broad & the
there is a quantity of luminous particles around
the upper part of the nucleus are difficult to

Comet III 1860

June 26th 1860

Openings among dense clouds allowed the Comet to be seen at intervals - But the sky was not at any time clear. & the Moon half-full fills the haze with light

By this sketch dis. any pos.
bright map at R & tail = 206

The apex of envelope 'a a' a'
is 18" from nucleus

dark halo 1" to 2" broad.

envelope eccentric



K...



not sharply defined outline



The envelope suspected yesterday evening is now distinguished with certainty & the above is a tolerably correct delineation

The nucleus presents a very curious change since last evening (the change is beyond any question real) It is now an elongated ^{spindle shaped} streak some 10" or 15" even ^{long} ~~broad~~ by 3" broad. < ~~is~~ better above

There is a quantity of luminosity projected towards
H On the right hand side the outlines are difficult to

Comet III 1860

June 25, 1860

Observing around eleven o'clock at the
to be seen at intervals. But the sky was not at any time
clear. A few stars half-faded. The hour with light
The apex of comet. 2.5"



is 18" from nucleus

18" from nucleus

The nucleus appeared
greatly enlarged in size
with a faint white outline
the shape is a triangle
most distinct

The nucleus presents a very curious change since
last evening (the change is rapid and frequent)
It is now an elongated shape, some 10" or 12" in length
by 3" broad & the tail shows

There is a quantity of luminous particles around
the nucleus, but the outline is difficult to

Comet. 111 1860

June 26th Cont.

Viewed in the Comet seeker with high power
the hollow of the axis is easily traced for 1° - the bright
half of branch comprises $\frac{3}{4}$ of the whole tail in bright-
ness & $\frac{2}{3}$ in width
much as in drawing of H.P. 7.

N.B. inverts sideways by
prism.

Clouds & moonlight prevent our tracing
the tail

See drawings and
in Comet seeker book at
one for 26th in this book at
end of 5th for June 29th



1860phae.proj..190B

Comet

1860 June 27th Clear & fine

112 22

40 56

This is the first
really clear night since
the discovery.

Entt R

 $7^h 29^m 32^s + 41^\circ 05'$
 $14 \ 32 \ 32 \ 41 \ 05$
 $7 \ 3 \ 26$
 $236 \ 14 \ 37 \ 30 \ 3$
 39.042
 39.324
 2.82

In direction of R Diam nucleus
Barely a trace of surrounding
nebulosity is seen in the
strong twilight

In the sketch the angles rep-
resent the angles of position of the
inner limits of the principal streams
of nebulosity issuing from the
neighborhood of the nucleus.

R



Strong twilight
just coming in night

197°

95°

Comet

1860 June 27 Cont

Stars a & b situated in the tail
14 47.45of $7/8$ 18th mag.

At 236 = 14 ^h 47 ^m 45 ^s		Nucleus		20" part bright edge of tail		C.C.	
		a		15" part axis			
		b					
Comet		14 48	38.8	1 34	14 49	6.4	
a			50.1	8 46		17.3	
b			51	5 10		18.3	
Comet		14 49	48.6	1 34	50	15.8	
a			59.1	8 49		26.2	
b			59.7	5 13		26.9	

Star a. B.Z. 492 7 25 51.10
 b " " 25 52.14

For reduction of stars see afterwards.

El.					
M	14 49 13.7	U-a	-10.65	-	7' 13.5
		Refr.	-0.05	-	0.9
		U-b	-11.50	-	3 37.5
		Refr.	-0.03	-	0.5

a	1860.0	7 27 41.64	41 9 2.1
Red. to app.		+ 1.59	+ 2.8
U-a		- 10.70	- 7 14.4
b	1860.0	7 27 42.21	41 5 28.9
		+ 1.59	+ 2.8
U-a		- 11.53	- 3 38.0

El. ~~14 49 13.7~~ B.Z. a 7 27 32.53 41 1 50.5
~~56.7~~ b 32.27 53.7

El. 14 49 13.7
 Ref. 56.7

Sid. 14 48 17.0 - 8 22 52 Cambridge mean Time

Conist Photographs

unc 27 Cont.

* meaning probably of Dec 13

The outline DCAB beautifully defined & all the features^x

bright & strongly marked far more so than

Donuts

The region between BEFF'E' has comparatively the least nebulosity

CD and

E F straight

The axis

Mr Whipple sent Camera
on Great Telescope & tried
to photograph Comet - but
did not appear to succeed.

My above sketch dif. ang. pos. of effusion
towards A and pos. axis tail = 260°

Tangents
visible to naked eye

A	14	54	$173^{\circ} 47'$	$33^{\circ} 67'$
---	----	----	-------------------	------------------

farther of B

			202	45	$[33.93]^?$
--	--	--	-----	----	-------------

C			152	56	31 58
---	--	--	-----	----	-------

15	03	D	144	20	29 71
----	----	---	-----	----	-------

Beyond D edge is asymptotic

15 07 Star Southernmost is 5" beyond edge
of tail

Zero of Microm. 39.41
" Pos. 83 47 on meridian.

Outer Envelope

E	268	25	35 38
---	-----	----	-------

E'	268	25	23 22
----	-----	----	-------

F	288	40	36 01
---	-----	----	-------

108 45	F'	288	40	32 25
--------	----	-----	----	-------

G'	122	55	30 15
----	-----	----	-------

Vertex	224	34 02
--------	-----	-------

Axis of tail $136^{\circ} 20'$
 $135^{\circ} 40'$

Breadth at 5' from nucleus
outside nebulosities

Co. Finished at about $15^h 30^m$

	12	30
Zero	39	41
	27	11
		5.4
	26	57

June 27th
Clear & fine

inner envelope
reaches just $\frac{1}{2}(\frac{1}{2} + \frac{1}{4})$ to outer

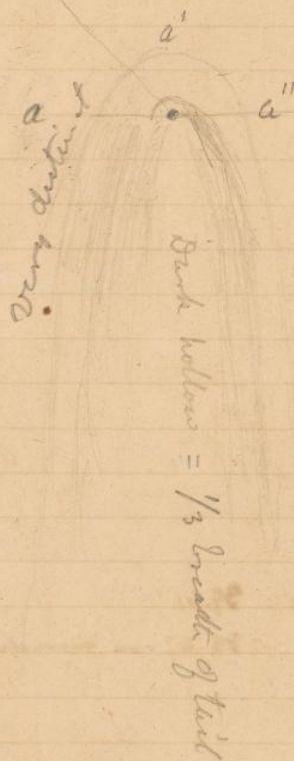
inner envelope 20" $\pm$

By this sketch, dif. ang. pos. of left hand
map & axis true = 260°

The sharply defined outline of the
inner side of outer edge is a new &
striking feature



40" from inner bright
margin doubtful
estimate



$a a'' = 23.92$

Zero 39.41
1549

Dark hollow = $\frac{1}{3}$ breadth of tail

Both branches of tail about equal in brightness!! after
 $\frac{1}{2}$ below nucleus asymmetrical.
Brightest emission from nucleus has reached
at least 7' from nucleus since last night
for to that distance it is now difficult to say which
branch is brightest

At 8' from nucleus $\frac{1}{4}$ breadth of tail

8.36

Zero 39.41

31.05

30.413

Jan 27 1860

Obs. H. College

Reduce for
Engraving to $\frac{2}{3}$

Scale 50" = 1" of this drawing.

Scale for engraving is 75" = 1.00

Jan 17th 1860

of P. A. 0^h 40^m 40^s



Comet III. 1860

1860 Jan 27th

Five = foot Equatorial

Ring = micrometer (best)

By G.L.

	Outer	Inner	Inner	Outer			
α b	14 35 3.1	14 35 45.6	14 37 4.6	14 37 47.1	Below	At 15 55 0	15 th f.
α a	5.4	52.4	36 55.4	37 42.6	Below	α 8 29 9 (40)	
Comet	15.9	36 3.3	37 9.0	37 55.8	Above	Dec. +41° 14'	
α a	14 39 15.8	14 40 2.7	14 41 6.2	14 41 53.8	Below	At 15 57 49	
Comet	28.8	16.3	22.8	12 8.7	Above	α 8 29 50 (40)	
Comet		14 46 41.5	14 47 48.0		Above	Dec. +41 3.4	
c		48 34.6	49 29 33.8		Above	At 16 0 52	
Comet		14 50 30.8	14 51 36.7		Below	α 8 34 27 (40)	
c		52 16.5	53 27.8		Below	Dec. +41 23.5	

Drawing in water, paper taken out &

The stars α b are apparently the same as are
 then called in Ab. with the Gt. Equatorial Transit.
 The star c is in B. Z. 452.

4
for return

1860 June 27th

five-foot Equatorial
H.S.

pretty fair
straight
7.4
2.2
30 to 40

Comet

June 27th 1860 Continued

Right for left by prism

projections

The change of aspect in the Comet seeker since last night is most remarkable. It was then much like H.P.T. drawing which I verified at the time. But now we have evidently a fresh ejection of luminosity on its way from the nucleus through the fainter tail of last night.

26th good

Right for left by prism of Comet seeker

27th good

New tail 10' long within old one

x x x 3.4

When I saw the comet by naked eye it was too late to see distinctly but I strongly suspected a cometary but no regular outline nor evident brightness as better edge

nucleus looks eccentric to left hand as respects new emission

Visible through fan.

* 5.6 10' from tail axis?

Comet 1860.III (Star - places)

1860 Jan 27th

hy

a

B.Z. 452	7	24	52.30	41	13	23.4	7.8
			+ 24.05			+ 17.8	
			- 0.20			+ 1.0	
B.Z. 492	7	25	51.10	41	12	54.7	7.8
			+ 35.46			+ 26.5	
			+ 0.16			- 0.6	
Mean 1860.0	7	25	15.98	41	13	21.4	
Pre.		2	25.53		- 4	18.7	
Red. to app.							

b

B.Z. 452	7	24	52.82	41	9	30.6	8.
			+ 24.05			+ 17.8	
			- 0.19			+ 0.9	
B.Z. 492	7	25	52.14	41	9	19.9	8.
			- 35.46			+ 26.5	
			+ 0.17			- 0.7	
Mean 1860.0	7	25	16.76	41	9	47.5	
Pre.		+ 2	25.45		- 4	18.6	
Red. to app.							

c.

B.Z. 452	7	26	58.99	41	3	10.2	7.8
			+ 24.06			+ 18.5	
			- 0.17			+ 0.9	
1860.0	7	27	22.88	41	3	29.6	
Pre.		+ 2	25.17		- 4	24.6	
Red. to app.							

Star a

Baily 147 ⁴¹ / ₄₂	h	m	s				
	7	23	32.17		+ 41° 16'	22.4	
Pre.		4	9.64		- 7	19.1	
Red. to Base.			+ 0.10			- 2.3	

Mean Places for 1860.0

a	Baily 147 ⁴¹ / ₄₂	7	27	41.91	41	9	10.2	Av.	41.64
	Base 2.452.492		27	41.51		9	2.75		2.1
b	—	"	27	42.21		5	28.9		
c	—	2.452	29	48.05	40	59	5.0		

Star-places for Comet III. 1860.

1860 June 27th
continued

Computation of Position

	1860 - 1860	1825 - 1860
a		
2°	7 25 37.00 9.96897	7 26 28.8 9.96832
5°	41 12.71 9.94240	41 14.20 9.94202
	1.30226	1.30223
cos 2°	9.5622	9.5664
$\frac{d\alpha}{d\delta}$	4.1607 (16.354)	4.1580 16.314
$\frac{d\delta}{d\alpha}$	-7.319	-7.390
	1825 - 1860	1825 - 1860
b	7 26 29.5 9.96831	7 28 35.5 9.96671
	41 7.64 9.94111	41 1.28 9.93949
	1.30223	1.30223
	9.5664	9.5763
	16.354	
$\frac{d\alpha}{d\delta}$	4.1558 16.280	4.1578 16.160
$\frac{d\delta}{d\alpha}$	-7.390	-7.580

Rev. to app.
 $\frac{1}{2} (a + b)$ G
x
H

Stars for Comet III. 1860.

1860 June 28thMotion of Comet June 27-28 8^h 4^m 4^s

$$+ 12^m 4^s - 00 54'$$

Int. M. $7^h 41^m 10^s$ $140^\circ 11'$
(136)

True R. $114^\circ 52' + 40^\circ 15'$
 $7^h 39^m 28^s$

Star B. 2 452 7th mag.

~~7 27 55.80~~ ~~40 11 39.6~~
+ 24.10 + 22.4
- 0.03 + 0.1
~~7 28 23.29~~ - 4 55.3

1860.0

7 40 43.16 40 7 6.8

$2^\circ 7' 39'' 31.6$
 $5^\circ + 40^\circ 9'.58$
True 9.92627
in d. 9.95770
(Venus) 1.30273
 9.6240

1.18620
15353
1.0235

$\frac{d\delta}{dt}$ 4.0940
 $\frac{d\alpha}{dt}$ 8.4438

Red. to app.

1.62

+ 2.4

G 343 4.6
d 115 11
H 173 12

14.5 9.928
14.6-4 9.995
9 1.213
14.6+4 -9.192

14.5 0.116
14.6+4 -9.977
14 1.310
14.6-4 +9.499
14.5 9.809

f 36.0

90 73.6 d - 2.5
140-253 N + 4.1
114 0.8

Comet. 1860 III.

1860 June 28th

At 14 53 26

H.C. 7 12 43

Dec. 40° 17'

Comet	15	21	236	8 33	15 21	31.9
			4.7			
			[34.8]			8.5
			41.2			

Star	15	22	lost	2 49	15 23	20.5
			(53.37)			
			(58.15)			

Comet	15	23	49.7	6 57	24	17.0
			24			
			25.8			53.3

Star	15	25	5.8	1 21	25	33.0
			36.6			
			—			8.8

At	15	21	54	8 - *	$\Delta \alpha$	$\Delta \delta$	$m \alpha$
		22	56		$-1^m 17.00$	$+5' 44''$	2 comp
		24	39		$1^m 15.70$	5 36	3 comp.

Hor. Motion in α +28.5

Reduce to	15	22	16	+ 0.57	16.43^m	5 44
				- 0.68	16.38	5 36

Hor. Ang. $7^h 44^m$
Dec. $40^\circ 13'$

Mean
Ref.

$-1^m 16.40$	$+5' 40.11''$
+ 0.08	+ 1.4

$\Delta \alpha$	$\Delta \delta$	- 1 16.32	+ 5 41.4
$\Delta \alpha$	$\Delta \delta$	+ 2.40	+ 0.14

Comet 1860 III

1860 June 28.

Star (1860.0)	γ	h	m	s	40°	$7'$	$6.8''$
Red. to app.				1.62			+ 2.4
	-	1		16.32		+ 5	41.4

Comet's L.	γ	39	28.46	δ	40	12	50.6
------------	----------	------	---------	----------	------	------	--------

El.	15	23	16
fact			56.
Sid. time	15	22	18
	6	27	12.4
		2	14.3
Amb. m.t.	8	52	51

Comp. α $114.56 = \gamma 39^h 44^m$
 $\delta + 40 14$

C-v

Comet III 1860

1860 June 28th Between cirrus cloud

Ang pos axis of principal luminosity $236 = 14^h 58^m$ $240^{\circ} 15'$
 about nucleus diam $20''$

Nucleus in dense cloud

Good

28

Think I can discern a point $1''$ in
 in diameter = true nucleus The sur-
 rounding haze is very dense & extends
 on all sides of nuclear point

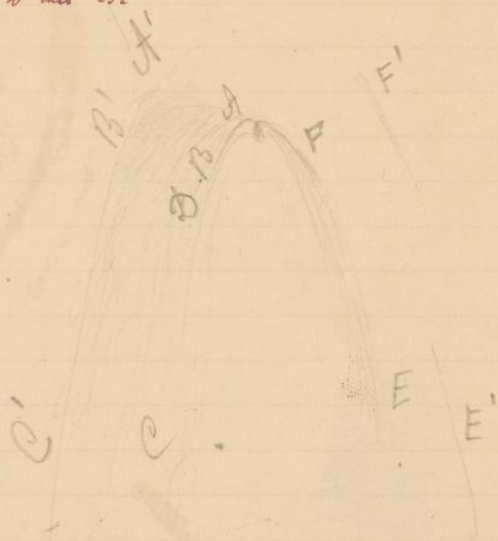
It is remarkable that the Comet is plainly visible to the
 naked eye in the sky still bright with twilight at a
 time when judging from the appearance of the head
 through the telescope I should not have had the least
 expectation of seeing it

Comet

1860 June 28th Cont.

Hazy

Bright maps to tail 252°



straight margin at F not so conspicuous as on last evg. A & E may be traced as far as E but A B D only as far as D.

at	directions of tangents	r
A	173 47	29.92
A'	173 47	35.77
B	156 00	34.89
B'	156 00	26.41
C		
C'	139 20	22.35
E		
E'	122 10	21.47
F	98 45	35.7
F'	98 45	27.54
D	150 28	34.42
D'	127 55	30.71

Outer envelope breadth hollow 8' from nucleus
Outline traced strong
as far as the 52°

Bright map to tail axis
240° ?

The general form of Comet is



estimated 7' width extreme at 10' from nucleus

Comet

June 28th (Cont.) H. P. J.

Finder breadth of tail at $\frac{1}{2}(54) = 27'$ from nucleus

10' good
14' ?

Dist at 6' from nucleus of E from centre of axis through nucleus $128^{\circ} 0'$ $23^{\circ} 25'$

Bright snap near α 20

tail axis $\pm 249^{\circ}$ wt=2

Prev. Sketch 240 " = 1

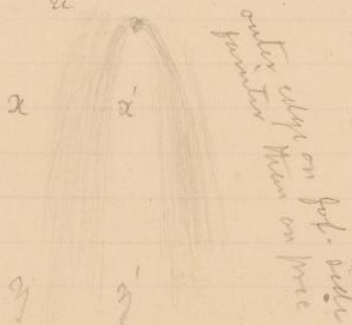
" 252 " = 2

Adapt 248.4

intermediate
point



Good



The nebulousity below $\alpha\alpha'$ on the left hand side suddenly & sharply terminated on side $\alpha\gamma$ - as far as α beyond which it is traced with difficulty in a cloudy sky -

below α the whole breadth of branch $\alpha\alpha'$ $\gamma\gamma'$ is of nearly uniform brightness but shades off towards hollow of axis - on the whole it may be slightly brighter at centre of branch but only a very little

In the finder and Comet seeker the inner tail now scarcely to be distinguished from original, but I have little doubt that it now reaches about 30' from nucleus symmetrical and of even brightness on each side of dark hollow - In striking contrast with appearance on 26th The spindle from the nucleus is now dispersed into the new tail.

The outline $ABDC$ is nearly symmetrical with AEE but the latter is more distinct between $F \& E$ than the former between $D \& C$

Note, that the emission from the nucleus forming the spindle 20" long on 26th had formed on the 27th a new tail as it were within the old one extending $\frac{1}{2}$ from nucleus on 27th and 30' about on the 28th. Altering its aspect completely in the great refractor and in the Comet seeker. The dark hollow of axis is now central & the light of tail, excepting within $1' 30''$ of nucleus quite symmetrical. I am at a loss to say which side is brightest. Though I think the new emission is a little the longest (seen in finder 30' from nucleus) on the apparent right hand & perhaps a trifle brightest on the opposite side

Comet

1860 June 28th

Comet III. 1860 June 28

13^h 50^m P.M. June 28.Not good Effort E_g

The principal lines
to the left, begin curved
to the right

There is an approach to an abrupt
turn at a.

Perhaps traces of an envelope at
b.

The right side is more curved
than it was yesterday.



The left side of the tail is
not symmetrical; there is more
fine matter inside of the
principal line of the figure
than outside

T-H Safford

Examined zero of position

173° 47'

as before

By Star on meridian

Comet 1860. III.

1860 June 28th.

J. H. S. observer Five-foot Equatorial.

Transits across the Inner Ring.

	By <u>E.L.</u>		<u>In</u>		<u>Out.</u>		<u>Mean</u>
Comet Below	16	6	0.2	7	18.8	16	6 39.50
Star Above		7	3.1	8	79		7 35.50
Comet Above	16	9	0.4	10	16.7	16	9 38.55
Star Above		10	7.2	10	59.6		10 33.40

The star is apparently the same as was used with the 4 ft. Equatorial.

For Comet 1860. III

1860 June 30.

June 28-30 $+ 25^m 0^s - 2^{\circ} 14'$

Instrum. 4 5 43 38 3

for 236.

Comet

June 30th 1960

Cloudy

Avg pos axis nucleus 224° Diam 38.83 at right angles 38.95 Nucleus is becoming brighter than on 28thIn dense haze - I have no glimpse of the outer envelope
& comet has returned to its original aspect about 21stDense haze prevents further
observations

My
Ta
-28

Comet

1860 July 1

Very clear & Fine - Moon nearly full

My obs below

Tail to bright maps

$$= 288^{\circ} 47' - 67^{\circ} 42' = 221^{\circ} 05'$$

Brighter maps as below

Zero	65 ⁰
	263 47
	198 47
	90 00
	108 47
	180 00
	288 47

Aug. pos. br. maps

New min envelope 8"

Aug. pos tail

106⁰ 05'

Zero

263	47
157	42

Aug pos tail

90	00
67	42



Tail may be 5' broad at 10' from nucleus
but very much

Apart from a faint irregular map
of luminosity adhering to prec sides of
nucleus the latter is round & sur-
rounded by hazy nebulosity on all
sides. Diam larger than on
June 30th



I cannot account for the great difference of aspect
since the 27th & 28th - all the strongly marked features of
that date have vanished & left only the original aspect.

Photometry Sun

July 1/2 1860 Very clear fine sky

236 = 3^h 40^m

7 Bengolas No 2 - to Bulb
 Globe B₅ to "
 Bengolas to Globe

29.8

15
 22.90
 7.20

Axis of B₅ directed to Sun

Angle between axis and light 80°

236 = 3^h 56^m

7 Bengolas No 2 to Bulb
 Globe B₅ to Bulb
 Bengolas to Globe

51.0

40.7
 10.7

Axis of bulb pointed at Bengolas angle axis to light 50°

By above B₅ = about $\frac{13}{7} = \frac{7 \times 15}{13}$ of Bengolas

Photometry

July 1st Cont.

Compared carefully the intensity of image of Sun reflected from B_5 with that from B_2 in ten or 12 angles of azimuth round 360° but no sensit variations above $\frac{1}{6}$ in distance (smaller to B_2) were found.

 B_2 to B_5

20"

 B_2 to comp. Bulb varied between 5.0 & 7.0average 6th Huma

$$\frac{\text{Image from } B_2}{\text{image from } B_5} = \left(\frac{6}{14}\right)^2 = \frac{9}{49} = \frac{1}{5.44} = 0.184$$

$$9 = 0.9542$$

$$49 = 1.6902$$

$$\frac{9.264}{9.7360} = 0.184$$

I am satisfied that generally there is no appreciable difference arising from angles of incidence varying. B_2 was changed repeatedly for each comparison.

The above were fully confirmed July 14

Photometry

July 1 perfectly clear. Good comparisons

1 Bengola to Bull 21.4^{bt}
 = Sun from B₅ 27.9
 Bull axis alt 10° az = az of light

Bengola = $\frac{49}{81}$ B₅
 " = $\frac{125}{7}$ B₅ By other trial of 7 together

|| It seems that several Bengolas together burn
 very much brighter than when separate

236^{*} = 4^h 45^m

1 Bengola to Bull 20 15
 Sun from B₅ 45 20
 Axis alt 10° az = ☉ + 90° towards 2 W.

4^h 50^m

1 Bengola to Bull 21.2
 B₅ 24.4

Bull axis directed to light
 Ang with Sun 90°

Bull axis points 18.4
 to East horizon 21.5
 1 Bengola
 B₅

Bull to Blue light not very good too faint 6.1
 " 1 Bengola & obs. unrec. 29.1

I find the comparisons of single Bengolas much
 the most satisfactory. The color not greatly different tending
 slightly to pink but there is a want of pungency
 in contrast with the sun image.
 Color of Bengola contrasted with sun has a ^{slight} tinge of
 but not strongly marked.

No 296 Ran down July 3 & was set at
 1.8 Slow of Clock W.C.B. now in use in place of E.C. which
 is having a new escapement applied to it.

Computation of Obs. on prev page

21.4	27.9	To B ₅	= 23.45	= 1.3701
15.0	20.0	" Bengala	= 19.00	= 1.2787
21.2	24.4			9.9086
<u>18.4</u>	<u>21.5</u>	Obs. at 65°	0.002	2
76.0	93.8	Dist Earth	<u>0.014</u>	9.8172
19.00	23.45		0.016	= <u>0.016</u>
				= 9.801

log Bengala
 Sum image in B₅

Mean

9.786
 9.793

July 1
 " 14

Photography

1860 July 2^d

Luteo Celar

Photographs of Sun

Of Mr Wythe's House

1. About 7^h 28^m
Thought to be10^s
2^sFull Aperture
too short.2. About 7^h 33^m5^s Sun shining full upon this side

(Route) (as before)

3. About 7^h 36^m2^s 25Ap 5ⁱⁿ10^s

concluded same intensity as Moon

" 5ⁱⁿ2^s 1/2A faint image of brightest parts
of clapboards on SW side of house
at 7^h 45^m of 236.

The picture in 10^s Aperture 5ⁱⁿ was thought to represent about equal chemical action with full moon photographs.

Pendulum Experiments

1860 July 2/3 8 A.M.

Vibrations of Pendulum for Arctic Expedition Dr Hayes

Dr Sontag

Pendulum made by W.B. & S on Capt. Fortnes plan

Its Vibrations at 71° gain 0.8 hourly on m.s.t.

Clock sheet 3^h 7^m 00^s
3 8 00
3 9 00

Bar 30.049
At. Thr 65°

Side No 3 towards
Telescope

Upper Thr. 65.9
Lower " 64.8

3^h 4^m Arc of Vibrations 1.15 + 1.60 = 2.75 divisions of scale
Clock WCB 3^h 11^m Commenced observing vibrations
Knife edge is behind the scale.
Vibrations right to left

Dots

left to right



The point noted for transits was the centre of the segment
seen below the scale. It is a part of the steel to which
the knife edge is attached -

arc denotes extreme swing
of pendulum from left to right

Pendulum is mounted against brick wall very firmly
on W side of East Transit room.

Pendulum Experiments

July 2/3 1860

No. 3

After waiting about 5^m repeated observations.

The signals are always given

At about 3^h 16^m

Right to Left

No signal between

Left to Right

~~Break~~

two short breaks follow.

Finding that the wire of telescope does not bisect the arc of vibrations altered the telescope after obs at 3^h 16^m

3^h 22^m

Arc of Vib.

$$1.40 + 0.90 = 2.30$$

At 3^h 28^m repeated obs of vibrations

Right to Left -

Break

Left to Right

3^h 29^m

Arc.

$$1.25 + 0.80 = 2.05$$

The stand of telescope again altered.

At 3 35 Repeated

Right to Left

Dot Break

Left to Right

3 39

Arc

$$1.12 + 0.68 = 1.80$$

4^h 11^m Vibration $0.87 + 0.44 = 1.31$
 Right to left Break Left to Right

Upper Thermom. 67.1
 Lower 66.5

4^h 15^m Vibration $0.84 + 0.43 = 1.27$
 Right to left Left to right 80.6

5^h 17^m Vibration $0.58 + 0.13 = 0.71$

Right to left Break Left to right

Other 0.7 } 6^h 14^m Vibration $0.43 - 0.02 = 0.41$
 6.122 } Upper Ther. 70.2 $0.50 - 0.10 = 0.40$?
 Lower Ther. 68.6

6^h 16^m About 7 14 Vibration 0.23
 Upper Ther. 71.8
 Lower 70.0

Reversed Sideways. (see next page)

Baron

Pendulum Experiments

1860 July 3

Side No 1

Pendulum now on same knife edge but the number 1 at knife edge is now turned towards telescope.
Reversed likewise

Bars. 30.009

A. Thr 77

At 7 29

Vibration $2.35 + 1.88 = 4.23$

Right to Left -
1 minute

At 7 31 30

Right to Left.

B. D. 13

Left to Right

7^h 38^m Vibration

$2.07 + 1.64 = 3.71$

Right to left
D

7^h 39^m Left to right

7 4

7^h 50^m $1.76 + 1.35$

R to L

D D D

L to R

Sheet 15 taken off

Pendulum Experiments

60 July 3

Side No 1

R to L

New Sheet

8^h 59^m

Vib. 0.50 + 0.90 = 1.40

B

L to R

El. 10^m 7

7

R. to L.

4^m10 4^m

D. B.

L. to R.

Upper Thr. 72.9

Lower " 70.0

R to Left

B

11^h 2^m

Vibration

0.42 + 0.03 = 0.45

L to R.

Upper Thr 72.9

Lower " 70.2

11^h 5^m

El. 12 0

12^h 5^m

Vibrations

0.26

R. to L.

D. B.

L. to R.

Upper Thr. 72.8

Lower Thr. 69.8

El 12 10 0

Pendulum Experiments

1860 July 3

Side No 4

Reversed pendulum end for end

The knife edge numbered 4 is now presented to the telescope & is that belonging to the end vibrating.

It was found that the swinging knife edge now touched the wooden case - the latter was screwed closer to the wall to free it.

The pendulum remained $1^h 40^m$ in its new position before observations were recommenced.

R to Left
Left to Right

D. B. B. B.	13 59	Arc. of Vibration	2.10 (3.10 ²)
R L			
B			
L R			

R L	14 7		$1.56 + 1.28 = 2.84$
L R			

Dts.			
B. D. R L	15 21	Upper Am. 71.8	$0.88 + 0.62 = 1.50$
L R.		Lower " 69.8	

B. B. R L	16 ^h 7 ^m		$0.55 + 0.26 = 0.81$
L R			

16 9	The upper	71.7	Bar. 29.924 - 74
		69.8	

Pendulum

1860 July 3

R L

Dts.

L R

$$17^{\text{h}} 56^{\text{m}} \text{ Arc } 0.38 + 0.10 = 0.48$$

R L

D

L R

17^h

56

Arc

0.33

17^h 59

Upper

Mr

70.8

Lower

68.7

Bar

29.901

At. Mr.

73

Stopped for the night 11^h 15^m P.M.

Pendulum

1860 July $\frac{3}{4}$

Side No 2 swinging & faces telescope

Pen Off at 2^h 51^m 00 sun followed by D.D.
 " taken up 1^m 3 20

2 50

Upper Thr 68.6

Lower " 67.2

Bar 29.812 at Thr 71

R to L

3 03

D

L to R

3 00

$$2.07 + 1.75 = 3.82$$

3 05

R to L

L to R

3^h 07^m

$$1.43 \quad 2.03 = 3.46$$

3 15

R to L

L to R

3 16

$$1.25 \quad 1.84 = 3.09$$

Pen off at 4 20 00
 " on 4 22 00

Upper Thr 69.2
 Lower " 67.5

4 25 Arc

1 39

R L

4 24

L R

R L

L R

4 27

Pen off at 5 23 59
 off at 35 0.
 on at 1 36 0

Pendulum

July 3/4 1860

Face 2

R L

5^h 40

Arc.

0.72

Pen off

6 16 0

Circuit broken

6 19 0

R L

6 20

6 21

0.50

L R

upper θ_m 71.3

Lower " 70.4

R L

72.5

7 9

0.33

L R

72.0

29.808

at θ_m 77

The vibration was from left to right
when clock marked - nearly coinciding with each other

7 19 40

Pendulum

July 4 Fac 1. Reversed back to No 1 swinging and facing telescope To see whether the alteration of clock case 4 pages back influenced the determinations
El. 7 20 0 circuit closed.

At 7 25 R 2 arc = $1.85 + 2.6.0 = 4.45$
L R

7 28 R 2 7.29 arc + $2.55 + 1.75 = 4.30$
L R

7 31 R 2 7 30 arc $2.47 + 1.70 = 4.17$
L R

7 39 R 2 3 Arc arc $2.20 + 1.42 = 3.62$
L R 3 " Upper Thr 73.3
Lower " 72.9

pen off 7 42 00 put Down again a few seconds after

12 8 R 2 12^h 8^m arc
L R arc 0.26

Put down 12^h 14^m 00^s

12^h 15^m R 2
L R

Upper Thr. 73.2
Lower " 72.3

18 18 R 2
D
L R

Pen Taken off 12^h 24^m 00^s

Upper Thr 72.8
Lower " 71.9

Bar. 29.790
At Thr. 74

Fac 3 swinging & facing telescope.
Pen taken up 16^h 15^m 00^s 17 00^s { Upper Thr. 70.2 Lower Thr. 69.0 }
17 16 00 arc
17 18 arc 0.25
17 19^m Upper Thr = 76.0 Lower " = 68.9
R 2 Bar = 29.830
L R Alt Thr. = 71
Pen taken up 17

Pendulum Experiments.

Sc.

3

~~16~~

10.6

12.7

14.7

16.8

18.7

20.7

22.6

24.7

26.6

28.7

30.7

32.7

34.7

36.6

38.7

Dots

53.4

55.6

57.6

59.5

14

1.6

3.6

5.6

7.6

9.6

11.6

13.6

15.6

17.5

19.6

3

15

35.4

37.5

39.5

41.5

43.5

45.5

47.5

(Continued)

3 15 49.4
51.5
53.5

16 0.2
2.2
4.2
6.2
8.2
10.2
12.3
14.3
16.3

or B.

3 27 29.2
31.2
33.1
35.2
37.2
39.2
41.2
43.2
45.2

27 58.1

28 0.2

2.1

4.1

6.1

8.1

10.1

12.2

14.1

16.1

18.1

20.1

(Continued)

3 28 22.1
24.235 34.4
36.4
38.4
40.4
42.4
44.4
46.4
48.5
50.4
52.4
54.4
56.4
58.436 0.4
2.4

D. 13

3 36 11.3
13.4
15.4
17.4
19.4
21.4
23.4
25.4
27.5
29.5
31.5
33.4
35.4
37.3

4 10 53.7
 55.7
 57.7
 59.7
 11 1.7
 3.7
 5.8
 7.8
 9.7
 11.7

B.

4 11 20.6
 22.7
 24.7
 26.6
 28.6
 30.6
 32.6
 34.6
 36.6
 38.7
 40.6
 42.7
 44.6

4 18 2.3.
 4.3.
 6.2.
 8.4.
 10.2.
 12.4.
 14.5.
 16.6.
 18.6.
 20.4.
 22.5.
 24.5.
 26.4.

4 18 35.8
 37.7
 39.8
 41.8
 43.8
 45.9
 47.8
 49.8
 51.8
 53.8
 55.7

5 18 25.5
 27.5
 29.7
 31.7
 33.6
 35.6
 37.6
 39.6
 41.6
 43.6
 45.6

(B.?) B.

5 19 20.6
 22.6
 24.7
 26.6
 28.7
 30.6
 32.6
 34.6
 36.5
 38.5
 40.5

6 16 42.3
 44.3
 46.2
 48.3
 50.4
 52.3
 54.3
 56.1
 58.2
 17 0.2
 2.3

6 17 22.9
 25.0
 27.0
 29.1
 31.0
 32.9
 35.0
 37.0
 39.0
 41.1
 43.0

7 1.9 1.3
 3.4
 5.5
 7.5
 9.5
 11.5
 13.5
 15.5
 17.5
 19.5
 21.6

B

7 19 36.6
38.5
40.5
42.5
44.6
46.5
48.5
50.6
52.5
54.5
56.5
58.5

7 29 25.7
27.6
29.7
31.7
33.7
35.7
37.7
39.7
41.7
43.7
45.7

50.8
52.8
54.7
56.7
58.6

7 30 0.7
2.6
4.7
6.6

7 31 24.0
26.0
28.0
29.9
34.0
36.0
38.0
40.1
42.0
44.0
46.0
48.1
50.0
52.0
54.0

B.D.B

7. 32 15.1
17.1
19.1
21.1
23.1
25.1
27.1
29.1
31.1
33.1
35.1
37.1
39.2

7 38 45.0
 47.1
 49.1
 51.1
 53.1
 55.1
 57.1
 59.2
 39 1.1
 3.1
 5.1
 7.1

D.B.

7 39 38.2
 40.2
 42.2
 44.2
 46.2
 48.2
 50.3
 52.3
 54.3
 56.3

7 44 28.0
 30.0
 32.0
 34.0
 36.0
 38.0
 40.0
 42.0
 44.0

D.D.

7 44 53.0
 55.0
 57.0
 59.0
 45 7.0
 3.0
 5.1
 6.8

8 57 29.0
 31.1
 33.1
 35.1
 37.0
 39.0
 41.0
 43.1
 45.1
 47.1

43

8 57 59.1
 58 1.1
 4.1
 6.2
 8.1
 10.1
 12.1
 14.2
 16.2
 18.2
 20.2

~~9~~ → 34.

10 3 34.6
 36.5
 38.5
 40.5
 42.5
 44.4
 46.5
 48.6
 50.3
 52.5
 54.4
 56.5

4 12.1
 14.2
 16.3
 18.2
 20.2
 22.2
 24.2
 26.3
 30.4
 32.1
 34.3
 36.4

11 0 53.4
 55.5
 57.5
 59.5
 1 1.5
 3.5
 5.5
 7.4
 9.5
 11.5
 13.5

B.

11 1 22.6
 24.6
 26.7
 28.6
 30.6
 32.7
 34.7
 36.6
 38.7
 40.7
 42.7

12 5 59.0 (See below)
6 0.7

2.7
6.8
8.7
10.8
12.8
14.6
18.7
20.7
22.8
24.8
26.8
28.8

3 (Here should precede)

12.5 20.0
21.9
24.0
26.0
28.0
30.1
32.2
34.2
36.1
38.0
40.0
42.2
43.9
46.1

D.B.

13 57

14.2	+	1 ⁵	=	15.2
16.2				17.2
18.2				19.2
20.2				21.2
22.2				23.2
24.2				25.2
26.2				27.2
28.2				29.3
30.2				31.2
32.2				33.2

13 57

37.2				38.2
39.2				40.2
41.3				42.3
43.3				44.3
45.3				46.3
47.2				48.2
49.2				50.2
51.2				52.2
53.3				54.3
55.3				56.3
57.2	-			58.2
59.3	+		58 ^m	0.3

D.

14 6 52.8

54.8

56.8

58.8

7 0.8

2.9

4.8

6.8

8.8

10.8

Let Continued

14 7 12.8
 14.8
 17.9
 19.9
 21.9
 23.9
 25.9
 27.9
 29.9
 31.9
 33.9
 36.0
 37.9

1
 Dots.

15 3 34.0
 36.0
 38.0
 40.0
 42.0
 44.0
 46.0
 48.1
 50.1
 52.1
 54.0
 56.1
 58.0

B. & B

15 4 23.2
 25.2
 27.3
 29.3
 31.2

(Cont. next page)

15 4 33.2
 35.2
 37.3
 39.3
 41.3
 43.3
 45.3
 47.3
 49.3

16 6 4.0
 6.2
 8.1
 10.2
 12.2
 14.1
 16.2
 18.2
 20.2
 22.2
 24.2

B. B.

16 6 39.3
 41.3
 43.3
 45.3
 47.4
 49.4
 51.4
 53.4
 55.4
 57.4
 59.4

Continued

16 7 1.3
 3.4
 5.4
 7.4
 9.4
 11.5
 13.4
 15.5
 17.4
 19.4

See below

16 9 51.5
 53.5
 55.5
 57.5
 59.5
 10 1.6
 3.6
 5.6
 7.6
 9.7
 11.6
 13.6
 15.5
 17.6

Should precede the last set.

16 9 16.3
 18.4
 20.4
 22.4
 24.4
 26.4
 28.5
 30.5
 32.5
 34.5
~~36.4~~
 38.4

17 56 34.0
36.1
38.1
40.1
42.2
44.2
46.1
48.1
50.2
52.1
54.2
56.2
58.2
57 0.0

17 57 9.3
11.2
13.2
15.2
17.2
19.2
21.2
23.2
25.2
27.2
29.2
31.2
33.2
35.2
37.3
39.2
41.2
43.2
45.2
47.2
49.2
51.2

July 3/4. 1860.

B 2 38.8

40.8

42.8

44.8

46.9

48.9

50.9

52.9

54.8

56.8

B. D.

B 3 7.9

9.9

11.8

13.8

15.8

17.9

19.9

21.9

23.9

25.9

27.9

29.9

31.9

33.9

35.9

38.0

B 5 17.3

19.3

21.3

23.2

25.3

27.3

29.3

31.2

3 5 33.3

35.3

37.3

39.3

46.3

48.3

50.3

52.3

54.3

56.3

58.3

6 0.3

2.3

4.3

6.4

8.3

8 8.

3 13 46.6

48.6

50.6

52.6

54.7

56.6

58.7

14 0.7

2.6

4.7

6.7

8.7

10.7

12.7

14.7

July 2-3/4

Clock Rate 4.02 in 35^h 8^m2.75 in 24^h

3 14 19.7

21.7

23.6

25.7

27.7

29.7

31.7

33.7

35.8

37.6

39.8

41.7

43.7

45.7

47.7

49.8

51.7

53.7

55.7

4 22 29.7

31.7

33.7

35.7

37.7

39.7

41.7

43.6

45.7

47.6

49.7

51.6

53.8

55.6

4 23 10.7
 12.6
 14.6
 16.6
 18.6
 20.6
 22.6
 24.7
 26.7
 28.7
 30.7
 32.7
 34.7
 36.7
 38.6

4 26 28.2
 30.3
 32.3
 34.3
 36.4
 38.3

4 26 45.3
 47.3
 49.3
 51.3
 53.3
 55.3

5 36 57.7
 59.7
 39 1.7
 3.6
 5.6
 7.6
 9.6

(continued)

5 30 11.6
13.6
15.7
17.7

30 22.8
24.8
26.7
28.8
30.8
32.8
34.8
36.8
38.8
40.8

5 30 57.7
59.6
30 7.7
7.6
5.6
7.6
9.9
11.8
13.7

6 19 52.0
54.0
56.0
58.0

20 0.0
2.0
4.1
6.0
8.1
10.1

20 15.2
17.1
19.1
21.2
23.1
25.1
27.2
29.1
31.1
33.2

$\frac{1}{24} \frac{1}{15}$ 29.95
7.25

7 7 59.6

8 1.5

3.6

5.6

7.6

9.6

11.6

13.7

15.7

17.6

19.7

8 24.7

26.7

28.7

30.7

32.7

34.7

36.8

38.8

40.8

42.7

8 44.8

7 24 48.1

50.1

52.1

54.1

56.1

58.1

25 0.2

2.1

4.1

6.1

8.1

10.2

12.2

25 17.1

19.1

21.0

23.2

25.1

27.2

29.2

31.1

33.2

35.2

27 24.6

26.5

28.5

30.5

32.5

Continued

Pendulum Experiments

1860 July 4

N.B. The observations on this leaf ~~precede~~ ^{follow} those recorded on the cover following the sheet.

Reversal of Observations of which memorandum will be found on a part of page marked off in parallelogram 13 leaves back

12 56 21.0
23.0
25.0
27.0
29.0
31.1

16 19 48.7
50.7
52.7
54.7
56.7
58.7

17 18 21.6
23.7
25.6
27.6
29.6

12 56 38.0
40.0
42.1
44.0
46.1
48.0

16 20 3.6
5.6
7.6
9.6
11.6

18 32.7
34.7
36.7
38.7
40.7

7	27	35.5									
		37.6									
		39.6									
		41.6									
		43.5									
		45.6									
		47.6									
		49.6									
		51.5									

Continued

1500000.0001.1000