

KG
11365
191

H.37

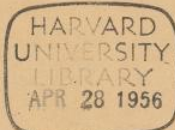
Equatorial
July 4 to Sept. 22.
1860.

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

KG 11365, 191



KG 11365.191



For Comet 1860 III.

1860 July 6th

M 8 mt. Wash.

$141^{\circ} 24'$ $+ 25^{\circ} 10'$
9 25 36

B.Z. 345

a. 1825.0 9 21 26 25 10 50
1860.0 23 27 25 1 48

b. 1825.0
1860.0

Star a (347) 9 19 30.20 $+ 25^{\circ} 26' 30.0$
+ 29.92 + 1.8
+ 0.02 - 0.7
1825.0 9 20 0.14 25 26 31.1

Star b. B.Z. 345 9 20 56.50 $+ 25^{\circ} 10' 42.5$
+ 29.27 - 6.6
- 0.04 + 1.5
347 9 20 55.43 25 10 49.4
+ 29.92 + 1.8
+ 0.03 - 1.0
345 9 21 15.73 25 10 37.4
347 25 38 50.2

B.Z. 345 contains no systematic error, as shown by
comp: with Struve Catalogue.

B.Z. 347 also seems to contain none.

Zero of Position

1860 July 6th

On July 2nd the Zero of Position was altered in the attempt at Photographing the comet.

Determined again July 6th by a star near the meridian.
and found

I. $262^{\circ} 24'$
 $82 \text{ } 27$ } $26'$

Determined again II $262^{\circ} 31'$
 $82 \text{ } 34$

Adopted $82^{\circ} 30'$

Comet 1860. III. (H.P. Tuttle)

1860 July 6.

M 15 44 7

H.L. 6 18 26

Dec. $25^{\circ} 12' 6''$

I. Star α (236) 15 51 36.5 10 2
 (x=a) 40.8
 52 2.7
 7.0

Comet (236) 15 53 14.8 0 16
 19.7
 40.8
 45.3

II. Star γ (236) 15 54 20.8 1 45 Time for Dec. + 17' $\frac{d\alpha}{dt}$
 ($\gamma=b$) 25.3 Cor. - 17' $\frac{d\alpha}{dt}$

Comet. (236) 54 38.2 7 25
 39.8

(values altered)

III Star γ 15 56 47.8 1 51
 58.8

Comet. 52 3. 7 14
 12.7

By El.

15 51 47.9
52.7

52 14.3
18.7

53 26.7
31.6

52.6

57.0

15 54 32.6
37.3

46.9

51.7

Camel - Star + 14.35 + 5 40

15 56 59.5
57 8.5

+ 15.80

+ 5 23

15.2

24.4

Comet

II. Star γ	15 ^h	58 ^m	15.7	3' 11"
~~Comet~~			24.3	
Comet.			31.	8 21
			40.8	

D.

Star γ	15	59	57	2 36
	16	0	6	
Comet.	16	0	15.	7 36
			24.3	

Stars x and y are in B.Z. 347
 y also — — 345

Z. 347.	H	9	19	30.20	x .
			20	55.43	y .

15 58 27.4
36.2

43.6

52.6

Comet - Star +16.30 + 5 10

16 0 9.5
18.5

26.9

35.9

+ 17.40 + 5 0

Compared with α

El. 15 53 42

6.42 - 5.42
0.5

Compared with in R.A. for Dec. +17.	γ	Reduced.	Reduced	La. Reduced.	Reduced
15 54 49	14.35 5.40"	1.80	16.15	-21.0	5' 19" 0
57 20	15.80 5.73	+0.38	16.18	-2.8	20.2
58 48	16.30 5.10	-0.45	15.85	+7.9	17.9
16 0 31	17.40 5 0	-1.43	15.97	+20.3	20.3

Reduced to 15 58 0

H.M. +34" - 7'25"

El. 15 58 0

Comet - Star

5.19

+ 16.04 + 5' 19" 35

15 58 41

+ 0.16 1.05

7 1 50

Ref.
Temp.

M.T. Lamb. 8 55 41

16.20 5 20.4

- 9 46

- 32.2

Comet

1860 July 6

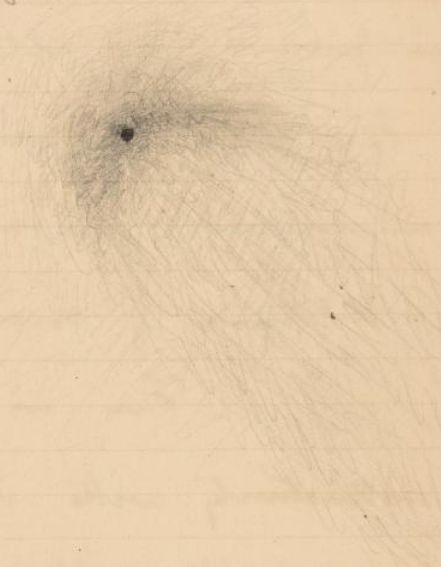
16^h 04

Good.

axis tail $87^{\circ} 30'$
 Zone $\frac{262}{25}$ new.

Tail a little n. of nucleus

(Faint nebulae 3' from nucleus)


4ⁿ Finder

5'

Tail not as wide
 at 30' as at head



Comet

1860 July 6 Cont.

The aspect of Comet in great telescope and in finder has altered greatly since last observation.

The extent of hazeings about the nucleus has increased & fades away very indefinitely to a distance of nearly 3' towards Sun.

The increased hazeings of outline contrasts distinctively with its appearance June 27-28. But it is plain that the luminosity about the head has a close resemblance to the remarkable eruptions of that date.

Diff. ang pos p & tail
236°

Immediately in contact with the nucleus in the direction p. there is as usual a brightening up a faint luminosity attached to it.



I was interested in seeing that with the finder the aspect of the tail had assumed an appearance like that sketched on previous page - a collapse as it were towards the axis so that the tail is quite as wide at the nucleus as at 30' from it. However

Comet

at 2° or more sun in Cometicus it was wider
nig-dimly.

Sum 1860 III.

1860 July 2th

Star a 1825.0

1860.0

9 20 0.14
2 1.65
9 22 1.79
+ 1.71

25 26 31.1

-8 59.7

25 17 31.4
- 2.7

25 7 11.9

Star 8 1825.0

Per.

1860.0

9^h 21^m 25.38 + 25° 10' 50.2

2 1.38 - 9 2.5

9 23 26.76 25 1 47.7
+ 1.71 - 2.7

Star³ app. phase

9 23 28.67 25 1 45.0
+ 16.20 + 5 20.4

Sum

9 23 44.67 25 7 5.4

BZ 367

only

Comp. of Per. a

α^0 9^h 21^m 1^s + 9.80576
 α^0 25 22.5 9.67605
 $\frac{d\alpha}{dt}$ 3.47587
 $\frac{d\alpha}{dt}$ 1.30223
 $\frac{d\alpha}{dt}$ - 9.88587
 $\frac{d\alpha}{dt}$ 1.18810
 $\frac{d\alpha}{dt}$ 2.73217

Comp. of Per. 2

G 344 21 49.5 9.669
H 1410 57 14.16 9.917
H 166 10 9 1.228
9^h 37^m 4^s 9.762
9^h 1.4 9.043
9^h - 18.1 9.906
9^h - 9.8 9.308
9^h + 5.2 9.781
9^h + 1.9 9.626

Comp. of Per. 3.

α^0 9^h 22^m 26^s 9.80252
 α^0 25° 6.3 9.6775
 $\frac{d\alpha}{dt}$ 3.4660
 $\frac{d\alpha}{dt}$ 1.30223
 $\frac{d\alpha}{dt}$ 9.88808
 $\frac{d\alpha}{dt}$ 1.19032

Comet 1860 III

1860 July 9th

G.P.B. obs:

J.H.S. rec:

Position Circle $172^{\circ}30'$ (~~at~~ before, see July 8th)
~~on meridian~~

Star	16	32	54.7	6 25
		33.	3.	
		33	—	1 52
		17.		

Comet 1st com = ~~the~~ The 1st com has started out of place.

Star	16	34	35.8
------	----	----	------

Mindest Comet

On Scale.

Star	16	35	45.9	7 38
			—	
			1.2	
Comet		36	1.2	1 55
			5.6	

		Dots		
Star	16	37	1.6	6 50
			5.9	
Comet.		37	17.7	2 59
			21.8	

Star	16	38	13.6	8 5
			17.8	
Comet.			30.4	2 3
			34.5	

16 33 15.6
24.4

33 30.0
39.1

16 34 56.7

16 36 7.0
11.1

22.2
26.6

16 37 22.7
27.0

37 38.8
43.1

16 38 34.7
38.9
51.5
55.6

Comet 1860 III.

60 July 9 cont.

Star	16	39	22.7 26.-	8 22
------	----	----	--------------	------

Comet			40.4 44.5	2 14
-------	--	--	--------------	------

~~Star~~	16	40	20.8 25.2	8 40
-----------------	----	----	--------------	------

Comet			38. 42.8	2 28
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Scale Comet 6'.5 South of star at 16^h 41^m 5^s by 236..

Axis of tail $48^{\circ} 58' \pm 2^{\circ}$

16 39 44.0
48.2

40 1.5
5.6

16 40 42.2
46.7

59.7
41 4.2

Cambr. M.S.T

Count - Star

16 33 39
36 24
37 41
38 32
39 42
40 2

Printed 16 37 50
1 32.

16 36 18
7 10 35
2 19

9 23 24

Rev. to 16 37 50

+14.7⁵ - 4' 33" : 16.92 5 8.2
15.35 5 43 16.11 5 55.1
16.10 3 51 16.18 3 52.3
16.75 6 2 16.38 5 56.1
17.45 6 8 16.46 5 52.3
17.50 5 12 15.81

Star for Comet 1860. III.

1860 July 9.

Comet 1860. III (Resurrection)

1860 July 9.

Comet 1860. III.

1860 July 12th

8"5"

Comet compared with 35th Sextantis Sequens
~~Time for dec.~~

Set

I. Star	16	8	31.5	5 20
			35.7	

Comet	16	10	11.8	6 29
			16.2	

16.15.	28.2	3.0
	24.4	
	24.6	
	22.4	1.6
	25	

II. Star	16	10	46.3	3 43
			50.5	

Comet	16	12	27.7	4 29
			31.8	

B. B. B.

III. Star	16	13	27.8	4 50
			32.0	

Comet 8th Very ~~27.8~~ small nucleus 1" diameter.

Comet	16	15	10.2	5 13
			14.1	

B. B. B.

IV. Star	16	16	8.7	4 5
			13.0	

Comet	16	17	52.5	4 7
			56.8	

V. Star	16	20	—	6 9
			35.8	

Comet	22	17h	5 37?
		21.7	

Dec. Ob. about 13' before R. A.

16 10 37.6
41.8

II. 16 11 12.0
16.2

12 53.4
57.7

III 16 13 53.5
57.7
15 35.8
39.8

El. m. s.
At 16 10 40 +1 40.40 + 1' 9" + 11' 32"
12 55 41.45 (95) 0 46
15 38 42.20 (80) 0 23
18 20 43.90 (60) + 0 2
22 46 46.00 (40) - 0 32?
25 13 47.35 1 6

Reduce to 16^h 17^m 30^s H.M. + 0^m 464 - 8' 46

IV. 16 16 34.3
38.6
18 18.2
22.5

16 17 30 + 1^m 43.57 + 0' 11.2
43.59 6.7
43.07 7.2
43.51 + 9.0
43.56 (12.6) Report.
43.76 - 0.7
1 43.51 + 0' 6.0

V 16 20 57.4
21 1.4
22 43.2
47.5

Comet 1860. III

1860 July 12.
D.

VI. Star

16

23

58.0

6 36

(35 Sextantis

24

2.1

16

25

45.5

5 30

Tail 1' long.

49.5

RI. 16 24 23.7
27.9

16 25 11.2
15.1

Not corr. for refraction

At 16 17 30 El. 8.2 10 37 49.95 $\delta + 5^{\circ} 28' 47''$
1 39 Par. 6 + 0.92 + 12.3

Low J. 16 15 51
7 22 24
8 53 22
2 14

A.S.T. 18 51 13 Par. coeff. + 0.424 + 5.67

Cambridge.

For Comet 1860 III

860. July 12.

Star Place

~~Star~~ Stron. 1235	1830.0	10	34	31.16	+5	38	14.1
3.1172			1	33.52	-	9	21.1
18.703		10	36	4.68	5	28	53.0
Res. to Bessel				-0.05			-1.6
P. M.				+0.02			-1.5
Armazh 1840.0		10	35	2.44	5	35	7.5
			1	2.34	-	6	14.2
Residual to B. in M.		10	36	4.75	5	28	53.3
P. M.				+0.01			

Str. with 2 Arm=1	10	36	4.69				
Sec. Struve				5	28	49.9	
Res. to app.			+1.75			-9.5	
	10	36	6.44	5	28	40.4	Res. to App.

G 344.32
 d 159.1
 H 160.47.

$4.5 + 8.9822$
 $\ln(G+H) 9.7739$
 1.2377
 $\ln(G+d) - 9.9049$

$\ln d$ 0.0020
 $\ln(H+d) - 9.8099$
 $\ln$ 1.3061
 $\ln(H+d) + 9.8830$
 $\ln d$ 8.9803

f 38.3 g' -13.9
 g° +1.0 h' +1.5
 h° -13.1 i' +2.9

Comet

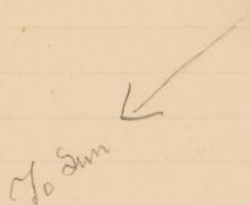
1860 July 12

The Comet singularly reduced
in brightness. Nucleus 1" in diameter but barely
distinguishable - perhaps as star of 11th mag.

No Tail visible but
nebulousity extends furthest say

1' 30" away from Sun.

No bifurcation nor
regular structure



Search for Concordia

1860 July 12th.

J.H.S.

Set the instrument in R. $12^h 20^m$
Dec. $+1^{\circ} 15'$

to find the stars N. XII. 298. 329.

Clouded up.

For Comet 1860 III

1860 July 13¹⁴
Comet.

$$162^{\circ} 38' + 2^{\circ} 12' \\ 10 \ 48 \ 32$$

$$H.M. + 26.7^{\circ} - 8.21 \quad 8.44 \\ 7.26$$

U. X. 825
895

$$10 \ 45 \ 35 + 2 \ 5.1 \\ 49 \ 35 \ 2 \ 15.7$$

Search for Concordia

1860 July 13.

⑤⑤ α 12^h 25^m 22^s ✓⑤⑤ δ +1° 7' 7"

W. 298

12 19 8

1 17.4

329

20 37

12.8

Mars

1860 July 13 11^h 40^m

Sky clear atmosphere tremulous

Mars low in the South - near opposition

The only decisive peculiarity in its aspect besides polar cap, is a remarkable similarity to the full moon in the brightness of its limb contrasted with the centre.



Photometry

(See July 31)

860 July 14 Clear Compare with July 1 & 31
 " 55" Aux. bulb from B_5 13.0
 3 Pole " B_2 5.8
 When reflected image of Sun from $B_2 = B_5$
 Both seen in Auxiliary Bulb -
 B_2 South of B_5

B_5 to Bulb	13.0
B_2 to Bulb	5.7
	5.6 13.1
	5.8 13.0

3000
 B_5 from B_2 in air Sun
 300

B_5 to Bulb	13.0
B_2 "	4.8
	5.5 13.3

B_2 North of B_5

	13.8
	5.0

B_2 in air towards Sun from B_5

	13.1
	5.7

The above were intended to ascertain the relative brightness of the Sun images in B_2 diam. 3.436, and in B_5 diam. $10'' 32 - 0.16 = 10.16$. B_2 was repeatedly changed to various positions but no difference in the intensity of the image from it could be discerned.

It seemed however that when B_5 came nearer to a line with the sun, more light was reflected from it as is natural being less perfectly polished & silvered than B_2 .

$$\frac{\text{Image from } B_2}{\text{Image from } B_5} = \left(\frac{5.5}{13.3} \right)^2 = \frac{1}{5.84} = 0.1711$$

$$\frac{\text{Absorption } B_2}{\text{Absorption } B_5} = \frac{1}{1.496}$$

5.5	0.7404	"	0.184	July 1 st	By less accurate exp.
13.3	1.1238	diam $B_2 = 3.436$	= 3.5360	0.1711	9.2332
	9.6166	" $B_5 = 10.16$	= 0.0069		9.0582
	9.2332		9.5291	1.496	0.1750
			9.0542		

Photometry

(20 July 31)

1860 July 14

Bulb B₂

3^h 17^m On hill side S. East of Obs. Observed a single
 Bengala ~~the~~ ^{of Sun} image reflected from B₂ compared ^{photometer} // B₂ to Bulb ¹¹ 2.6
 with 1 Bengala wt = 1 ^{Reject this}
 Bengala was too near. ^{comp.} Bengala to Bulb, ^{photometer} 7.9

① alt 45°

3^h 20 1 Bengala Very good
 Another trial very much better photometer Bulb to B₂ 11.6
 weight 2 " Bengala 27.6

43°

3^h 30^m 1 Bengala Very good 11.9
 weight 2 28.3

The comparisons at largest distances are much the best.
 as the images are more alike.

$$\% B_2 \quad 11.75 = 1.0700$$

$$- \text{Bengala } 27.95 = 1.4464$$

$$0.3764$$

2

$$44^\circ = 0.7528$$

$$\text{① alt. ext. } 0.033$$

$$\text{② Dist. cor } 0.014$$

$$0.046$$

$$B_2 = 0.707$$

$$B_5 = 0.1711$$

$$0.233$$

$$\frac{\text{Bengala}}{\text{Sun in } B_2}$$

$$9.793$$

$$9.233$$

$$0.560$$

$$0.707$$

$$0.633$$

Mean

$$0.633$$

$$\log \frac{\text{Bengala}}{\text{Sun's image in } B_2} = 0.707$$

$$\frac{\text{Bengala}}{\text{Sun's image in } B_5} = 9.793$$

$$0.914$$

$$\frac{B_5}{B_2}$$

$$8.2$$

$$5.8$$

next page

indirect

me. p Direct

$$0.560 = \log \frac{\text{Bengala}}{\text{Sun in } B_2} \text{ reduced from } B_5$$

observed direct

Photometry (See July 31)

860 July 14

Clear

Bull B₅ diam 10.16 silvered surface

① alt. 39°

3 45

Sunlight makes an
angle of 30° with line
from Bengola to B₅

Bull to B₅

30.6

from Bengola to B₅

" Bengola

28.0

B₅ is D.E. of Bengola & below it on hill.

alt 39°

3h 50m m.s.

Bull to B₅

52.2

" Bengola

40.5

The Bengolas compared with B₅ belong to a different
package - but are of same size & were bought together
as of same make No 2 (Results agree with July 1 when 1st package was used)

The light of flame when comparing globe
is held near the Bengola looks pinkish - but when
the images are small the comparisons do not
seem to be affected - nor is the difference of color
perceptible.

The above agreed very well with obs. July 1st

$$\% B_5 \quad 30.6 = 1.4887$$

$$\% Bengola \quad 28.0 = 1.4472$$

$$9.9615$$

2

$$9.9230$$

$$\text{Est. alt } 39^\circ$$

$$0.049$$

$$\text{① Mean dist.}$$

$$0.014$$

$$0.063$$

$$9.860$$

$$52.2 = 1.7177 \log$$

$$40.5 = 1.6075$$

$$9.8898$$

$$9.7796$$

$$\text{alt } 38^\circ$$

$$0.053$$

$$0.014$$

$$0.067$$

$$9.713$$

$$\log \frac{\text{Sun's image in } B_5}{\text{Bengola}} = -9.860 + 10.000$$

$$9.713$$

Mean

$$9.786$$

" July 14

$$9.801$$

" " "

Final Mean

$$-9.793 + 10.000$$

$$\log \frac{\text{Bengola}}{\text{Sun's image in } B_5} = 9.793$$

Photometry (Sun July 31)

1860 July 14

Bengola & Blue light	Phot. bulb to	Blue light	27.4
	"	Bengola	72.6

Same parcel of Bengolas used this P.M.

"	19.2
	80.8

Mean $29.9 = 1.920$ $79.1 = 1.898$ 0.978

2

log. $\frac{\text{Bengola}}{\text{Blue}}$ 1.156

"	19.0
	81.0

	18.0
	82.0

(10 July 1918)

100.0
100.0
100.0
100.0
100.0

18

Comet 1860. III.

1860 July 14.

Compared with Weiss X 1099
Comet North preceding star.

Band

I. Comet	38	33.2	6 10	16	39	5.5	-	1	50.30
		55.3 ?				28.6			
	39	1.3				33.7			

Star	16	40	23.3	3	48	40	55.6		
			47.2			41	19.6		
			51.4				23.5		

II. Comet	16	41	23.6	6	43	16	41	56.0	-	1	49.43
			48.2				42	20.6			
			52.4					24.9			

Star	16	43	14.2	4	41	43	46.5		
			37.3			44	9.6		
			41.4				13.7		

B. B. D.

III Comet	16	44	21.0	7	30	16	44	53.4	-	1	47.50
			46.2				45	18.6			
			49.7					22.1			

Star.	16	46	8.8	5	53	46	41.2		
			33.2			47	5.6		
			37.4				9.8		

Comet 1860. III.

1860 July 14.

16 39 23	- 1 50.30	+ 2 22	15 3.6
42 14	1 49.43	2 2	18 3.7
45 11	1 47.50	1 37	21 3.4
~~48~~			

Res. to 16 42 17 A.M. + 28.5 - 7.96

Corrected + 1.23 - 23.1
 + 0.02 - 0.4
 - 1.23 + 23.1

At 16 42 17 - 1 49.07 + 1 58.9
 49.43 2 1.6
 48.73 2 0.1
 - 1 49.08 + 2 0.2
 + 0.21 + 2.9
 - 1 48.87 + 2 3.1
 0'

Refr.

Star 11 1 9.73 - 1 8 57.6
 48.67 + 2 3.1

10 59. 20.86 - 1 6 54.5
 Parallax + 0.89 + 12.1

16 42 17 Band S.
1 49 feet16 40 28 Sid Time
7 30 18.59 10 10
± 16"

9 7 54 Camb. mt.

h m
 Hor. ang. 5 41
 5° 11.1
 5 - 1 8.39
 8' - 1 6.39
 aty 0.0365

mi q 9.8287
 mi q 0.0018
 mi q + 0.8502
 mi q 8.6789 87° 16'

K 1.4022
 mi(5' 10") 6.7655
 mi(4' 50") 7.7004
 0.4673
 192000 6.0806
 hi q 8.9572
 mi q 0.0002
 mi(6' 00") 9.9994
 0.5045

Par. Coeff

+0.421 +5.76

From Elem. II

1860.0 < 164, 49 1.8 10 59
Rw. +38.41 2 - 1 6 17.1
-15.40. 164 to 11.2 - 21.10 Δα
+10.5 Δα

Star's Place

1860 July 14.

Muse X. 1099.

1825.0 10 59 20.72
 1 47.24

1600.0 11 1 7.96
 1.77

11 1 9.73

- 0° 57' 27.2"
 11 18.2

- 0 8 45.4
 - 12.2

- 1 8 57.6

2° 11 0 14.3

8° -1 2.92

$\log - 8.26257$

$\log + 9.41131$

1.30224

9.98507

- 8.97612

- 0.0095

+ 46.057

45.962

15.32

1.28731

2.83138

G 744 38

2 165 17

H 158 58

$\log - 8.303$ $f + 38.6$

$\log(G+2) + 9.700$ $g^0 - 0.2$

g 1.241 $h^0 - 11.8$

$a(G+2) - 9.937$

$\log$ $g^1 - 15.1$

$\log(H+2) - 9.767$ $h^1 - 0.3$

h 1.305 $i^1 + 3.2$

$a(H+2) + 9.909$

$\log$ - 8.303

for Concordia

1860 July 14th

J.H.S.

Made an unsuccessful attempt to find the
only stars near: from H.Z. (of the last set) Nos. [6.7]

R.	12	27	24	Dec.	+ 0° 58' 2"		
	28	3	1			0	20
	28	42	0			36	

For Comet 1860. III

1860 July 16.

At 5^h Wash.

169° 37'

-7° 2'

11 18 28

			<u>kg</u>		
α	W. XI	304	8	11 18 26	-7° 5'.0
β		333	8	19 43	7 1.3

For Comet 1860. III.

1860 July 17th

At 8^h Wash'n

α $171^{\circ}53'$ $11^h 27^m 32^s$
 δ $-9^{\circ}47'$

β Hydrae et Crateris 5^h

α $172^{\circ}23'45''$ $11^h 29^m 35^s$
 $-9^{\circ}11'7''$

Wisse XI. 502 8^h

$11^h 29^m 19.7^s - 9^{\circ}39'83''$

1630 185
1830
1840

Comet 1860 III

1860 July 17th
G.P.B. obs

By 236

I. Comet	16	8	29.6	2	20	Wire	16	9	11.7
			53.0			Lines			34.9
			57.-			—			39.2

Star		10	11.5	10	10	W.	10	53.6
			35.6			L.		17.7
			39.6			—		21.8

II. Comet.	16	14	35.7	2.1 circa,				
			44.6	—			15	17.6
			7.3				—	—
			11.8				—	—

Star	16	16	15.9	10	00		16	57.8
			23.7				17	5.7
			48.0					30.2
			52.5					34.3

Declination

III. Comet.	16	22	52.7 ^h	0	35	16	23	36.8
			23					42.9
			~~20.4~~					
			Int					

Star	16	24	30.5	9	46	16	25	12.5
			38.					20.5

B. B. J.

Comet 1860 III

1860 July 17.

IV. Comet	16	26	12.	1	20	16	26	54.2
			20.7				27	2.8
			44.5 not good					26.7

Star

(2 ^o wire)	16	27	57.3	10	47	16	26	39.2
-----------------------	----	----	------	----	----	----	----	------

V. Comet	16	31	13.	8	35	16	31	56.7
			22.9				32	5.0

Star	16	32	47.8	10	33	33	30.2
			56.9			33	36.5

Reduce to 16 17 0 Band L.

Mars

1860 July 17

Clear - Definition pretty good considering

Obs. G. P. B.

the low alt.

Screw motion S

236

19^h 5^m 50^s

Mars N. limb

28. 716

S "

26 130

Star is S of ♂ S limb

Polar diam

2.586

Screw motion S

19 10 40

BAC

Star 7/8

20. 24.5

20 233

Motion N

19 13 40

N

33 07

S

30 35

Motion N

19 17 00
30

Star

24.71

24.72

19 20 40

N

37 28

S

34 66

Vel. touched

2.62

after 2nd obs

Motion S

19 23 30

N

32 27

S

31 75

" S

19 28 15

Star

26 24

28

Mars

Mercur N

19 34 0.0
20

Mars N

37 64
35 00

" N

19 38 20
38 40

BAC. Star 7/8

80
78

In the prec. obs. Wini was set 1st on 3rd limb
and about 20^s after " " N "

Then follow two settings on star in correspond-
ing parts of the field.

Polar Diam

79
09
2, 70

Polar Diam

N 48 40
S 45 79
2, 60

5

51 13
48 30
2, 8319 47^m50.93
48 33
2, 60

Mars

Diam on Scale - Polar 29"

			Scale
Mars centre transit	19	51 ^m 47 ^s	S. limb 5 00
Star of comp.	19	56 10	4 17
	Dif R	4 23	* S of S limb 43



Decidedly brightest at margin

Vision too much disturbed for details

Eclipse of Sun

1860 July 17/18

Clear & Fine
 M.T.C. 21 10 00
 236 4 54 43.0 coincidence

Mean line Clock 18. 33. 00
 236 2 17. 17. 1

Transit Clock 236. 4 59. 16.25
 M.C.B. 5. 00 00.

M.T.C. 18 35 00
 424 2 16 33.5

Obs. G.P.B

At 1st Contact Eye directed to precisely the proper point. & the 1st impression was detected as soon as it became visible. It advanced however quite slowly & did not seem to afford a very good observation. Atmosphere quite tranquil considering the altitude.

M.T.C. 18 36 0.0
 Chro. Watch J. Hutton 18 34 5.0

M.T.C. 18 38 00
 J.H. 18 36 5.0

1st Contact observed by G.P.B with finder

Observation is followed by long Dots and 3 break.

Afterwards observed 1st Contact with large Spot. about 236 3 29. 32.

followed by Dots -

1st Contact by H.P. Tuttle

424 = 3^h 8^m 58.0

Eclipse of the Sun

July 17/18 1860

236 3^h 6^m 34.^s01st Contact by R.T. Paine

3 27 35.5 Small spot to left of large one

3 29 32.5 1st Contact large spot } black

3 30 18.5 last " " } nucleus

J. Hutton 19 25 16 : J.H.D. uncertain: eye not directed
to proper pointJ. Hutton compared on the
preceding page

M.T.C. 21 28 00

J.H. 21 26 5.3

3 00

21 25 00

Approx. J.H. fast 1 5.3

Eclipse of Sun

July 17/18 1860 perfectly clear

Last Contact by G.P.B. on Spring Governor

Obs. Preceded by long dots
followed by D.D.D.

Sun's limb very tranquil & time well observed.

By H.P. Tuttle

424 5 15 8.0

R.T. Paine

236 5 17 51.0

G. H. S.

J. Hutton. 21 31 7.6

Eclipse of Sun

Photography

1860 July 17/18

Mr Whipple obtained ^{3 or 4} ~~5 or 6~~ good impressions
of Progress of Eclipse. and 2 or 3 after the Moon had left
the disc of Sun.

Aperture was $0''.45$
over which a slit of $0''.56$ wide with parallel sides
was moved at the rate of 3 inches in $0''.25$ about.

Equivalent to an exposure of about $0''.04$ whose aperture $0''.45$

Eclipse of Sun.

1860 July 17/18

Reduced from data in Transit- and Clock Books.

G. P. B.	1 st contact	3	12	17.3
B. and S.	fast		+ 2	3.8
	Sidereal Time	3	10	13.5
July 18	Greenwich L.T.M.N.	7	46	3.5
		19	24	10.0
				1.4

Cambridge Mean Time 19 24 8.6

G. P. B.	Last contact	5	18	36.4
B. and S.	fast		+ 2	5.2
		5	16	31.2
		7	46	3.5
		21	30	27.7
				22.1

Cambridge Mean Time 21 30 5.6

R. J. P.	1 st contact	3	6	34.0
236	fast		+ 1	21.2
	Sidereal Time	3	5	12.8
	Conjectural Emendation		+ 5	
	Sidereal	3	10	12.8
		7	46	3.5
		19	24	9.3
				1.4

Cambridge Mean Time 19 24 7.9

Rate + 1 st per day	Last Contact	5	17	51.0
	236 st fast		+ 1	21.3
	Sidereal Time	5	16	29.7
		7	46	3.5
		21	30	26.2
				22.1

Cambridge Mean Time 21 30 4.1

For Comet 1860. III

1860 July 19th

At 8^h 28^m Cambridge m.t.

$$\begin{array}{r} p.a. \quad 176^{\circ} 57' = 11^{\circ} 44' 28'' \\ \delta \quad -14 \quad 45 \end{array}$$

	^h	^m	^s	^{1860.0}		Mag.
Weisse II. 786	11	46	5.8	-14° 53' 42"		8
	46	32.8		14 49 19		8

2^d star follows 1st 27.8 and is 4' 23" north.

There is no large star nearer than η Crateris

R.	Sec.	Mag.
11 ^h 48 ^m 53 ^s	-16° 22'	6

Clock started after dots at 16^h 16^m 1^s

Looked for Comet without success

Mars

1860 July 19

Atmosphere disturbed

N & S limbs of Planet
compared with Star α of
11th mag.

19	20	15	N	43	72
	20	45	S	41	16

At 19^h 40^m the star was
say 6" North of centre of Mars.

19	22	5	Star α	42	94
	22	35		43	18

		55	S	40	80
19	26	30	N	43	51

				43	00
19	28	48		43	03

		27	N	43	45
19	32	00	S	40	70

19	33	50		42	91
	34	25		43	16

Any of pos. for prec. obs.
was 88° 35'

Afterwards altered it to 85° 30'

Mars

6.4 14-6
15.0

1860 July 19

19	42	24 58	N S	44 41	23 76
----	----	----------	--------	----------	----------

19	45	47 25	Star x	44 44	27 23
----	----	----------	--------	----------	----------

N	44	51
S	41	74

N	44	30
S	41	76

At 19 57 30 282 beats = 141^s = $2^m 21^s$ = dist to Mars
 centre and x 10-12 mag. At 10-11 mag E just
 out of field from it n.p. no other conspicuous stars
 near.

— For Concordia —

1860 July 20th

J. H. S.

At 10^h Cambridge.

Pro. 185 - 2.3

α $188^{\circ} 28.3$ S + $0^{\circ} 13.0$

Stars in Harvard Zones		Reduced Magnitudes	
2 No.			
6	(9)	12 32 44 + $0^{\circ} 14.7$	9
7	(10.11)	32 55 11.7	10.3
	13	33 27 9.3	12.0
	8.9	33 47 9.3	8.5
	12	34 21 14.9	11.3
130	10	34 56 0 16.3	10.0
	10	35 11 12.1	10.0
	13	35 38 14.3	12.0
	9	35 50 14.1	9.0

Star α follows d. n. +6.5 +4.5 is very near the place.
 α is fainter than e. Brighter than c. ~~in d~~
 Magnitude of α (Rev) 11.8

Star γ [precedes] d - 20.5 + 5.0

[precedes] c - 0.5

is (s) of a
 $= \frac{1}{4}(3-a)$

About $\frac{1}{2}$ mag. fainter than c.

Star

Star γ [south] follows d +16.5 - 1.2

[south] c - 1.0

Mg γ : c + 0.7

Star d is not red.

1860 July 20 Chart for Concomia 1-4, P. T.

860 July 20.



Europa.

1660 July 20.

J. H. S.

Copied from the original minutes.

Zero of Position right — (perhaps 1° wrong; see Record)

Observed with Chro. 236. and Scale.

Star α is in Argelander's Zones

1856.0 ^h 20 ^m 10 ^s 8 $-18^\circ 19'.0$

1) At 18 18 Planet follows α , north —

+ 3 ^m 51 + 8.8

By field of view.

Planet, compared with δ°

$\Delta \alpha (2 - 2^\circ) \Delta \delta$

At	^h 18 ^m 47	+ 5.9	+ 8' 14"
	48	5.9	8 10
	49	5.8	8 12
	51	5.8	8 12
	57	5.2	
	19 17	4.6	

α 19 4 50.3 52.5 $-11^\circ 13'$

δ 8 39.3 43.5 $-1^\circ 46'$

α 19 11 41.6 45.8 $-11^\circ 14'$

δ 15 30.6 34.7 $-1^\circ 44'$

Star δ° must be determined later. (on the following day)

Approx. Posid

α 20 ^h 14 ^m 20 $\delta - 18^\circ 16'.2$

Can be compared with 20 16 55 $-18^\circ 21.3$ A. Z. 244 9th

Europa.

1860 July 20.

Place of star a.

Arg. 252,107 = Bailey 58932. Date 1849-1851 $\left. \begin{array}{l} \text{HA} \\ \log \\ 273 \\ 356 \end{array} \right\}$

h	m	s	$^{\circ}$	$'$	$''$
20	10	43.26	-18	19	0.1
		-34.88			-5.8
		+0.01			-2.2
					0.0

 $a^{\circ} 20 10 22$
 $\delta^{\circ} -18 18.2$

R

1850.0	20	10	8.39	-18	19	8.1
			~~34.43~~			
			+1.41			+4.8.0
1860.0	20	10	42.82	-18	17	20.1
			+4.41			+9.9
App. Eq.	20	10	39.78	-18	17	10.6
			47.23			

 $\log \delta^{\circ} -9.5202 195$
 $\log \delta^{\circ} -9.9256$
 1.3022
 $\log \delta^{\circ} +9.7313$ -0.7464 1.0335 $+5.59$ 46.06 $\frac{dx}{dt} 40.47$ 51.65 $\log$ $G 344.50$ $\alpha 302.39$ $H 153.35$ $\log -9.520 f 39.5$ $\log (H+\alpha) -9.979 g^{\circ} +5.6$ $g 1.251 h^{\circ} +21.0$ $\log (H+\alpha) +9.478 54.$ $\log \delta 0.023 g' +5.5$ $\log (H+\alpha) 9.997 h' +0.7$ $h 1.303 i' +3.7$ $\log (H+\alpha) -9.036$ $\log \delta -9.498$

Europa (52) $-4' - 69''$

1860 July 20.

Refr. $+ 3'' 48.92$ $[+ 9' 28.5 \quad ?]$
 Temp. [neglected] $- 0.01$ $+ 0.7$
 Motion in Star. 0.0

$+ 3 48.96$ $+ 9 29.2$
 $20 10 47.23$ $-18 17 41.6$

(52) C.D. $20 14 36.19$ $-18 17 42.4$
 Par. $- 0.05$ $+ 3.1$

236 $19 12 3$
 fast $1 24$
 Sid. Time $19 10 39$
 $7 54 44$
 $11 15 55$
 $1 51$

Ann. m.A. $11 14 4$ $11 240$
 $5 38 6$
 $- 19 47$
 Berlin $16 32 23$

1.6676
 29. 9.2768
 2.3944

Computer

12 Berlin $20 14 34.27$ $-18 17 7.9$
 $- 8.80$ $- 46.9$
 C. $20 14 25.47$ $-18 17 54.8$
 C-o $-10' 67''$ $- 15' 5''$

Mars

1860 July 20

definition much disturbed

236 = $19^h 24^m$

Comp. with star of 6th mag - proc Marsby 20^s 19.5

Scale

*	0	47
S	6	59

The superior brightness

19 26

*	1	25
S	7	37

of the limb to the centre

is very noticeable. as much

so as with the full disc

to the naked eye

19 27

*	1	44
S	7	56

The star is δ Sagittarii

*	1	24
N.	8	2

N.B. The Scale is reversed so that

the above readings belong

N	0	38
	7	17

0 to the 10' mark on scale

1 " 9 "

2c

2c

19 " 31

N	0	59
	7	39

The star is $6' 25''$ S. of Mars centre

for Concordia.

1860 July 21.

J. H. S.

Star κ follows d
" " d

6' south

5' south

Sp. R . about 25°

Star m follows κ , and is south; between R and ℓ in R .

58.60 July 21.

(By 236)

- 8' 6"	17	58	21.2	25.4	a	
- 2'	18	1	25.4	29.7	(52)	3 4.25
6 43		2	5.5	9.9	b°	

-10 44 18 12 48.9 53.2 a
 $-?$ 18 15 52.6 57.2 (52) 3 3.85

-10	18	18	18	4.3	8.8	α	
-4	54		21	8.5	12.7	(52)	3 '4.05

- 10 24 18 22 41.0 45.3 $\bar{x}_a$
- 4 58 25 44.6 49.2 (52) 3 3.75

10 24

18 29 13.6 17.9 a

~~27 57.5~~ ~~1.7~~

2ort:

- 10 4 18 33 41.1 45.3 a
- 4 39 clouds. (52)

- 10 30 18 38 55.5 59.8 a 3 3.00
- 5 5 58.6 2.7 (52)

Plank. C.A. 20 13 40.7 -18° 11.9
+10.7 +0.2

20 13 51.4 - 18 11.7

(Same Has used yesterday)

8

[For the Boston Daily Advertiser.]

The Path of the Meteor.

The path of the meteor of the 20th inst., which will best reconcile the accounts received from various parts of the country, is nearly as follows:—

It first appeared far to the west of Buffalo, having crossed the southern part of Lake Huron, following a course E. S. E. over Canada West, Southwestern New York, the northeastern corner of Pennsylvania and near the boundary line between New Jersey and New York. It crossed the Hudson twenty-five or thirty miles north of the city of New York, and reached the Sound in the vicinity of Norwalk, at the southwest corner of Connecticut, pursuing its path to an unknown distance over the ocean, far to the southeast of Nantucket. According to the latest accounts it must have been, when last seen, three or four hundred miles to the eastward of New York.

The distance, as above described, is not much short of one thousand miles, which it seems to have accomplished in less than a minute, or with a velocity of about twenty miles a second. The estimates of the time of flight are, however, not much to be relied upon.

When crossing the Hudson it was thirty-five miles vertically above the river, and forty or fifty miles in an air line from New York.

The mass of sparks and burning fragments surrounding the probably solid nucleus, may have had a diameter of one-fourth of a mile at right angles to the direction of its motion.

[For the Boston Daily Advertiser.]

The Meteor.

MR. EDITOR :—The evidence collected from a larger number of observations does not materially change the path of the great meteor, as communicated by me to the Advertiser of the 26th. It indicates, however, that instead of falling upon our globe, or being consumed, like most bodies of its class, before reaching it, it may have passed beyond the limits of the atmosphere, and resumed its original character as a wanderer in the planetary spaces. The accounts from the sea-board agree tolerably well in describing its disappearance as a gradual fading away, at a considerable altitude above the horizon, sufficient to carry its path, when prolonged, quite clear of contact with the earth. If the velocity, relative to the earth's surface, of 20 miles a second be admitted, it follows that the greater part of the apparent motion of the meteor was due to our motion in the solar system, and that the major axis of the orbit of this little asteroid, and the period of describing its complete circuit about the sun, must have been less than those of the earth.

A telescopic view of the meteor was enjoyed by Mr. C. A. Damon of Boston, who had the singular good fortune to catch sight of it in full course, with a telescope of 5 inches aperture.

G. P. BOND.

Observatory of Harvard College,
July 28, 1860.

Meteor

1860 July 20.

Messrs Editors,

The Meteor of the 20th inst. was seen in the following position by two of the assistants at the Observatory of Harvard College, at 10 P.M.

Altitude when first seen, 12° , bearing 45° West of South; it passed the meridian at an altitude of 12° and disappeared at an altitude of 10° , bearing 50° East of South. The arc passed over was about 95° , occupying twenty seconds in its transit. The apparent vertical diameter was one-fourth of a degree, the train extending seven degrees.

Observations of the altitude and bearing from distant stations would be valuable for fixing the distance, path and velocity. The uncertainty of the estimated positions makes it desirable to combine as large a number as possible. I take this opportunity to request the communication of accounts from observers giving the path among the constellations, or else the altitude and bearing, when first and last seen. If the bearing refers to the North and South points by compass, the fact should be stated.

G. P. Bond

Director of Observatory of Harvard College.

Cambridge July 23. 1860.

Communicated to the Editors of the "Boston Traveller" July 23/60.

Europe (52)

860 July 23rd

At 16^h 48^m Berlin

20 12 8 -18° 20' 2

a 20. 10 40 -18 17.2

El. 19 14 0 B.D.

Right Ascension by 236

By (B. and S.)

a 19 39. 46.7 51.0 (second ?)
(52) 41 15.8 20.2

a 42 13.5 17.9
(52) 43 35.7 40.1?

a -6' 42" 19 45 57.9 62.0 27.00 26.33 2.1
(52) 9 44?
~~4 41~~
47 24.9 29.0
a 11.4 -5 52.5 48 20.5 24.8 27.15 26.64 1.5
(52) 8 59 47.8 51.8

a 52 41.8 46.2
(52) 54 9 (11.7)

a -3 33 56 36.7 40.8 26.80 26.55 1.1
(52) -6 36 58 3.5 7.6

a 57 57.3 61.7 26.60 26.42 1.8
(52) 59 24.0 28.2

a -3 49.5 28 1 36.4 40.6 26.40 26.31 3.1
(52) 5 59 3 3.0 6.8

a 2 27.5 4 15.2 19.3 26.90 26.90 1.4
(52) 5 36.5 5 42.0 46.3 26.51

By 20 6 12 17.5
(52)

July 24 Occultation of δ Virginis

Observed by H. P. B. & H. P. J.

H. P. J. Instrument, Comet Seeker

Immersion at $17^h 4^m 55^s$ Chronometer 236

True Lid. time at obs. 17 2 28.4 An instant before the
 Emergence* observed with G. R. and disappearance, the star
 Spring Chronometer at $17^h 58^m 35^s.6$ appeared ^{dist.} projected on the
 B & G fast 2 37.2 moon's dark limb. It is
 True Emergence Lid. 17 55 58.4 the first time I have
 8 10 29.6 ever seen the like
 9 45 28.8 H. P. J.
 1 35.9

True time of Em. 9 49 52.9 H. P. J.

H. P. B. Instrument, Great Equatorial

Immersion at $17^h 5^m 9^s.5$ Spring Chronometer

B & G fast 2 37.1

True Lid at obs. 17 2 32.5
 8 10 29.6
 8 52 2.9
 1 27.3

True int. of Im. 8 50 35.6 H. P. B.

8 50 35.2 H. P. J.

* Not very reliable

Occultation of δ Virginis. Summary of Results July 24

Immersion by G. P. B.

Cambridge m.s. & $8^h 50^m 35^s.6$

Immersion by H. P. T.

Cam. m. s. & $8^h 50^m 35^s.2$

Emergence by H. P. T.

Cam. m. s. & $9^h 43^m 52^s.9$

Europa. (52)

1860 July 24th

el. 16 9 0

Page 1

1960-1961

This is the first of three

comparative study of the 18, 19, and 20

of the 18, 19, and 20

18, 19, and 20

18, 19, and 20

18, 19, and 20

18, 19, and 20

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18, 19, and 20

18, 19, and 20

18, 19, and 20

18, 19, and 20

18, 19, and 20

Photometry

860 July 31

Fine sky perfectly Clear

Compared image of Moon 12" before full with 6 Bengolas
of same lot used July 14

Bengolas were burned at entrance of avenue on Gar-
den St. Bulb B₅ Diam. silvered surface = 10^h.16 was

placed as follows on Lincoln St.

18 ^h 15 ^m	2nd time	(a)	1982 ft	NE	from Bengola
18 25	"	(b)	1682	"	"
18 30	"	(c)	1682	"	"
18 44	"	(d)	1718	"	"
18 50	"	(e)	1718	"	"
18 55	"	(f)	1718	"	"

The silvered Bulb B₂ Diam. sil. surf. = was held

between B₅ & the Bengola.

Dist. of focus of Bulb B₂ ft

a	B ₂ to B ₅	1.37 + 0.07	+ 0.21	= 1.65
b	"	2.20		= 2.48
c	"	1.80		= 2.08
d	"	2.10		= 2.38
e	"	2.25		= 2.53
f	"	2.56		= 2.84

The above are distances of the foci of the bulbs 1/2 way
from centres to circumference.

a	to B ₅	1.65 = 0.2175	b & c	2.28 = 0.3579	d & e	2.58 = 0.4116
"	Bengola	980.35 = 2.9914		1679.72 = 3.2252		1715.42 = 3.2343
		2.7739		2.8673		2.8227
		5.5478		5.7346		5.6454
Ext. alt 21° 30'		0.174	alt 24°	0.148	alt 26°	0.129
Mean dist.		0.031		0.031		0.031
		0.205		0.179		0.160
		5.3438		5.5556		5.4854

Photometry

15 2.1
Aug. m

$$\begin{array}{lcl} \text{July 31} & \text{Moon's} & \text{s.d.} = 15' 2''.2 = 902.2 = 2.9553 \\ \text{Mean} & & = 734.67 = 2.9707 \\ & & 0.0154 \\ & \text{Cor to } A_1 \text{ mean dist} & 0.0308 \end{array}$$

Results from prec. page

$$\begin{array}{lcl} (a) & \log \frac{\text{Benzola}}{\text{Moon's image in } B_5} & = 5.344 \\ (b \& c) & \text{"} & 5.556 \\ (d, e, f) & \text{"} & 5.485 \end{array} \left. \vphantom{\begin{array}{l} (a) \\ (b \& c) \\ (d, e, f) \end{array}} \right\} \begin{array}{l} \text{Corrected for} \\ \text{Extinction \& reduced} \\ \text{to Moon's mean dist.} \end{array}$$

$$\text{Mean by weights} \quad \log \frac{\text{Benzola}}{A_1 \text{ image in } B_5} = 5.485$$

$$\text{July 1 and 14.} \quad \log \frac{\text{Benzola}}{\text{Sun's image in } B_5} = \underline{\underline{9.793}}$$

~~At mean dist to~~
~~mean full moon~~

$$\log \frac{\text{Sun light.}}{\text{Moon light}} = 5.692$$

$$v = 172.4$$

$$\begin{array}{lcl} \text{Red. to mean full moon phase} & & 9.987 \\ & 477530 & = 5.679 \end{array}$$

Full Moon July 32 5^h 33^m 4^s
31 14 44 "

$$\begin{array}{r} 12.3 \\ .62 \\ \hline 246 \\ 738 \\ \hline 7.626 \\ 1.800 \\ \hline 24 \end{array}$$

$$\begin{array}{r} 1449 \quad 24) 14.8 \quad (.62 \\ \underline{144} \quad 40 \end{array}$$

Final Result from Bulb B₅

Light of Sun at mean distance

$$\frac{\text{Light of Sun at mean distance}}{\text{Light of mean Full Moon}} = 477530 : 1$$

Photography

1860 Aug 1 11 PM

Photographs of Moon 11^h from July
in 12 brats driving clock.

Mars takes in $\frac{30}{11}$ times Moon

Photography

1860 Aug. 30th

Mr Whipple came & Allen took 5 or 6 fine
plates of the Moon at 11 P.M. Moon being 5^h before full

Time 10 beats of driving clock = 5^s.22

Photometry

860 Aug. 30th A very clear, fine night. Moon 5 hours
before full Single Bengolal Diam $B_2 = 3.436^{\text{in}}$

Compared images of Bengolal and Moon on B_3

$10^h 30^m$ m.s.t. $10 \ 35$ $10 \ 55$	$\left. \begin{array}{l} \text{Images equal on } B_3 \\ \text{at alt. } 39^\circ \end{array} \right\}$	B_3 to Bengolal	8 ⁵ 89.1
			85.5
			89.6
			Mean 88.1

Image of Bengolal reflected from B_2 upon B_3
made equal to image of Moon on B_3

$10^h 40^m$ B_2 to Bengolal B_2 to B_3 B_2 to Bengolal $10 \ 50$ B_2 to B_3	$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\}$ at alt.	8 ⁵ 3.5
		1.5
		3.0
		1.4

The above for absorptions of B_2 they were
not thought satisfactory and a different series were
taken as on next page

Was particularly impressed with the almost perfect sim-
ilarity of tint & quality between Moon and Bengolal images -

Photometry

Bengola burned in front screen 40 or 50 ft
S.W. of entrance B_2 at telegraph post next beyond
Mrs Austins distant 1718 feet.

Image of moon reflected from B_2 upon B_3 was
compared with image of Bengola on B_2 Silverell diam-

eter 3.436

11 ^h 20 ^m	m.s.t.	(x)	1718	from Bengola
25		(y)	1718	
30		(z)	1718	

Silverell Bull B_3 1.760 diam was held between B_2
and the Bengola.

Distance of foci of globes

x	B_3 to B_2	$= 1.30 - 0.07 - 0.04 = 1.19$	} at alt. 41°
y	"	$1.40 - 0.07 - 0.04 = 1.29$	
z	"	$1.40 - 0.07 - 0.04 = 1.29$	
		Mean = 1.26	

After above to ascertain that Bengola was not affected
by the smoke blowing before it (The smoke in fact ascended
almost vertically so that no injurious influence was apprehen-
ded.)

11 ^h 45 ^m	Image A = Bengola - both on B_3	B_3 to Bengola	93.5
50		at alt. 41°	90.0
54			88.5
			90.7

Photometry - Reduction of Obs

Aug 30

Sid.	Camb. m.s.t.	α, δ	Dec.	alt.	log ext. cor
21 ^h 18 ^m	10 ^h 40 ^m	22 ^h 24 ^m 32 ^s	-6° 54'	39°	0.049
22 03	11 25	22 25 52	-6 43	41	0.042
22 28	11 50	22 26 30	-6 37	41	0.042

$$\alpha^1 \text{ diam. } 14' 46''.7 = 886''.7 = 2.9478$$

$$\alpha^1 \text{ mean s.d. } 934.67 \quad \underline{2.9707}$$

$$0.0229$$

$$\text{Earth's rad. vect. } 0.0038$$

$$\text{Cor. Earth's dist. } = 0.0076$$

Cor Extinction

$$0.0458 = \text{Cor. tem. diam. } \parallel 2 = 177''.8$$

$$0.0076 \text{ cor Earth's dist. } \parallel$$

$$0.0010$$

$$\text{Phase } \parallel \text{ log. phase cor } = -9.999 + 10.000$$

$$0.0440$$

$$2) \underline{0.0984}$$

$$\parallel \text{ Dist of Bengola } 1^{\text{st}} \text{ set } 88.1$$

$$2^{\text{nd}} \quad \underline{90.7}$$

$$0.0492$$

$$\text{Mean } \underline{89.4}$$

$$1.9513$$

$$\text{log. } 1.9513$$

$$79.8^{\text{st}} = 1.9021$$

$$\underline{2}$$

Hence 1 Bengola at 79.8^{st} = Mean full Moon at Zenith.

Photometry Reduction

Distance of foci of B_2 and B_3 mean of 3 obs = 1.26^{85}
 " focus of B_2 from Bengola $1718 - 0.07 = 1717.93$
 " focus of B_3 " $1718 - 0.07 - 1.26 = 1716.67$

$$\begin{array}{r} 1.26 = 0.1004 \\ 1716.67 = 3.2347 \\ \hline 3.1343 \\ \hline 6.2686 \end{array}$$

Cor. A. s.d., Earth dist } log.
 Phase and Extinct. } 0.0984
 as on prev. page

Cor. A. s.d. &c

$$\begin{array}{r} 0.0984 \\ \hline 6.1702 \end{array}$$

Mean of (x) (y) & z

$$\log. \frac{\text{Bengola}}{\text{Moon's image in } B_2} = 6.1702$$

July 14

$$\frac{\text{Bengola}}{\text{Sun's image in } B_2} = 0.7007$$

$$\frac{\text{Sun}}{\text{Moon}}$$

5.463

= 290400

Laguerre's Planet.

1860 Sept. 21. H.

By rough comp's (See A.P.D. Planet = book)

I found

$$q - a \quad 10^m 26^s 2 - 2' 7$$

$$a = \text{Heine } 22.1033$$

$$\text{Also } (59) - q \quad - 55.9 \quad - 4.2 \quad 10 \ 27 \text{ mt}$$

$$(59) - a \quad \begin{array}{r} 9 \ 27 \ 4 \\ 9 \ 27 \end{array} \quad \begin{array}{r} - 6.9 \\ - 7 \ 39'' \end{array} \quad \begin{array}{r} 10 \ 27 \text{ mt.} \\ 11 \ 45 \end{array}$$

$$\text{Conseq. } (59) \quad \begin{array}{r} 22 \ 59 \ 19.5 \\ + 6.5 \end{array} \quad \begin{array}{r} - 4 \ 6 \ 46 \\ + \end{array} \quad \begin{array}{r} 11 \ 45 = 11 \ 20 \text{ mark} \\ 54 \end{array}$$

Rev. to 8 29 Wark

$$\text{Ferg. star } \times 12 \ (59) \quad \begin{array}{r} 22 \ 59 \ 26.0 \\ - 1 \ 56.4 \end{array} \quad \begin{array}{r} - 4 \ 5 \ 52 \\ - \end{array} \quad \begin{array}{r} 8 \ 27.5 \end{array}$$

$$\text{App. pl. } \times (12) \quad 22 \ 57 \ 29.6 \quad - 4 \ 14 \ 19.5$$

Weisse 22.11

Rough value of W. 22.1033 = Bai 44872

Bai
18600 Lab. 22 46 47.3 - 4° 18' 34"

+3 6.0 + 19 4.8

22 49 53.3 - 3 59 29.2

22 48 4.5 - 4 10 45.4

1 48.5 +11 8.5

Weisse 22 49 53.0 - 3 59 36.9

Challis 1849 22 49 19.01

34.10

22 49 53.11

App. Eq. 22^h 49^m 57.5^s - 3° 59' 7"

Lerguson's Planet Star-places.

1860. Sept. 22

W. XXII. 1014

1825.0	22 47 40.76	-4° 27' 30.0"
	+1 48.56	+11 8.1
1860.0	22 49 29.32	-4 16 21.9
	+4.40	+25.8
App. Eq.	22 49 33.72	-4 15 56.1
Star	+7 56.0	+1 28
	~~27 25.32~~	~~-4 14 53.9~~
	22 57 29.72	-4 14 28.1

α''	22 48 35.0	-9.48656
δ''	-4 21.96	-888280
		1.30224
		+9.97856
$\frac{d\alpha}{dt}$	0.4469	+7.67160
$\frac{d\delta}{dt}$	46.526	
	98.052	
	18.509	
	1 48.56	
$\frac{d^2\alpha}{dt^2}$		1.28080
$\frac{d^2\delta}{dt^2}$		1.54407
		2.62687

$\bar{C}$	346 17	
α	342 22	
δ	89 41	
$\frac{d\alpha}{dt}$	-4° 16'	-8.8728
$\frac{d\delta}{dt}$	328 29	-9.7162
$\bar{g}$	21.17	1.3257
$\bar{m}(G+e)$		+9.9315
		+9.9147
		+1.2572
$\sec. \delta$		0.0012
$\bar{m}(H+e)$	72 3	9.9783
$\bar{h}$	18.76	1.2732
$\bar{m}(H+e)$		7.4888
$\bar{m} \delta$		-8.8716
$\bar{f}$	47.23	
$\bar{g}''$	+0.62	
$\bar{h}''$	+17.89	
$\bar{g}'$	+18.08	
$\bar{h}'$	-0.43	
$\bar{c}'$	+8.12	

Jagunson's Planet Position circle = $264^{\circ} 20'$

1860 Sept. 22⁸

Position Circle $264^{\circ} 20'$

a 10 45 23 12 42.6 67.5
(59) 9 23 2296 7.4 11.1
I.

Star a 5 3.4 22 36 15.1 19.2
26 15.1

Star b 8' 3" 39^m 24 9 29.0

Star c 7' 2" 44^m 11.2 15.1

Planet 8' 3" 45^m 42.7 17.7 R cl.

II.
* 6' 4" 47^m 16.1 20.2

Planet 8-28 5-6 44.2 ~~7.2~~ doubtful (whole seconds) tenths are right

III * 6 52 23 1 31.9 35.9
(59) 9 15 10 29.1 33.1

IV * 6 34 23 15 33.5 37.5
(59) 8 50 31.0 35.0

doubtful wind shakes the instr.
Bad part of scale }

Planet - Star.

h 29 15.2 +2 29 58.55
56.2 24 58.10
23 10.5 23 57.20

22 57.3 2' 25.3 8 57.92

44 ft. 0.1

22 57

59 - +8 57.92

22 49 33.72

22 58 31.64

f. m. - 0.009

+2' 25.4

- 4 15 56.1

- 4 13 30.7

+ 6.4

22 57 18

2 2

236 Jan.

22 55 16

12 6 16

10 49 0

2 33

10 46 27

m.s.A.

Planet's a. S.

Elements of Comet III 1860

by H. P. T.

$$T = 1860, \text{ June } 16.064360 \quad \text{G. M. T.}$$

$$\pi = 161^\circ 33' 9'' .5 \quad \left. \begin{array}{l} \text{Mean Equinox} \\ 1860 \text{ Jan. 1} \end{array} \right\}$$

$$\Omega = 84 \quad 39 \quad 45 \quad .4$$

$$i = 79 \quad 20 \quad 9 \quad .5$$

$$q \text{ lg} = 9.466870$$

Direct

C

Ephemeris of Comet 1860 III. (Luthe H.P.)

Wash.	8 ^h	8 ^h	h ^h	h ^h	
June 28	115° 21'	+40° 0'	9.40 ⁸¹⁰	9.6883	
29	118 27	39 3			
30	121 39	37 16	756		
July 1	124 58	36 15			
2	128 16	34 28	9.7308	9.7621	
3	131 41	32 24			
4	135 7	30 5			
5	138 33	27 30			
6	141 58	24 41	9.6732	9.8252	
7	145 20	21 38			
8	148 38	18 28			
9	151 50	15 5			
10	154 52	11 40	9.6508	9.8724	ln. to α 5
11	157 50	8 13			56' +10'
12	160 52	4 57			1 0 11
13	163 39	+1 27			1 4 12
14	166 18	-1 46	9.6706	9.9267	-1 8 13
15	168 50	4 50			
16	171 14	7 44			

Elements I.

T 1860 June 15.1518 Wash. mt.
 ln 9 9.45862
 ω = π - Ω 75° 21' 27" } App. Eq.
 Δ 85 10.52 } June 24.
 i 79 20.68 } Direct.

Elements II. (From obs. June 21. 28 July 6)

T 1860 June 15.8502 Wash. mt.
 ln 9 9.466876
 ω = π - Ω 76° 53' 25".8 } li. Eq.
 Ω 84 39 45.9 } 1860.0
 i 79 20 9.5 }
 Direct. Middle Ob. ΔA (6-0) + 0.7 ΔB + 7.6

84° 39' 45".9
 76 53 25.8
 161 33 11.7

2^h 19^m 49^s.8

31

36

54.5

141

1860phae.proj..191B

1860phae.proj..191B

1860phae.proj.: 191B