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Notes on Reductions

Berlin Time = Gr. T. + 54m.

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Comet e 1888 (Barnard) R 49. 94

Dec. 6. 1888.



	α		*	
3	52	59.2	56	7.7
	53	22.1	57	0.1
	106	21.9	113	7.8

$-6^m\ 45.9^s \quad -3^m\ 22.95^s$

3	57	36.4	4	0
	57	47.6	1	36.1
	115	34.0	122	21.1

$-6^m\ 47.1 \quad -3^m\ 23.55$

2	25.4	5	36.0
2	47.7	6	27.2
125	13.5	132	3.2

$-6^m\ 49.7 \quad -3^m\ 24.85$

7	16.5	10	27.5
7	34.2	11	19.4
134	54.7	141	46.9

$-6^m\ 52.2 \quad -3^m\ 26.10$

12	16.7	15	29.5
12	34.2	16	19.6
144	54.9	151	49.3

$-6^m\ 54.4 \quad -3^m\ 27.20$

124.65

$-3^m\ 24.93$

Mean Sets = 6 24 17 9.0 7

4 2 41.9 S.R

+ 3 38.4 2

4 6 20.3 7

17 3 34.8 7

11 2 45.5 7

1 48.6 7

11 0 56.9 = Camb. M. T. of obs.

4 44 31.0

15 45 27.9 = Gr. M. T. of obs.

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$\Delta\alpha$	$\Delta\chi$	$\alpha - \chi$
22.3″	52.4″	30.1″
21.2″	51.1″	29.9″
21.9″	51.2″	29.3″
21.7″	51.9″	30.2″
21.5″	50.8″	28.8″
	148.3″	
	0m 29.66″	

Log. 29.66 = 1.47217 ″.7
" 7.5 = 0.87506 ″.7
" cos. δ = 9.99662 ″.7
2(220.7 ″.7 = 2.34385 ″.7
+ 110.4 ″.7 = +1′ 50.4 ″.7
−7° 8′ 19.9 ″.7
−7° 6′ 29.5 ″.7

1.47217 ″.7
0.87506 ″
.7 9.99665 ″.7
220.7 = 2.34388 ″.7
= +3′ 40.7 ″.7

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Comet c 1888 (Barnard)
Dec. 6. 1888.

Comp. Star = N.D. −7° 319 (7.9 K)

N.D. Place = 1h 47m 32.4s −7° 18′ 6

H. 1h 451 = 1h 46m 3.63s −7° 27′ 15.6s (1825)

		+1	34.25		+9	25.4
Mid. Pl. =	1h	47,	37.88″	−7°	17	50.2
	26°	54′	28.20			

log. $\frac{n}{\Delta}$ = +0.12611
" sin. δ = +9.65567
" cos. δ = −9.10739
−0.0775 = −8.88917
+3.0707
+482,
+2.9932 = +0.47614

log 63 = +1.79934
+188.57 = +2.27548

log. n. = +1.30221
" cos. δ = +9.95024
" 63 = +1.79934
+1126.7 = +3.05179

(* 1825.0)	1h	46	3.63s	−7°	27	15.6s
	s	+3	8.57	s	+18	46.7
(* 1888.0)	1h	49	12.20	−7°	8	28.9
		−3	24.93		+1	50.4
	1h	45	47.27	−7°	6	38.5
(* 1888.0)	1h	49	12.20	−7°	8	28.9
		+0	2.68		+0	9.0
ap. Pl. * =	1h	49	14.88	−7°	8	19.9
		−3	24.93		3	40.7
					+1	50.4
ap. Pl. α =	1h	45	49.95	−7°	4	39.2

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1888phaethproj...505.

Dec. 6, 1888

Comet a 1888 (Barnard) Asph. Pl.

$f = +1.865'.7$ $\mathfrak{G} = 1^h\ 14.5'.7$ $\mathfrak{H} = 0^h\ 53.0'.7$

$g = 1^h 14.5'.7$ $\lambda = 1^h\ 49.2'.7$ $\lambda = 1\ 49.2'.7$

$\mathfrak{H} = 0\ 53.0'.7$ $\mathfrak{G}+\lambda = 3\ 3.7'.7$ $\mathfrak{H}+\lambda = 2\ 42.2'.7$

Log $g = +1.8097'.7$

" $h = +1.3084'.7$ $\delta = -7°\ 8\ 29''$

" $i = +0.3062'.7$

Log 1/15 $= +8.8239'.7$

" g $= +1.1097'.7$

" sin.$(\mathfrak{G}+\lambda) = +9.8564'.7$

" tan. δ $= -9.0978'.9$

$-0.077'.7 = -8.8879''$

Log 1/15 $= +8.8239'.7$

" h $= +1.3084'.7$

" sin.$(\mathfrak{H}+\lambda) = +9.8128'.7$

" sec. δ $= +0.0034'.7$

$+0.888'.7 = +9.9485''$

$+1.865'.7$

$+2.753'.7$

$-0.077'.7$

$+2.676'.7$ = cor. in R.A.

Log. g. $= +1.1097'.7$

" cos.$(\mathfrak{G}+\lambda)$ $= +9.8424'.7$

$+8.96'.7 = +0.9521''$

Log. h $= +1.3084'.7$

" cos.$(\mathfrak{H}+\lambda) = +9.8807'.5$

" sin. δ $= -9.0944'.5$

$-1.92'.7 = -0.2836''$

Log i $= +0.3062'.7$

" cos. δ $= +9.9966'.7$

$+2.01'.7 = +0.3028''$

$+8.96'.7$

$+10.97'.7$

$-1.92'.7$

$+9.05''$ = cor. in Dec.

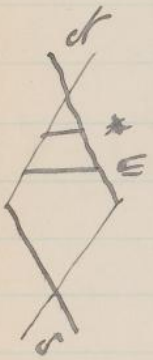
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(B49. p. 103)

Dec. 12. 1888.

Comet c 1888. (Barnard)



	E		*		E − *	
2	51	3.2	53	2.2		
	51	49.4	53	23.5		
	102	53.2	106	25.7	−3m 32.5	−1m 46.25
	53	56.0	55	54.7		
	54	41.6	56	16.0		
	108	37.6	112	10.7	−3m 33.1	−1m 46.55
	56	59.1	56	54.5		
2	57	44.5	59	19.4		
	114	43.6	118	17.9	−3m 34.3	−1m 47.15
2	0	6.9	2	6.6		
	0	52.0	2	27.2		
	120	58.9	124	33.8	−3m 34.9	−1m 47.45
	3	29.1	3	29.5		
	4	14.0	4	0.5		
	127	43.1	131	20.0	−3m 36.9	−1m 48.45
						−235.85
						−1m 47.17

571 23.64 ;

Mean Sats = 2h 57m 29.6s, N.R.

+ 3 53.6 = Chron. mov

3h 1m 23.2 ;

17 27 14.3 ;

9h 34 8.9 = ~~Camb. mean Time of obs.~~

~~4 44 31.0~~

~~14h 18m 39.9s~~ = ~~Gr. " " "~~ ;

9 34 8.9

1 34.1

9 32 34.8 ;

9 32 34.8

4 44 31.0

14h 1m 5.8 = Gr. M.T. of obs.

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1888phaet.proj...505.

Δ ⊏	Δ ✳	⊏ − ✳
45.6″	21.3″	24.3″
45.6″	21.3″	24.3″
45.4″	20.9″	24.5″
45.1″	20.6″	24.5″
44.9″	21.0″	23.9″
		121.5
		0m 24.30s

Log. 24.30 = 1.38561″
" 7.5 = 0.87506″
" cos. δ = 9.99627″
180.1″ = 2.25694″
− 90.4″ = − 1′ 30.4″
− 7° 29′ 50.0″
− 7° 31′ 20.4″

1.38561″
0.87506″
9.99625″
180.1″ = 2.25692″
− 3′ 0.7″

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1888phae.proj..505.

Dec. 12. 1888. (R 49. p. 104)

Comet c 1888. (Barnard)

Comp. Star = −7° 22 3

Am. place = 1h 17m 3.5s −7° 40′ 0.4″ (60 K)

Gr. 1h 27l = 1h 15m 32.2s −7° 49′ 51.9″ (1825)

	+1m 34.82	+9 57.9
Mid. Pl. =	1h 17 7.66	−7° 39 54.0
	19° 16 54.90	

Log. $\frac{m}{15}$ = 0.12611
" sin. α = +9.51880
" tan δ = −9.12899
− 0.0594 = −8.77390
+3.0707
+3.0113 = +6.47875
63 = +1.79934
+189.71 = +2.27809

Log. m = +1.30221
" cos. α = +9.97492
" 63 = +1.79934
+1192.5 = +3.07647

(* 1825.0)	1h 15 32.84	−7° 49 51.9
	+3 9.71	+19 52.5
(* 1888.0)	1h 18 42.55	−7° 29 59.4
	+0 2.47	+0 9.4
(app. Pl. *) =	1h 18 45.02	−7° 29 50.0
	−1 47.17	−3 0.7
app. Pl. c =	1h 16 57.85	−7° 32 50.7

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1888phaet.proj...505.

Dec. 12, 1888

Comet 2 1888 (Barnard) Aps. Pl.

$f = +1.910$ ″ $\quad \mathfrak{G} = 1^h\ 11.1$ ″ $\quad \mathfrak{H} = 0^h\ 30.5$ ″

$G = 1^h\ 11.1$ ″ $\quad \alpha = 1\ 18.7$ ″ $\quad \alpha = 1\ 18.7$ ″

$H = 0^h\ 30.5$ ″ $\quad G+\alpha = 2^h\ 29.8$ ″ $\quad H+\alpha = 1^h\ 49.2$ ″

$\log g = +1.11779$ ″

$\log h = +1.3099$ ″ $\quad \delta = -7^\circ\ 29'\ 59''$

$\log i = +0.0698$ ″

$\log 1/15 = +8.8239$ ″

$\log g = +1.11779$ ″

$\log \sin(G+\alpha) = +9.7839$ ″

$\log \tan \delta = -9.1194$ ″

-0.0170 ″ $= -8.8451$ ″

$\log 1/15 = +8.8239$ ″

$\log h = +1.3099$ ″

$\log \sin(H+\alpha) = +9.6614$ ″

$\log \sec \delta = +0.0037$ ″

$+0.629$ ″ $= +9.7989$ ″

$+1.910$ ″

$+2.539$ ″

-0.070 ″

$+2.469$ = cor. in R.A.

$\log g = +1.11779$ ″

$\log \cos(G+\alpha) = +9.8998$ ″

$+10.66$ ″ $= +1.0177$ ″

$\log h = +1.3099$ ″

$\log \cos(H+\alpha) = +9.9487$ ″

$\log \sin \delta = 9.1157$ ″

-2.37 ″ $= -0.3743$ ″

$\log i = +0.0698$ ″

$\log \cos \delta = +9.9963$ ″

$+1.16$ ″ $+0.0661$ ″

$+10.66$

$+11.82$

-2.37

$+9.45$ = cor. in Dec.

$+9.21$

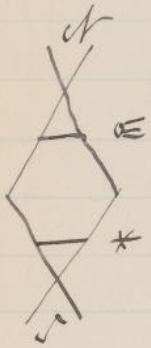
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*

Dec. 14. 1888. (R49. f. 114) 1st "

Comet e 1888. (Barnard)



	E		*		E − *
1h	40m	34.9s	42m	26.5s	
	41	6.1s	42	9.5s	
	81	41.0s	85	26.0s	−3m 45.0s −1m 52.50s
	43	33.7s	42	25.5s	
	44	4.9s	42	54.7s	
	87	38.6s	91	24.2s	−3m 45.6s −1m 52.80s
	46	46.1s	42	32.2s	
	47	17.2s	49	12.5s	
	94	3.9s	97	51.3s	−3m 47.4s −1m 53.70s
	49	43.0s	51	35.7s	
	50	14.0s	52	9.5s	
	99	57.0s	103	45.2s	−3m 48.2s −1m 54.10s
	52	52.1s	54	40.0s	
	53	23.0s	55	14.7s	
	106	15.1s	110	3.7s	−3m 48.6s −1m 54.30s
					−1m 267.40s
					−1m 53.48s

467 155.6s

Mean Sats. = 1h 46m 57.56s

+ 3 58.8

7h 50m 56.4s

17 35 7.2

8h 15 49.2

1 21.2

8h 14 28.0 = Camb. M. T. of obs.

4 44 31.0

12h 58m 59.0s = Gr. M. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	$\alpha+\delta$
31.2″	33.0″	1ᵐ 4.2″
31.2″	33.2″	1ᵐ 4.4″
31.7″	33.7″	1ᵐ 5.4″
31.0″	33.8″	1ᵐ 4.8″
30.9″	33.7″	1ᵐ 4.6″

23.4″

1ᵐ 4.68″

Log. 64.68 = 1.81077″

" 7.5 = 0.87506″

" cos δ = 9.99603

480.7″ = 2.68186″

$\frac{886.0}{405.3''}$ = +6 45.3″, +3 22.6, −7 44 15.8, −7 40 53.2″

1.81077″

0.87506″

9.99608

480.8″ = 2.68191″

$\frac{886.0}{405.2''}$ = +6 45.2″

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1888phae.proj..505.

Dec. 14. 1888. 2d series. (R 49. p. 120)

Comet e 1888 (Barnard)



	E	*	E − *
2	46 44.5 r	44 54.6 r	
	47 23.7 r	49 24.6 r	
	94 12.2 "	98 19.2 "	− 4m 7.0 " − 2m 3.5 "
	49 27.9 r	51 29.4 r	
	50 27.9 r	52 29.4 r	
	100 20.8 "	104 29.2 "	− 4m 8.4 " − 2m 4.2 "
	53 0.6 r	55 7.5 r	
	53 35.7 r	55 34.5 r	
	106 36.3 "	110 45.9 "	− 4m 9.6 " − 2m 4.8 "
	56 32.2 r	54 39.5 r	
	57 7.0 r	59 10.1 r	
	113 39.2 "	117 49.6 "	− 4m 10.4 " − 2m 5.2 "
2	59 43.5 r	1 50.6 r	
3	0 14.0 r	2 27.5 r	
	120 1.5 "	124 13.1 "	− 4m 11.6 " − 2m 5.8 "
			23.5
			− 2 4.7 "

53.3 11.0 "

Mean Sats 2h 53m 29.0 " R

+ 3m 58.8 "

2h 57m 27.8 "

17h 35 7.4 "

9h 22 20.4 "

1 32.1 "

9h 20 48.3 " Camb. M. T. obs.

4 44 31.0

14h 5m 19.3 = Gs. M. T. obs.

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$\Delta \Phi$	$\Delta \lambda$	$\Phi + \lambda$
35.2″	30.0″	1m 5.2″
35.0″	30.4″	1m 5.4″
35.1″	30.9″	1m 6.0″
34.8″	30.6″	1m 5.4″
34.5″	31.9″	1m 6.4″
		28.4″
		1m 5.68″

Log. 65.68 = 1.81743″
" 7.5 = 0.87506″
" 1002.8 = 9.99603″
488.1″ = 2.68852″

886.0″
+397.9″ = +6 37.9″
+3 10.9
−7 44 15.8
−7° 40 58.9

1.81743″
0.87506″
9.99608″
488.2 = 2.68857″

886.0″
397.8 = +6 37.8″

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1888phae.proj..505.

Dec. 1K. 1888.

Comet a 1888 (Barnard)

Comp. Star = ~~=~~ √D. −7° 20K (+.7K)

Dm. places = 1K 2m √9.9s −7° √5.1

(Star double – middle print used)

Hr. 1d 12K	1h	7m 24.72 √	−2° K′ 31.3″ √	(1825)
	+1m	3.94 7.08	+ 10′ 4.8	
Mid Pl =	1h 9	5.80 3.66	−8° 54 26.5	
	17°	+6 27.00 .15 54.90		

Log. $\frac{m}{15}$ = 0.12611

" sin. α = +9.47267 14267

" tan δ = −9.~~47514~~ 551

−0.0~~622~~ = −8.~~79398~~ .74145

+3.0707

+3.~~0085~~ 0156 = +0.47~~8885~~ 938

Log. 63 = +1.79934

+189.53 = +2.~~27769~~ .27872

189.99

Log. m = +1.30221

" cos. δ = +9.97995

" 63 = +1.79934

+1206.4 = +3.08150

(* 1825.0) =	1h	7	28.72	−8° 4 31.3
		+3	9.~~88~~ 98	20 6.4
(* 1888.0) =	1h	10	38.71	−7° 44 24.9
		+0	2.40	+0 9.1
appa. Pl. *	1	10	41.11	−7° 44 15.8
		−2	4.70	+6 37.8
appa. Pl. ∝ =	1	8	36.41	−7° 37 38.0 (2d obs)

Mn. pl. * =	1	10	41.11	−7 ~~44~~ 15.8
		−1	53.48	+6 45.2
appa. Pl. ∝ =	1h	8	47.63	−7° 37 30.6 (1st obs).

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1888phae.proj..505.

Dec. 14, 1888

Comet c 1888 (Barnard)

$f = +1.927$ $\quad \mathfrak{G} = 1^h\ 11.6$ $\quad \mathfrak{H} = 0^h\ 23.0$

$\mathfrak{G} = 1^h\ 11.6$ $\quad \alpha = 1\ 10.6$ $\quad \alpha = 1\ 10.6$

$\mathfrak{H} = 0^h\ 23.0$ $\quad \mathfrak{G}+\alpha = 2\ 22.2$ $\quad \mathfrak{H}+\alpha = 1\ 33.6$

$\log. g = 1.1218$

$\log. h = 1.3102$ $\quad \delta = -7^\circ\ 44\ 25$

$\log. i = +9.9480$

$\log. 1/\Delta = +8.8289$

$\log. g = +1.1218$

$\log \sin(\mathfrak{G}+\alpha) = +9.7645$

$\log \tan \delta = -9.1333$

$-0.070 = -8.8435$

$\log. 1/\Delta = +8.8289$

$\log. h = +1.3102$

$\log \sin(\mathfrak{H}+\alpha) = +9.5989$

$\log$ acc. $\alpha = +0.0040$

$+0.546 = +9.7370$

$+1.927$

$+2.473$

-0.070

$+2.403$ = cor. in R.A.

$\log. g = +1.1218$

$\log \cos(\mathfrak{G}+\alpha) = +9.9104$

$+10.77 \quad +1.0322$

$\log. h = +1.3102$

$\log \cos(\mathfrak{H}+\alpha) = +9.9627$

$\log \sin \alpha = -9.1293$

$-2.52 = -0.4022$

$\log. i = +9.9480$

$\log \cos \delta = +9.9960$

$+0.88 = +9.9440$

$+10.77$

$+11.65$

-2.52

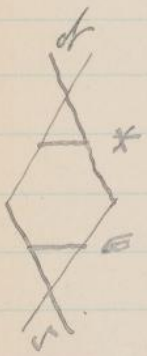
$+9.13$ = cor. in Dec.

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1888phae.proj..505.

Dec. 18, 1888.

Comet c 1888. (Barnard)



	Ⓔ		✳		Ⓔ − ✳
2	51	52.0	51	10.6	
	52	35.0	51	36.4	
	104	27.0	102	47.4	+ 1m 39.6 + 0m 49.80
	53	52.5	53	10.9	
	54	35.5	53	37.3	
	108	28.0	106	48.2	1m 39.8 0m 49.90
	55	56.0	55	15.5	
	56	39.2	55	41.2	
	112	35.2	110	56.7	1m 38.5 0m 49.25
	57	47.2	57	6.5	
	58	30.2	57	32.5	
	116	17.4	114	39.0	1m 38.4 0m 49.20
2	59	42.5	59	2.5	
3	0	26.1	59	28.5	
	120	8.6	118	30.7	1m 37.9 0m 48.95
					247.10
					+ 0m 49.42

560m 116.2s

Mean Pats 2h 56m 11.6s

+ 4m 8.9

3h 0m 20.5

17 50 53.4

9h 9 27.1

1 30.0

9h 7 57.1 = Comb. M.T. of obs.

4 44 31.0

13h 52m 28.3 = Gr. M.T. of obs.

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1888phae.proj..505.

$\Delta\alpha$	$\Delta\delta$	$\alpha+\delta$
43.0″	26.2″	1ᵐ 9.2″
43.0″	26.4″	1ᵐ 9.4″
43.2″	25.7″	1ᵐ 8.9″
43.0″	26.0″	1ᵐ 9.0″
43.6″	26.3″	1ᵐ 9.9″
		46.4″
		1ᵐ 9.28″

Log. 69.28 = 1.84061″
" 7.5 = 0.87506″
" cos. δ = 9.99618″
515.0″ = 2.71185″

1.84061″
0.87506
″ 9.99613″
515.0 = 2.71180″

$\frac{886.0}{371.0}$″ = −6′ 11.0″
−3 5.5
−7 35 13.6
−7° 38 19.1′″

$\frac{886.0}{371.0}$″ = −6′ 11.0″

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1888phae.proj..505.

Dec. 14. 1888.

Comet c 1888. (Barnard)

Comp. Star = N2 − 7° 153 (9.1) Lalletland.

Am. place = 0h 51m 11.1s −7° Ev. 9

~~Comp. Star to which nulettered star will be referred is N2 − 7° 159 (7.3 K)~~

See p. 24

(Ap. Pl. * 1888.0) =	0h 52 54.11	−7° 35 13.6
	+0 49.42	−6 11.0
ap. Pl. ⌀ =	0h 53 43.53	−7° 41 24.6

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1888phae.proj..505.

Dec. 18, 1888

Comet c 1888 (Barnard) Apr. Pl.

f =
g =
H =
Log. g =
" h =
" i =

Log. $1/15$ =
" g =
" $\sin.(G+\alpha)$ =
" $\tan \delta$ =

Log. $1/15$ =
" h =
" $\sin (H+\alpha)$ =
" $\sec. \delta$ =

Log. g =
" $\cos.(G+\alpha)$ =

Log h. =
" $\cos. (H+\alpha)$ =
" $\sin. \delta$ =

Log i =
" $\cos \delta$ =

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1888phae.proj..505.

Dec. 19. 1888.
Comet a 1888 (Barnard)



	E	*	E − *
2	5 11.0 ✓	3 ~~4~~ 6.5 ✓	
	~~4~~ 42.1 ✓	~~4~~ 10.0 ✓	
	10 53.1	~~10~~ 6 6.5	2m 46.6 1m 23.30
	7 39.6 ✓	6 25.9 ✓	
	4 10.4 ✓	6 39.5 ✓	
	15 50.4	13 5.4	2m 45.0 1m 22.50
	9 ~~5~~4.4 ✓	4 ~~4~~4.7 ✓	
	10 29.4 ✓	2 ~~5~~4.7 ✓	
	20 28.6	17 43.4	2m 45.2 1m 22.60
	12 12.5 ✓	10 ~~5~~9.0 ✓	
	12 ~~4~~3.2 ✓	11 12.5 ✓	
	24 55.7	21 11.5	2m 44.2 1m 22.10
	14 32.0 ✓	13 14.4 ✓	
	15 2.6 ✓	13 32.4 ✓	
	29 34.6	26 ~~5~~0.8	2m 44.8 1m 21.90
			112.40
			+ 1m 22.48

98 222.4 7

Mean 5 sets = 2h 10m 10.2s M.R.

+ 4m 11.7

2h 14 21.9 7

17 54 50.0 7

8h 19m 31.9 4

1 21.8 7

8h 18 10.1 7

4 44 31.0

13h 2m 41.1 = G. M. S. of obs.

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1888phae.proj..505.

Δ ☌	Δ ☀	☌ + ☀
~~31.8~~		
31.1″	13.5″	0ᵐ 44.6″
31.2″	13.6″	0ᵐ 44.8″
31.0″	14.0″	0ᵐ 45.0″
30.7″	13.5″	0ᵐ 44.2″
30.6″	14.0″	0ᵐ 44.6″
		223.2″
		0ᵐ 44.64″

Log. 44.64 = 1.64972″
" 7.5 = 0.87506″
" cos. δ = 9.99592″
331.6″ = 2.52070″

886.0′
+554.4″ = +9′ 14.4″
4 37.2″

+4 37.2″
−7° 50 40.4″
−7° 46 3.2″

1.64972′
0.87506′
9.99600″
2.52078″

331.7″ = 886.0′
554.3″ = +9′ 14.3′

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1888phae.proj..505.

Dec. 19. 1888.

Comet c 1888. (Barnard)

Comp. Star = N2 - 8° 163 (AGK)

N2 place = 0h 47m 23.4s -8' 1.4

Yr. 0h Azz = 0 45 51.94 -8 11 26.1 (1825)

+1 35.51' +10 19.3"

11° 51 51.75 = 0 47 27.45 -8° 1 6.8

Log. $\frac{u}{15}$ = 0.12611

" sin. α = +9.91302

" tan. α = -9.14882

-0.0387 = -8.58795

+3.0707

+3.0320 = +0.48173

63 = +1.79934

191.02 = 2.28107

Log. u = +1.30221

" cos. α = +9.99062

" 63 = +1.79934

1236.4 = +3.09217

(* 1825.0) = 0h 45 51.94" -8° 11 26.1"

+3 11.02" +20 36.4"

(* 1888.0) = 0h 49 2.96" -7° 50 49.7"

+0 2.25" +0 9.3"

app. Pl. * = 0h 49 5.21" -7° 50 40.4"

+1 22.48" +9 14.3"

app. Pl. α = 0h 50 27.69" -7° 41 26.1"

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1888phae,proj..505.

Dec. 19, 1888

Comet 2 1888 Barnard

$f = +1.999$ ″
$G = 1^h\ 9.7$ ″
$H = 0^h\ 4.3$ ″
$\log g = +1.1364$ ″
$\log h = +1.3106$ ″
$\log i = +9.2201$ ″

$G = 1^h\ 9.7$ ″
$\alpha = 0\ 49.0$ ″
$G+\alpha = 1^h\ 58.7$ ″

$H = 0^h\ 4.3$ ″
$\alpha = 0^h\ 49.0$ ″
$H+\alpha = 0\ 53.3$ ″

$\alpha = -7^\circ\ 50\ 50$ ″

$\log 1/15 = +8.8239$ ″
$\log g = +1.1364$ ″
$\log \sin(G+\alpha) = +9.6946$ ″
$\log \tan \alpha = -9.1393$ ″
-0.062 ″ $= -8.7942$ ″

$\log 1/15 = +8.8239$ ″
$\log h = +1.3106$ ″
$\log \sin(H+\alpha) = +9.3626$ ″
$\log \sec \alpha = +0.0041$ ″
$+0.317$ ″ $= +9.5012$ ″
$+1.999$ ″
$+2.316$ ″
-0.062 ″
$+2.254$ = cor. in Dec.

$\log g = +1.1364$ ″
$\log \cos(G+\alpha) = +9.9389$ ″
$+11.89$ ″ $= +1.0753$ ″

$\log h = +1.3106$ ″
$\log \cos(H+\alpha) = +9.9881$ ″
$\log \sin \alpha = -9.1352$ ″
-2.72 ″ $= -0.4339$ ″

$\log i = +9.2201$ ″
$\log \cos \alpha = +9.9959$ ″
$+0.16$ ″ $= +9.2160$ ″
$+11.89$ ″
$+12.05$ ″
-2.72 ″
$+9.33$ = cor. in Dec.

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1888phae.proj..505.

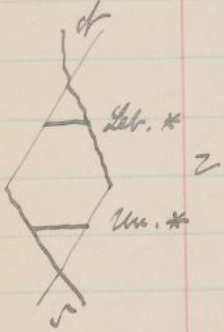
(see p. 96)

Dec. 19. 1888.

Obs. to join unlettered star used with Barnards Comet on Dec. 12. 1888. with a lettered star.

Unlettered Star = $\overset{\wedge}{SD.}$ -7° 1 ν 3 (9.1)

Lettered " = $\overset{\wedge}{SD.}$ -7° 1 ν 9 (7.3 K)



Un. *		Let. *		Un. * − Let. *		
30	K1.7 ν	33	KK.K ν			
30	ν6.4 ν	3~~6~~ 3	ν9.K ν			
61	3K.1 c.	6~~6~~ 66	44.2 c.	− 6 m	6.1 c.	− 3 3.0 ν c.
3K	30.9 ν	37	3K.2 ν			
3K	KV.K ν	37	KK.1 ν			
69	16.7 c.	75	22.3 c.	− 6 m	5.6 c.	− 3 2.K0 c.
3K	30.ν ν	K1	3K.2 ν			
3K	KV.7 ν	K1	KK.1 ν			
77	16.2 c.	83	22.3 c.	− 6 m	6.1 c.	− 3 3.0 ν c.
Kν	29.7 ν	Kν	33.6 ν			
Kν	Kν.0 ν	Kν	K7.K ν			
85	14.7 c.	91	21.0 c.	− 6 m	6.3 c.	− 3 3.1 ν c.
K6	ν2.K ν	K9	ν6.ν ν			
K7	K.0 ν	ν0	10.1 ν			
94	0.K c.	100	6.6 c.	− 6 m	6.2 c.	− 3 3.1 0 c.
ν1	3.1 ν	νK	7.9 ν			
ν1	19.K ν	νK	21.0 ν			
102	22.5 c.	108	28.9 c.	− 6 m	6.K c.	− 3 3.2 0 c.

(Comparison next page.)

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1888phae.proj..505.

Δ Un.*	Lrb*	Un.* + Lrb*
14.7°	14.6°	0m 29.3°
14.9°	13.9°	0m 28.8°
15.2°	13.9°	0m 29.1°
15.3°	13.8°	0m 29.1°
15.6°	13.6°	0m 29.2°
16.3°	13.1°	0m 29.4°

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1888phae.proj..505.

Dec. 19. 1888.

Con. from previous page.

	Mu. *		Let. *		Mu. * − Let. *	
2	✓✓ 34.K ✓		✓4 39.1 ✓			
	✓✓ ✓0.6 ✓		✓4 ✓2.0 ✓			
	111	25.0 "	117	31.1 "	6m 6.1 "	3 3.0✓ "
	✓9 24.K ✓		62 33✓ ✓			
	✓9 K5.0 ✓		62 K6.0 ✓			
	119	13.4 "	125	19.5 "	6m 6.1 "	3 3.0✓ "
	63 39.6 ✓		66 K5.0 ✓			
	63 ✓6.✓ ✓		66 ✓7.1 ✓			
	127	36.1 "	133	42.1 "	6 6.0 "	3 3.00 "
	64 1K.K ✓		71 20.6 ✓			
	64 32.0 ✓		71 32.0 ✓			
	136	46.4 "	142	52.6 "	6m 6.2 "	3 3.10 "
						− 3m 3.06 "



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1888phae.proj..505.

Un.*	Let*	Un.*+Let*
16.2	12.9	29.1
16.6	12.5	29.1
16.9	12.1	29.0
17.6	11.4	29.0
		29.1
		29.11

Log. 29.11 = 1.46404
" 7.5 = 0.87506
" 002.4 = 9.99637
216.5 = 2.33547

886.0
−669.5 = −11′ 9.5″
−5 34.8
−7° 24 4.1
−7° 29 38.9

1.46404
0.87506
9.99628
216.5 = 2.33538

886.0
−669.5 = −11′ 9.5″

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1888phae.proj..505.

Dec. 22. 1888. (K9. 160)

Comet a 1888 A (Barnard)



E	*		
5h 0m 17.1s W	1 17.0 W		
0 37.0 W	1 52.6 W		
0 54.1	3m 9.6	2m 15.5	1m 7.75
2 21.5 W	3 21.9 W		
2 40.7 W	3 56.5 W		
5m 2.2	7m 18.4	2m 16.2	1m 8.10
E 23.0 W	W 23.3 W		
E 40.6 W	W 57.1 W		
9m 3.6	11 20.4	2m 16.8	1m 8.40
6 41.2 W	7 41.5 W		
6 57.4 W	8 14.0 W		
13m 38.6	15 55.5	2m 16.9	1m 8.45
8 49.7 W	9 49.1 W		
9 3.8 W	10 20.6 W		
17m 52.5	20 9.7	2m 17.2	1m 8.60
			41.30
			−1m 8.26

Mean sets = 5h 4m 39.1s, N.A.

	44	151.0
	+4	20.9
5h	9	0.0
18	6	39.7
11	2	20.3
	1	48.5

11h 0m 31.8s = Camb. m. T. of obs.

4h 44 31.0

15h 45m 2.8s = Gr. m. T. of obs.

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1888phae.proj...505.

Δ∈	Δ✳	∈ − ✳
19.9″	35.6″	15.7″
19.2″	34.6″	15.4″
17.6″	33.8″	16.2″
16.2″	32.5″	16.3″
15.1″	31.5″	16.4″

$\sqrt{}$ 88.0 ✓ 17.60 ✓ $\sqrt{}$ 168.0 ✓ 33.60 ✓ 0 ≈ 80.0 / 16.00″

1.20412
0.87506
9.99608

1189 = 2.07526
+ 1′ 58.″9

(−7° ∨1.′2)

Log. 16.00 = 1.20412″ 1.20412′
„ 7.5 = 0.87506″ 0.87506′
„ ω δ✳ = 9.99∨49 9.99∨91
2/1182.9′ 2.07∨07″ 2.07∨09″ = 1182.″9′
∨9.″4∨′

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1888phae.proj..505.

Dec. 22. 1888.

Comet c 1888 (Barnard)

Comp. Star = −7° 12′ 3 (9.5)

Dm. place = 0h 40m 16.1 −7° 51′.2

Star to be compared with enclosed star is
No 2 −7° 130 (8.6 m6)

Munich pr. (−3° to −9° m. v.) = 0h 40m 19.s49 v −7° 56′ 29.″2 v (1850)

See page 156 for reduction.

Enclet * 1888.0 =	0	41	55.86	−7 41	15.0
			+2.21		+9.4
ap. Pl. Enclet. * =	0	41	58.07	−7 41	~~5.4~~
		−1	8.26	+1	58.9
ap. Pl. ☉ =	0	40	49.81	−7 39	~~6.7~~ v ~~7.2~~

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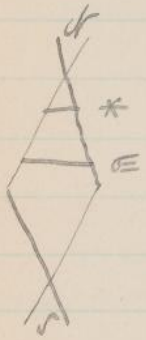
1888phaed.proj..505.

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1888phae.proj..505.

Jan. 3. 1889. (R49.192)

Comet c 1889 A (Barnard)



	E	*	E − *
3	53 33.6	57 26.1	
	54 20.9	57 32.5	
	107 54.5	114 58.6	− 7m 4.1 − 3m 32.05
	54 7.2	61 59.5	
	54 53.2	62 5.0	− 7m 4.1
	~~50 32~~		~~6 34.1~~
	~~47 104~~		
	~~66.0~~		
	47 0.4		
	63 36.9	67 29.5	
	64 27.6	67 39.6	
	128 4.7	135 9.1	− 7m 4.4 − 3m 32.20
	62 29.4	72 22.0	
	69 18.7	72 31.0	
	137 48.1	144 53.0	− 7m 4.9 − 3m 32.45
	73 13.6	77 6.4	
	74 2.1	77 14.6	
	147 15.7	154 21.0	− 7m 5.3 − 3m 32.65
			129.35
			− 3m 32.34

519 123.0

4h 5m 7.9

+4 49.9

4h 9 57.8

18 53 54.4

~~9h 16 53.4~~

~~5 59~~

9 15 59.4

1 31.8

C.M.T. 9h.29 14 28.3

4 44 31.0

Gr. m. T. = 13 54 59.3

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1888phae.proj..505.

~~A ∝~~ ~~A ✳~~ ~~∝ − ✳~~

47.3 ✓ 6.4 ✓ 40.9 ✓

50.9 ✓ 10.1 ✓ ~~5.5~~ 40.8 ✓

49.3 ✓ 9.0 ✓ ~~10.1~~ 40.3 ✓

48.5 ✓ 8.2 ✓ 40.3 ✓

4 | 196.0 ✓ 4 | 33.7 ✓ 16 2.3 ✓

49.00 ✓ 8.42 ✓ 40.58 ✓

0

Log. 40.58 = 1.60831 ✓

" 7.5 = 0.87506 ✓

" ∞ ∂ = 9.9966K ✓

302.0" ✓ = 2.47001 ✓

− √ 2.0" ✓

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1888phae.proj..505.

Jan. 3. 1889.

Comet c 1889 (Barnard)

Comp. Star ~~Dec.~~ N2 − 7° 44 (7.6 mag)

~~Dec.~~ N2. place $0^h\ 15^m\ 37.^s0\ \nu\ -7°\ 15'.9\ \nu$

Comp. * = Schj. 122.

Pos. 1865 = $0^h\ 16^m\ 7.^s20\ \nu\ \ -7°\ 12'\ 42.''1\ \nu$

$+36.72 \qquad +4\ \ 0.1\ \nu$

mid. pl. = $0\ \ 16\ \ 43.92 \qquad -7\ \ 4\ \ 42.0\ \nu$

$4°\ 10'\ 59.''$

Log $\frac{n}{\nu}$ 0.12607 ν — log n = 1.30216 ν

" sin α 4.46294 ν — " cos α = 9.99944 ν

" tan δ w9.09414 ν — " Δ = 1.34021 ν

$-0.01225\ \nu$ w8.04719 ν ~~479.9~~ $+2.64121\ \nu$

$+3.07111\ \nu$ $+44''0$

$+3.0\ \nu 49 = +0.44\nu\nu 7\ \nu$

$\Delta = +1.34021\ \nu$

$+73.''41 = +1.46\nu 74\ \nu$

Pos. 1865.0 = $0\ \ 16\ \ 7.20\ \nu\ 7. \qquad -7\ \ 12\ \ 42.1\ \nu\ 7$

$+1\ \ 13.41\ \nu \qquad +4\ \ 0.0\ \nu$

mean pl. 1889.0 = $0\ \ 17\ \ 20.61\ \nu \qquad -7\ \ 4\ \ 42.1\ \nu$

$-1.13\ \nu \qquad -10.6\ \nu$

App. pl. * = $0\ \ 17\ \ 19.48\ \nu \qquad -7\ \ 4\ \ \nu 2.7\ \nu$

$\varepsilon - *$ = $-3\ \ 32.34\ \nu \qquad -\nu\ \ 2.0\ \nu$

App. pl. ε = $0\ \ 13\ \ 47.14\ \nu \qquad -7\ \ 9\ \ \nu 4.7\ \nu$

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1888phaeq.proj..505.

Jan. 3. 1889.

Comet e (Barnard) Appr. Pl.

$f = \cancel{-0.913} -0.900$ ✓
$\delta = 9^h\ 46.4$ ✓
$H = 23\quad 2.1$ ✓
Log $g = +0.2460$ ✓
" $h = +1.3025$ ✓
" $i = -0.2974$ ✓

	0	17.3
	9	46.4
$(\delta+H)=$	10	3.7

	0	17.3
	23	2.1
$(H+H)=$	23	25.4

Log $\frac{1}{r}$ $= +0.2239$ ✓
" g $= +0.2460$ ✓
" $\sin(\delta+H) = +9.6466$ ✓
" $\tan\delta = -9.0940$ ✓
$-0.^m0248$ ✓ -4.4250 ✓

" $\frac{1}{r}$ $= +0.2239$ ✓
" h $= +1.3025$ ✓
" $\sin(H+H) = -9.1772$ ✓
" $\sec\delta = +0.0033$ ✓
$-0.^m206$ ✓ -9.3129 ✓
-0.024 ✓
-0.234 ✓
-0.900 ✓
-1.134 ✓ Red. in h

Log g $= +0.2460$ ✓
" $\cos(\delta+H) = -9.9412$ ✓
$-6.^s13$ ✓ $-0.^m7272$ ✓

" h $= +1.3025$ ✓
" $\cos(H+H) = +9.9950$ ✓
" $\sin\delta = -9.0907$ ✓
$-2.^m44$ ✓ $-0.^m3924$ ✓

" i $= -0.2974$ ✓
" $\cos\delta = +9.9967$ ✓
$-1.^s97$ ✓ $-0.^m2941$ ✓
$-2.^s44$ ✓
$-6.^s13$ ✓
$-10.^s54$ ✓ = Red. in δ.

Log f. Δ in R. A. $= +9.5756$ ✓
" " " Dec. $= +0.^m401$ ✓

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1888phae.proj..505.

Sept. 7. 1888.
Barnard's Comet.

$f = +1.^{v}189$ | $\beta = 1\ \ 27$
$\beta = 1\ \ 27$ | $\alpha = 6\ \ 7\ 2.0$
$\log g = +0.937_9$ | $(\beta+\alpha) = 2\ \ 37$
$\alpha = 6\ \ 7\ 2.0$
$\delta = +10\ \ 9\ 31$

$\log \sin(\beta+\alpha) = +9.892^{v}$
" $g = +0.937_9{}^{v}$
" $\tan \delta = +9.245^{v}$
$+1.244$ | $= +0.1099^{v}$
$+1.189$
$+2.477$

$\log g = +0.937_9{}^{v}$
" $\cos(\beta+\alpha) = -9.797^{v}$
$-7.^{"}39 = -0.7317^{v}$

Nov. 1. 1888.

$f = +1.^{v}716$ | $\beta = 1\ \ 21.9$
$\beta = 1\ \ 21.9$ | $\alpha = 7\ \ 21.9$
$\log g = +1.02_{7}{}^{v}$ | $(\beta+\alpha) = 6\ \ 43.8$
$\delta = 2\ \ 37\ \ 44$

$\log g = +1.02_{7}{}^{v}$
$\log \cos(\beta+\alpha) = -9.276^{v}$
$-2.^{"}01 = -0.3031^{v}$

$\log g = +1.02_{7}{}^{v}$
$\log \sin(\beta+\alpha) = +9.9920^{v}$
" $\tan \delta = +9.6620^{v}$
$+0.^{v}477^{v} = +9.674^{v}$
$+1.^{v}716^{v}$
$+1.993^{v}$

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1888phaeproj..505.

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1888phae.proj..505.

Comet e 1888 (Barnard) (R. 50, 34)
Jan. 19. 1889.



	∈		★				
	19	12.2 ✓	17	14.0 ✓			
	19	47.7 ✓	12	0.5 ✓			
	38	59.9 ✓	29	14.5 ✓	3	41.4 ✓	1 50.70 ✓
	22	27.4 ✓	20	33.3 ✓			
	23	4.3 ✓	21	17.5 ✓			
	45	31.7 ✓	41	50.8 ✓	3	40.9 ✓	1 50.45 ✓
	26	17.5 ✓	24	24.0 ✓			
	26	46.3 ✓	25	9.5 ✓			
	53	13.8 ✓	49	33.5 ✓	3	40.3 ✓	1 50.15 ✓
							151.30 ✓
							+ 1m 50.43 ✓

Mean Sidtk

	136	105.4	.7
h	22	57.6	.7 J.R.
	+5m	29.7	D.
4h	28m	27.3	7
19	57	3.30	7
8h	31	24.00	7
	1	23.8	7
8h	30	0.2	✓ = Camb. m. S. of obs.
4	44	31.0	
13h	14m	31.2	= Gr. m. S. " "

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$\Delta\alpha$	$\Delta\delta$	$\alpha - \delta$
35.5″	42.5″	7.0″
36.9″	44.2″	7.3″
38.8″	45.5″	6.7″
3)111.2″ ✓	3)132.2″ ✓	21.0″
37.07″ ✓	44.07″ ✓	7.00″

Log. 7.00 = 0.84510″

" 7.5 = 0.87506″

" cos. δ = 9.99735″

52.18″ = 1.71751″

− 26.09″ = − 0′ 26.1″

− 6° 19′ 27.1″

− 6° 19′ 53.2″

0.84510″

0.87506″

9.99734″

− 52.18″ = −1.71750″

− 0′ 52.18″

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Comet e 1884 (Barnard)
Jan. 19. 1889.

Comp. Star = N.D. = −6° 6313 (4.9 K)

N.D. places = 23h 46m 57.1s −6° 31.9

Hr. 23h 95d = 23h 45m 21.9s −6° 40′ 37.2″ (1825)

	+1m 38.56	+10′ 40.6
Mid. Pl. =	23h 47 0.54	−6° 29 57.2
	356° 45 8.10	

log. $\frac{u}{15}$ = +0.12611
" sin. δ = −8.75323
" tan. δ = −9.05649
+0.0086 = +7.93583
+3.0707
+3.0793 = +0.48845
log. 64 = +1.80618
+197.07 = +2.29463

log. u = +1.30220
" cos. δ = +9.99930
" 64 = +1.80618
1281.4 = +3.10768

(* 1825.0) =	23h 45 21.98	−6° 40 37.8
	+3 17.07	+21 21.4
(* 1889.0) =	23h 48 39.05	−6° 19 16.4
	−0 1.47	−0 10.7
app. Pl. * =	23h 48 37.58	−6° 19 27.1
	+1m 50.43	−0 52.2
app. Pl. ☌ =	23h 50 28.01	−6° 20 19.3

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Comet 2 1888 (Barnard)

Jan. 19, 1889

$f = -0.750''$ $\quad \mathfrak{G} = 9^h\ 39.7'$ $\quad \mathfrak{H} = 22^h\ 6.8'$

$\mathfrak{G} = 9^h\ 39.7'$ $\quad \lambda = 23\ 48.6'$ $\quad \lambda = 23\ 48.6'$

$\mathfrak{H} = 22^h\ 6.8'$ $\quad \mathfrak{G}+\lambda = 9\ 28.3'$ $\quad \mathfrak{H}+\lambda = 21\ 55.4'$

$\log. g = +0.7750''$

$\log. h = +1.3016''$ $\quad \delta = -6^\circ\ 19\ 16''$

$\log. i = -0.6148''$

$\log. 1/15 = +8.8239''$

$\log. g = +0.7750''$

$\log. \sin(\mathfrak{G}+\lambda) = +9.7886''$

$\log. \tan. \delta = -9.0455''$

$-0.027'' = -8.4330''$

$\log. 1/15 = +8.8239''$

$\log. h = +1.3016''$

$\log. \sin(\mathfrak{H}+\lambda) = -9.7137''$

$\log. \sec. \delta = +0.0026''$

$-0.695'' = -9.8418''$

$-0.750''$

$-0.027''$

$-1.472''$ = corr. in R.A.

$\log. g = +0.7750''$

$\log. \cos(\mathfrak{G}+\lambda) = -9.8969''$

$-4.70'' = -0.6719''$

$\log. h = +1.3016''$

$\log. \cos.(\mathfrak{H}+\lambda) = +9.9324''$

$\log. \sin \delta = -9.0417''$

$-1.89 = -0.2757''$

$\log. i = -0.6148''$

$\log. \cos. \delta = +9.9974''$

$-4.10'' = -0.6122''$

$-4.70''$

$-1.89''$

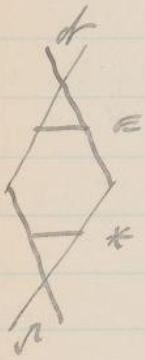
-10.69 = corr. in Dec.

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Comet e 1888 (Barnard)

Jan. 21. 1889.



	E	*	E − *
4	12 2.2	11 5.7	
	12 25.0	11 32.0	
	24 27.2″	22 43.7″	+ 1ᵐ 43.5ˢ 0 51.75″
	13 43.9	12 47.2	
	14 6.1	13 20.6	
	27 50.0″	26 7.8″	1 42.2″ 0 51.10″
	15 35.6	14 34.7	
	15 57.4	15 12.5	
	31 33.2″	29 51.2″	1 42.0″ 0 51.00″
	17 21.1	16 23.7	
	17 42.6	16 42.4	
	35 3.7″	33 22.1″	1 41.8″ 0 50.90″
	19 35.0	16 26.0	
	19 55.1	19 11.9	
	39 30.1″	37 47.9″	1ᵐ 42.2ˢ 0 51.10″
			255.85″
			+ 0ᵐ 51.17ˢ

156 144.4″

Mean Sets = 4ʰ 15ᵐ 50.4ˢ 27 SR

+ 5ᵐ 36.2″

4ʰ 21ᵐ 26.6″

20 4 56.4″

8ʰ 76 30.2″

1 21.3″

8ʰ 15 8.9″ = Camb. M.S. of obs.

4 44 31.0

12 ~~72~~ 78ʰ 59 39.9 = Gr. M.S. " "

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$\Delta\alpha$	$\Delta\chi$	$\varepsilon + \chi$
~~22.8~~		
22.8 "	32.3 "	55.1 "
22.2 "	33.4 "	55.6 "
21.6 "	33.8 "	55.4 "
21.7 "	34.7 "	56.4 " ✓

$\sqrt{108.4}$ = 20.1 ✓ ; 21.68 ✓

$\sqrt{170.1}$ = 35.9 ✓ ; 34.02 ✓

278.5 / 56.0

0 55.70

Log. 55.70 = 1.74586 "

" 7.5 = 0.87506 "

" cos. δ = 9.99755 "

415.4 " = 2.61847 "

1.74586 "

0.87506 "

9.99760 "

415.5 " = 2.61852 "

$+\frac{886.0}{470.6}$ " = + 7′ 50.6 "

$+\frac{886.0}{470.5}$ " = + 7′ 50.5 "

+3 55.8

−6 4 34.5 "

−6° 0 39.2 "

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Comet e 1844 (Bernard)

Jan. 21. 1889.

Comp. Star = N2 − 6° 6324 (40 K)

N2. place = 23ʰ 49ᵐ 43ˢ.0 −6° 16′.0

Gr. 23ʰ 1016 = 23 48 10.15 ✓ −6 25 45.9 ✓

+1 38.50 +10 41.0

Mid. Pl = 23 49 48.65 −6 16 26.9

357° 27 9.75

Log. $\frac{m}{15}$ = 0.12611

" sin. δ = −8.64780

" tan. δ = −9.77391

+0.00065

+0.0591 = +8.77130 = +7.81496

+3.0707 +0.48816

3.1298 = +0.49551

3.0772

64 = +1.80618

200.30 = +2.30169

196.94 = +2.29434

Log. ϱ = +1.30220

" cos. δ = +9.99957

" 64 = +1.80618

1282.2 = +3.10795

(* 1825.0) = 23 48 10.15 ⁷ −6° 25 45.9 ⁷

⁷ +3 16.94 ⁷ +21 22.2

(* 1889.0) = 23 51 27.09 ✓ −6° 4 23.7 ✓

−0 1.48 ✓ −0 10.8 ✓

App. Pl. * = 23 51 25.61 ✓ −6° 4 34.5 ✓

+0 51.47 .34 ✓ +7 50.5 ✓3.0 ✓

App. Pl. ⊕ = 23 52 16.78 −5° 56 44.0 ✓

16.95 ✓1.5

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Comet 2 1888 (Barnard)

Jan. 21 1889

$f = -0.7415$ '7
$\mathfrak{G} = 9^h\ 40.6$ '7
$\mathfrak{H} = 21\ 59.0$ '7
$\log g = +0.7688$ '7
$\log h = +1.3005$ '7
$i = -0.6400$ '7

$\mathfrak{G} = 9^h\ 40.6$ '7
$\alpha = 23\ 51.4$ '7
$\mathfrak{G}+\alpha = 33\ 32.0$ '7
$24\ 0.0$ '7
$9\ 32.0$ '7

$\mathfrak{H} = 21\ 59.0$ '7
$\alpha = 23\ 51.4$ '7
$\mathfrak{H}+\alpha = 45\ 50.4$ '7
$24\ 0.0$ '7
$21\ 50.4$ '7

$\alpha = -6^\circ\ 4\ 24$ '7

$\log 1/15 = +8.8239$ '7
$\log g = +0.7688$ '7
$\sin(\mathfrak{G}+\alpha) = +9.7795$ '7
$\tan\alpha = -9.0269$ '7
-0.025 '7 $= -8.3991$ '7

$\log 1/15 = +8.8239$ '7
$\log h = +1.3005$ '7
$\sin(\mathfrak{H}+\alpha) = -9.7290$ '7
$\sec\alpha = +0.0024$ '7
-9.8558 '7
-0.717 '7
-0.741 '7
-0.025 '7
-1.483 '7 = cor. in R.A.

$\log g = +0.7688$ '7
$\cos(\mathfrak{G}+\alpha) = -9.9023$ '7
-4.69 '7 $= -0.6711$ '7

$\log h = +1.3005$ '7
$\cos(\mathfrak{H}+\alpha) = +9.9265$ '7
$\sin\alpha = -9.0245$ '7
-1.78 '7 $= -0.2515$ '7

$\log i = -0.6400$ '7
$\cos\alpha = +9.9976$ '7
-4.34 '7 $= -0.6376$ '7
-4.69 '7
-1.78 '7
-10.81 '7 = cor. in Dec.

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Comet f. 1888 (Barnard) (disc Oct 30.)

Jan. 25. 1889.



	E	*	E − *
7	35 √49 √	37 KK √	
	36 K7.0 √	37 15.7 √	
	72 45.9	74 20.1	− 1m 34.2 − 0m 47.10
	37 √K.K √	39 0.3 √	
	38 K2.5 √	39 11.K	
	76 36.9	78 11.7	− 1m 34.8 − 0m 47.40
	39 √9.2 √	K1 K.5 √	
	K0 K7.0 √	K1 16.1 √	
	80 46.2	82 20.6	− 1m 34.4 − 0m 47.20
	K1 K7.7 √	K2 √3.2 √	
	K2 35.1 √	K3 K.2 √	
	84 22.8	85 58.0	− 1m 35.2 − 0m 47.60
	K3 37.0 √	KK K2.1 √	
	KK 23.5 √	KK √3.1 √	
	88 0.5	89 35.2	− 1m 34.7 − 0m 47.35
			1.65
			− 0m 47.33

Means of sets

	40 0	152.3
7h	40	15.2 √ D.R.
	+5m	48.4 √ √
7h	46	3.6 √
20	20	42.6 √
11h	25	21.0 √
	− 1	52.3
11h	23	28.7 √ = Comb. M. T. of obs.
4	44	31.0 √
16h	7m	59.7 = Gr. M. T. of obs.

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Δ ⊏	Δ ✶	⊏ − ✶
48.1″	11.3″	36.8″
48.1″	11.1″	37.0″
47.8″	11.6″	36.2″
47.4″	11.6″	35.8″
46.5″	11.0″	35.5″
		181.3″
		0ᵐ 36.26

Log. 36.26 = 1.55943″
" 7.5 = 0.87506″
" cos. δ = 9.98155″.7
260.6″.7 = 2.41604″
130.3″.7

16 34 58.1″
− 2 10.3″.7
16 32 47.8″

1.55943″.7
0.87506″.7
9.98163″.7
260.7 = 2.41612″
− 4′ 20.7″.7

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Comet f 1884 (Barnard) (close. Oct. 30)
Jan. 25. 1889.

Comp. Star = Dm. +16° 210 (9.0 K)

Dm. place = 10^h [illegible] 46.0 +16° [illegible] (9.0 K)

Hr. 10^h 177-A	10	7	8.30	+16	53	[illegible] (9)
	+1	44.34		−9	25.4	
Mid. Pl.	10	8	52.64	+16	44	32.6
	152°	13′	10.20″			

$\log \frac{n}{15}$ = +0.12611
" sin α = +9.66847
" tan. δ = +9.47831
+0.1845 = +9.27289

3.0707
+3.2552 = +0.51258

64 = +1.80618
+208.33 = +2.31876

Log. n = +1.30220
" cos. α = −9.94681
" 64 = +1.80618
−1135.5 = −3.05519

(* 18250) =	10	7	8.30	+16	53	58.4
	+3	28.33		−18	55.5	
(* 1889.0) =	10	10	36.63	+16	35	2.9
		+0.40			−4.8	
(ap. pl. *) =	10	10	37.03	16	34	58.1
	−0	47.33		−4	20.7	
(ap. pl. ⊜) =	10	9	49.70	+16°	30	37.4

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1888phae.proj..505.

Comet f 1888 (Barnard) (Olbers. Oct. 30)

Jan. 25, 1889

$f = -0.709'.7$
$G = 9^h\ 35.1'.7$
$H = 21^h\ 43.3'.7$
$\log g = +0.7571$ ".7
" $h = +1.2981$ '.7
" $i = -0.6850$ '.7

$G = 9^h\ 35.1'.7$
$\alpha = 10\ 10.6'.7$
$G+\alpha = 19^h\ 45.7'.7$

$\alpha = +16°\ 35.0'.7$

$H = 21^h\ 43.3'.7$
$\alpha = 10\ 10.6'.7$
$H+\alpha = 31\ 53.9'.7$
$24\ \ 0'.7$
$7\ \ 53.9'.7$

Log 1/15 $= +8.8239'.7$
" $g = +0.7571'.7$
" $\sin(G+\alpha) = -9.9521$ '.7
" $\tan\alpha$ '.7 $= +9.4739$ '.7
$-0.102 = -9.0070$ '.7

Log 1/15 $= +8.8239'.7$
" $h = +1.2981'.7$
" $\sin(H+\alpha) = +9.9438$ '.7
" $\sec\alpha = +0.0184$ '.7
$+1.214$ '.7 $= +0.0842$ '.7
$-0.709'.7$
$-0.102'.7$
-0.811 '.7
$+1.214'.7$
$+0.403$ = Cor. in R.A.

Log. $g = +0.7571'.7$
" $\cos.(G+\alpha) = +9.6484$ '.7
$+2.54$ '.7 $= +0.4055$ '.7

" $h = +1.2981'.7$
" $\cos.(H+\alpha) = -9.6784$ '.7
" $\sin.\alpha = +9.4555$ '.7
-2.70 '.7 $= -0.4320$ '.7

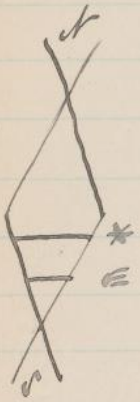
" $i = -0.6850'.7$
" $\cos.\alpha = +9.9816$ '.7
-4.64 '.7 $= -0.6666$ '.7
$-2.70'.7$
-7.34 '.7
$+2.54$ '.7
-4.80 = Cor. in Dec.

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Jan. 29. 1889.

Comet f 1889 (Barnard)



	E		*		E − *
7	3 W	31.5 W	33	W 3.0 W	
	36	46 W	34	39.9 W	
	71	40.3 "	68	32.9 "	+ 3m 7.4 " + 1m 33.70 "
	39	1.1 W	37	23.5 W	
	39	39.3 W	36	10.2 W	
	78	40.4 "	75	33.7 "	3m 6.7 " 1m 33.35 "
	K1	K3.7 W	K0	6.5 W	
	K2	22.1 W	K0	W 3.2 W	
	84	5.8 "	80	59.7 "	3m 6.1 " 1m 33.05 "
	KK	36.0 W	K2	W 9.0 W	
	4W	15.1 W	K3	K6.0 W	
	89	51.1 "	86	45.0 "	3m 6.1 " 1m 33.05 "
	W0	12.9 W	K4	36.5 W	
	W0	W 3.5 W	K9	23.6 W	
	101	6.4 "	98	0.1 "	3m 6.3 " 1m 33.15 "
					1.30 "
					+ 1m 33.260 "

Mean W sets 7h

	423	144.0 ' "	
	42m	32.4 "	RR
	+ 6m	0.4 '	
7h	48	32.8 '	
20	36	28.9 '	
11h	12m	3.9 '	
	− 1	50.1 '	
11h	10	13.8 '	= Cambr. m. T. of obs.
4	44	31.0	
15h	54m	44.8	= Gr. m. T. of obs.

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Δ∈ Δ⋆ ∈−⋆

37.3″ 46.9″ 9.6″

38.2″ 46.7″ 8.5″

38.4″ 46.7″ 8.3″

39.1″ 47.0″ 7.9″

40.6″ 47.1″ 6.5″

40.8″

0ᵐ 8.16″

Log. 8.16 = 0.91169″

" 7.5 = 0.87506″

" cos. δ = 9.97634′′

579.6′′ = 1.76309″

−289.8′′

18° 44 30.6′′

− 4 49.8′′

18° 39 40.8′′

0.91169″

0.87506″

9.97654′′

579.8 = 1.76329″

− 9′ 39.8′′

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Jan. 29. 1889.

Comet f 1888 (Barnard)

Comp. Star = 2 Lk. +12° 2326 (f.2 K)

Diff. places = $10^h\ 2^m\ 10.^s6\ ^v$ $+16'\ 5''.5\ ^v$

Fr. $10^h 15^m.6$. $10^h\ 0^m\ 32^s.39\ ^v$ $+19°\ 3'\ 13.''2\ ^v$ (f)

		+1	45.60	−9′	16.5″
	10^h	2	17.99	+18°	53	57.3
	150	34	14.85			

Log. $\frac{n}{15}$ = +0.12611
" sin. δ = +9.69138
" tan. δ = +9.53448
+0.2249 = +9.35197
+3.0707
+3.2956 = +0.51792
64 = +1.80168
+208.74 = +2.31960

Log. n = +1.30220
" cos δ = −9.94000
" 64 = +1.80618
−1117.8 = −3.04838

(* 1825.0)	10^h	0	32.39	+19°	3′	13.″8
		+3	28.74		−18	37.8
(* 1889.0)	10^h	4	1.13	+18°	44	36.0
			+0.52			−5.4
(ap. pl. *)	10^h	4	1.65	+18°	44	30.6
		+1	33.26		−9	39.8
(ap. pl. α)	10^h	5	34.91	+18°	34	50.8

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1888phae.proj..505.

Jan 29 1889

Comet f 1888 Barnard

f	$= -0.651$	$\mathfrak{G}$	$= 9^h\ 28.6'$
$\mathfrak{G}_.$	$= 9^h\ 28.6'$	α	$= 10\ 4.0'$
$\mathcal{H}_.$	$= 21\ 27.4'$	$\mathfrak{G}+\alpha$	$= 19\ 32.6'$
$\log g_.$	$= +0.7290'$		
" $h_.$	$= +1.2955'$	δ	$= +18^\circ\ 44.6$
" i	$= -0.7238'$		

$\mathcal{H}$	$= 21\ 27.4'$	$\mathcal{H}$	$= 21\ 27.4'$
α	$= 10\ 4.0'$	α	$= 10\ 4.0'$
$\mathcal{H}+\alpha$	$= 7\ 31.4'$		

$\log 1/15 = +8.8239'$
" $g = +0.7290'$
" $\sin(\mathfrak{G}+\alpha) = -9.9635'$
" $\tan\delta = +9.5306'$
$-0.111' = -9.0470'$

$\log 1/15 = +8.8239'$
" $h = +1.2955'$
" $\sin \mathcal{H}+\alpha = +9.9645'$
" $\sec.\delta = +0.0237'$
$+1.281' = +0.1076'$
$-0.111'$
$-0.651'$
$-0.762'$
$+1.281'$
$+0.519$ Cor. in R.A.

$\log g = +0.7290'$
" $\cos((\mathfrak{G}+\alpha) = +9.5945'$
$+2.11' = +0.3235'$

$\log. h. = +1.2955'$
" $\cos.(\mathcal{H}+\alpha) = -9.5892'$
" $\sin\delta = +9.5070'$
$-2.46' = -0.3917'$

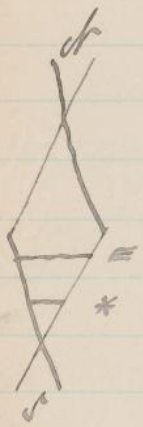
$\log. i = -0.7238'$
" $\cos.\delta = +9.9763'$
$-5.01' = -0.7001'$
$-2.46'$
$-7.47'$
$+2.11'$
$-5.36'$ Cor. in Dec.

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1888phae.proj..505.

Jan. 30. 1889. (R. 50. p. 44)

Comet f 1889 (Barnard)



	E	*	E − *
N	30 56.4 W	32 54.0 W	
	31 44.2 W	33 20.0 W	
	62 40.6 S	66 14.0 S	− 3m 33.4s − 1m 46.70s
	34 29.9 W	36 24.0 W	
	35 14.0 W	36 53.4 W	
	69 47.9 S	73 21.8 S	− 3m 33.9s − 1m 46.95s
	37 33.7 W	39 32.0 W	
	38 22.5 W	39 57.2 W	
	75 56.2 S	79 29.8 S	− 3m 33.6s − 1m 46.80s
	41 2.3 W	43 1.5 W	
	41 51.9 W	43 27.3 W	
	82 54.2 S	86 28.8 S	− 3m 34.6s − 1m 47.30s
	44 30.2 W	46 30.4 W	
	45 21.4 W	46 56.4 W	
	89 52.2 S	93 26.8 S	− 3m 34.6s − 1m 47.30s
			0.05s
			− 1m 47.01s

Mean Transit = 7h 38m 7.1s

37.7	251.1s	
~~20 40 25.4~~		+ 6m 2.9s
~~10h 57 41.7~~		7h 44 10.0
~~+ 47.8~~		20 40 25.4
~~10h 55 53.9~~		11h 3 44.6
		− 1m 48.7
		11h 1m 55.9 Camb. m. T. of obs.
		4 44 31.0
		15h 46 26.9 Gr. m. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	$\alpha - \delta$
47.8″	26.0″	21.8″
48.1″	25.8″	22.3″
48.8″	25.8″	23.0″
49.6″	25.8″	23.8″
50.6″	26.0″	24.6″
		115.5′
	$\bar{\sigma}$	23.10″

Log. 23.10 = 1.36361″
" 7.5 = 0.87506″
" cos. δ = 9.97510′
163.6′′ = 2.21377″
81.8′′

19° 13′ 1.9″
+ 1′ 21.8″
19° 14′ 23.7″

1.36361′
0.87506′
9.97504′′
163.6 = 2.21371″
+ 2′ 43.6″′′

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Jan. 30. 1449.

Comet f. 1449 (Bernard)

Comp. Star = Dm. +19° 2316 (9.2 B)

Dm. place =	10	4	26.3ˢ	+19°	23′	1.″1 ˢ
Gt. 10ʰ 79-80	10	2	47.28ˢ	+19°	31′	51.″4 ˢ
		+ 1	45.70		− 9	19.7
Mid. Place =	10	4	32.98	19°	22	31.7
	151	8	14.70			

Log $\frac{n}{15}$ = +0.12611
" sin δ = +9.68368
" tan. δ = +9.54614
+0.2270 = +9.35593
+3.0707
+3.2977ᵀ = +0.51821
64 = +1.80618
+211.05 = +2.32439

Log. n = +1.30220
" cos. δ = −9.94240
" 64 = +1.80618
−1124.0 = −3.05078

(* 1825.0)	10	2	47.28ᵀ	+19	31	51.4ᵀ
		+ 3	31.05ᵀ		− 18	44.0ᵀ
(* 1889.0)	10ʰ	6	18.33	+19°	13	7.4
			+ 0.54ˢ			−5.5ˢ
(ap. pl. *) =	10	6	18.87ˢ	+19°	13	1.9′
		− 1	47.01ˢ		+ 2	43.6′
(ap. pl. ⊂) =	10	4	31.86ˢ	+19°	15	45.5′

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Jan. 30, 1889
Comet F, 1889, Barnard

$F = -0.639$
$\mathfrak{G} = 9^h 28.6$
$\mathcal{H} = 21^h 23.4$
$\log q = +0.7207$
$\log h = +1.2949$
$\log i = -0.7326$

$\mathfrak{G} = 9^h 28.6$
$\alpha = 10\ 6.3$
$\mathfrak{G}+\alpha = 19\ 34.9$

$\mathcal{H} = 21^h 23.4$
$\alpha = 10\ 6.3$
$\mathcal{H}+\alpha = 31\ 29.7$
$24\ 0.0$
$7\ 29.7$

$\delta = 19^\circ\ 13''\ 7'$

$\log 1/5 = +8.8239$
$\log q = +0.7207$
$\log \sin(\mathfrak{G}+\alpha) = -9.9617$
$\log \tan \delta = +9.5423$
$-0.112 = -9.0486$

$\log 1/5 = +8.8239$
$\log h = +1.2949$
$\log \sin(\mathcal{H}+\alpha) = +9.9658$
$\log \sec \delta = +0.0249$
$+1.287 = +0.1095$
-0.639
-0.112
-0.751
$+1.287$
$+0.536$ cor. in R.A.

$\log q = +0.7207$
$\log \cos(\mathfrak{G}+\alpha) = +9.6046$
$+2.12 = +0.3253$

$\log h = +1.2949$
$\log \cos(\mathcal{H}+\alpha) = -9.5814$
$\log \sin \delta = +9.5174$
$-2.48 = -0.3937$

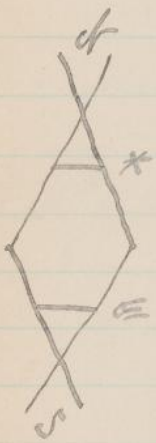
$\log i = -0.7326$
$\log \cos \delta = +9.9751$
$-5.10 = -0.7077$
-2.48
-7.58
$+2.12$
-5.46 cor. in Dec.

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Feb. 1. 1889. (R vol. p. 9v)

Comet f 1889 (Barnard) Sr. obs.



	E	*	E − *
7	50 v 46.6	47 41.v	
	v1 31.0	42 13.0	
	102 25.6	95 54.5	6m 31.1 +3m 15.5v
	vv 20.v	v2 2.4	
	vv v42	v2 34.9	
	111 18.7	104 47.3	6m 31.4 3m 15.70
	61 15.4	v4 v.0	
	61 vv.0	v4 35.1	
	123 10.8	116 40.1	6m 30.7 3m 15.3v
	6v 36.4	62 25.6	
	66 16.v	62 v6.0	
	131 52.9	125 21.6	6m 31.3 3m 15.6v
Rej. this set.	70 1.1	66 v2.3	
	70 (42.0)	67 22.6	
	140 43.1	134 14.9	6m 28.2 [3 14.10]

Last set rejected. 2 obs. 2/3 ob.

1.25

+ 3m 15.31

Mean 4 sets = 7h 46 108.0

58m 36.0

+6m 8.3

8h 4 44.3 11h 14 35.0

20 48 18.5 4 44 31.0

11h 16m 25.8 15h 59m 6.0 = G. M. T. of obs.

−1 50.8

11h 14 35.0 = Camb. M. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	$\alpha+\delta$
36.4′	31.5′	1ᵐ 7.9′
37.7′	30.5′	1ᵐ 8.2′
39.2′	30.1′	1ᵐ 9.3′
40.1′	30.4′	1ᵐ 10.5′
		35.9′
		1ᵐ 8.98′

Log 68.98 = 1.83872 ·c

" 7.5 = 0.87506 ·c

" cos. α = 9.97173 ·7

484.7 ·7 = 2.68551 ·c

886.0 ·7

− 401.3 ·7 = − 6 41.3 ·7

− 3 20.6 ·7

20 27 4.1 ·

20 23 43.5 ·7

1.83872 ·c

0.87506 ·c

9.97189 ·7

484.9 ·7 = 2.68567 ·c

886.0 ·7

401.1 ·7

− 6′ 41.1″ ·7

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Feb. 1. 1889. (See previous page)

Comet f. 1889. (Barnard)

Comp. Mer = +20° 24'29" (±0 K)

Dm. place. = 9h 57m 49s.1 +20° 36'9".1

Fr. 9h 12m 9s. 9h 57m 24s.57 +20° 47' 33".3 (f. 9)

+ 1 46.62 − 9 9.4

9h 57 15.37 +20° 36 23.9

149° 18' 50".55

Log. $\frac{u}{15}$ = +0.12611

" sin. δ = +9.70785

" tan. δ = +9.57520

+0.2565 = +9.40916

+3.0707

+3.3272 = +0.52208

64 = +1.80618

+212.94 = +2.32826

Log. u = +1.30220

" cos. δ = −9.93449

" 64 = +1.80618

−1103.7 = −3.04287

(* 1825.0) = 9h 55 28.75 +20° 45 33.3

+3 32.94 − 18 23.7

(* 1889.0) = 9h 59 1.69 +20° 27 9.6

+0.58 −5.5

(apr. pl. *) = 9 59 2.27 +20° 27 4.1

+3 15.31 − 6 41.1

(apr. pl. ∈) = 10 2 17.58 +20° 20 23.0

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1888phae.proj..505.

Feb. 1, 1889
Comet f, 1889, Barnard

$f = -0.624$ ✓
$\mathfrak{G} = 9^h\ 30.5'$ ✓ $\quad \mathfrak{G} = 9^h\ 30.5'$ $\quad \mathcal{H} = 21^h\ 15.3'$
$\mathcal{H} = 21^h\ 15.3'$ ✓ $\quad \alpha = 9^h\ 59.0'$ $\quad \alpha = 9\ 59.0'$
$\log g = +0.7069$ ✓ $\quad \mathfrak{G}+\alpha = 19^h\ 29.5'$ $\quad \mathcal{H}+\alpha = 31\ 14.3'$
$\log h = +1.2936$ ✓ $\quad 24\ 0.0$
$\log i = -0.7493$ ✓ $\quad \delta = 20^\circ\ 27'\ 10''$ $\quad 7^h\ 14.3'$

$\log 1/15 = +8.8239$ ✓
$\log g = +0.7069$ ✓
$\log \sin(\mathfrak{G}+\alpha) = -9.9660$.'
$\log \tan \delta = +9.5716$.'
-0.117 .' $= -9.0684$.'

$\log 1/15 = +8.8239$ ✓
$\log h = +1.2936$ ✓ .'
$\log \sin(\mathcal{H}+\alpha) = +9.9768$.'
$\log \sec \delta = +0.0283$.'
$+1.326$.' $= +0.1226$.'
-0.624 .'
-0.117 .'
-0.741 .'
$+1.326$.'
$+0.585$.' = cor. in R.A.

$\log g = +0.7069$ ✓
$\log \cos(\mathfrak{G}+\alpha) = +9.5805$.'
$+1.94'$ $= +0.2874$ '

$\log h = +1.2936$ ✓
$\log \cos(\mathcal{H}+\alpha) = -9.5032$.'
$\log \sin \delta = +9.5434$.'
$-2.19'$ $= -0.3402$.'

$\log i = -0.7493$ ✓
$\log \cos \delta = +9.9717$.'
$-5.26'$ $= -0.7210$.'
$-2.19'$
-7.45 .'
$+1.94'$
-5.51 .' = cor. in Dec.

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1888phae.proj..505.

Feb. 28 1889 (R 50 p. 160)

Comet f 1888 (Barnard)



	⊏		*		⊏ − *	
7h	47	20.0	48	44.4		
	47	39.0	48	54.5		
	94	59.0	97	38.9	− 2m	39.9 s − 1m 19.95 s
	52	4.4	53	29.5		
	52	24.5	53	39.5		
	104	28.9	107	9.0	2	40.1 s 1 20.05 s
	54	11.5	55	36.5		
	54	31.8	55	46.7		
	108	43.3	111	23.2	2	39.9 s 1 19.95 s
	56	48.5	58	14.0		
	57	9.1	58	24.2		
	113	57.6	116	38.2	2	40.6 s 1 20.30 s
8h	1	39.5	3	4.8		
	1	59.5	3	14.9		
	123	39.0	126	19.7	2	40.7 s 1 20.35 s
						.60 s
						− 1m 20.12 s
	542	227.8				
Mean Rect = 9h	54	34.8				
	+ 8	4.0				
8h	2	38.8				
22	34	45.5				
9h	27	53.3				
	− 1	33.0				
9h	26	20.3				
4	44	31.0				
14h	10	51.3	= G. M. T. of obs.			

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1888phae.proj..505.

$\Delta\alpha$	$\Delta\delta$	$\alpha+\delta$
19.0	10.1	29.1
20.1	10.0	30.1
20.3	10.2	30.5
20.6	10.2	30.8
20.0	10.1	30.1
		.6
	0	30.12

Log. 30.12 = 1.47885 — 1.47885

1c 7.5 = 0.87506 — 0.87506

" cos. δ = 9.92946 — 9.92991

192.0 = 2.28337 — 192.0 = 2.28337

886.0 / 694.0 = 11′ 34.0″ — 886.0 / 694.2 = 11′ 33.8″

3.8

− 5 47.0

31 46 50.2

31 52 37.2

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1888phae.proj..505.

Feb. 28, 1889

Comet f 1888 Barnard

Comp. Stac = +31° 2026 (6.2K)

D.M. place = 9h 33 0.1 +31° 55.4

Fr. 9h 696	9	31	12.52	+32	2.0
	+1	55.46		−2	31.4
mid. Pl. =	9	33	6.9A	+31	30.6
	13	16	44.7		

log $\frac{m}{r}$ = +0.12615

" sin t = +9.77664

" cos δ = +9.79952

Sum log. = +9.69731

Cor. 2y = +0.4921

+0.4921

+3.0719

3.5700 = 0.5267

64. = 1.80612

224.42 = 2.3524

Log u = +1.30224

" cos t = u9.90391

" 64. = 1.80612

−1024."79 = u3.01233

* 1224.0 = 9 31 12.52 +32 4 2.0

+3 44.44 −17 4.4

* 1229.0 = 9 35 1.00 +31 46 53.2

+0.45 −3.0

Ap. pl. * = 9 35 1.45 +31 46 50.2

−1 20.12 −11 33.4

" " E = 9 33 41.73 +31 35 16.4

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1888phaeproj..505.

Feb. 22. 1889.

Comet f. 1889. (Barnard) Obs. Pl.

$f = -0.^{\circ}K31^{\prime}$
$g = 9^{h}\ 16.^{m}5^{\prime}$
$h = 19\ \ 22.9^{\prime}$

g	16,5		19	22.9	
g	35.0		g	35.0	
(G+L) : 1F	51.5		K	57.9 = (H+L)	

$\log g = +0.5674^{\prime}$
" $h = +1.2775^{\prime}$
" $i = -0.4454^{\prime}$

$\log \frac{1}{\Delta} = +0.4239^{\prime}$
" $g = +0.5674^{\prime}$
" $\sin(G+L) = -9.9490^{\prime}$
" $\cos\delta = +9.7921^{\prime}$
$-0.^{\circ}1K9^{\prime} = -9.1721^{\prime}$

$\log \frac{1}{\Delta} = +0.4239^{\prime}$
" $h = +1.2775^{\prime}$
" $\sin(H+L) = +9.9439^{\prime}$
" $\sec\delta = +0.0706^{\prime}$
$+1.^{\circ}K32^{\prime} = +0.1^{\circ}5^{\prime}59^{\prime}$
$-0.^{\circ}54^{\prime}0^{\prime}$
$+0.^{\circ}4^{\prime}52^{\prime}$ Cor. in L

$\log g = +0.5674^{\prime}$
" $\cos(G+L) = +9.3K40^{\prime}$
$+0.''82^{\prime}$ $+9.9158^{\prime}$

" $h = +1.2775^{\prime}$
" $\cos(H+L) = +9.K276^{\prime}$
" $\sin\delta = +9.7266^{\prime}$
$+2.''67^{\prime}$ $+0.K267^{\prime}$

" $i = -0.4454^{\prime}$
" $\cos\delta = +9.9290^{\prime}$
$-6.^{\circ}5K^{\prime} = -0.4152^{\prime}$
$+3.K9^{\prime}$
$-3,0^{\circ}5^{\prime}$ Cor. in δ.

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1888phae.proj..505.

March 1, 1889

Comet of 1888 Barnard R 50 p. 164



	∈		★		∈ − ★			
6^h	41	15.8	38	53.0				
	41	45.8	39	38.0				
	82	1.6 ✓	78	31.0 ✓	+ 4	30.6	2	15.30
	45	7.0	42	43.9				
	45	36.7	43	28.7				
	90	43.7 ✓	86	12.6 ✓	4	31.1	2	15.55
	48	30.5	46	7.5				
	49	0.0	46	52.5				
	97	30.5 ✓	93	0.0 ✓	4	30.5	2	15.25
	52	9.0	49	46.5				
	52	38.8	50	31.6				
	104	47.8 ✓	100	18.1 ✓	4	29.7	2	14.85
	56	16.9	53	53.9				
	56	45.0	54	39.0				
	113	1.9 ✓	108	32.9 ✓	4	29.0	2	14.50
								.45
							+ 2	15.09

	487	125.5	.7
Mean Fcts 6^h	48	54.6	.7 R
	+ 0	2.2 ✓	
6^h	48	56.8	.7
22	38	42.0	.7
8^h	10	14.8	.7
	− 1	20.3	.7
8^h	8	54.5	.7
4	44	31.0	
12^h	53	25.5	= G. M. T. of obs.

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Δ E	Δ *	E + *
30.0	45.0	75.0
29.7	44.8	74.5
29.5	45.0	74.5
29.8	45.1	74.9
28.1	45.1	73.2

22.1

74.42

Log 74.42 = 1.87169

" 7.5 = 0.87506

" cos. δ = 9.92962

474.6 = 2.67637

886.0 / 411.4 = 6′ 51.4″

3 25.7

31 44 39.3

31 48 5.0

1.87169

0.87506

9.92936

474.4 = 2.67611

886.0 / 411.6 = 6′ 51.6″

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1888phae.proj..505.

Mar. 1, 1889.

Comet f 1888 Barnard

Comp. Star. = D.M. +31° 2012 (8.9 K)

D.M. place = 9h 28 36.5 +31° 54.5

Gr. 9h 60s = 9 26 49.64 +32 1 36.2
+1 54.42 −8 23.7
9 27 44.06 +31 53 12.5

Mid. Pl. = 1887 11 6.9

Log $\frac{w}{r\Delta}$ = +0.12615
" sin α = +9.72754
" tan δ = +9.79344
Sum log. = +9.70713
+0.5100
+3.0719
+3.5419 = +0.5512
6K. = +1.40618
229.25 = +2.36030

Log w = +1.30224
" cos K = w 9.49768
" 6K. = +1.40618
101K." 1 = w 3.00610

*1425.0 = 9 26 49.64 +32 1 36.2
+3 49.25 −16 54.1
*1449.0 = 9 30 38.89 +31 44 42.1
+0.84 −2.8
Ap. pl. * = 9 30 39.73 +31 44 39.3
+2 15.09 +6 51.6
Ap. pl. δ = 9 32 54.82 +31 51 30.9

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1888phae.proj..505.

Mar. 1. 1889.

Comet f. 1889. (Barnard) Obs. PK.

$f = -0.^{\circ}5624$ $\quad \alpha = 9^{h}\ 30.6^{s}$ $\quad \alpha = 9^{h}\ 30.6^{s}$

$\delta = 9^{h}\ 14.2^{s}$ $\quad \delta = 9\ 18.2^{s}$ $\quad H = 19\ 18.6^{s}$

$H = 19\ 14.6^{s}$ $\quad \delta+\alpha = 18^{h}\ 48.8^{s}$ $\quad H+\alpha = 4\ 49.2^{s}$

Log $g = +0.5623^{s}$

" $h = +1.2771^{s}$ $\quad \delta = +31^{\circ}\ 44.7^{s}$

" $c' = -0.4424^{s}$

Log $\frac{1}{r} = +0.4239^{r}$

" $g = +0.5623^{s}$

" $\sin(\delta+\alpha) = -9.9901^{s}$

" $\cos\delta = +9.7915^{s}$

-0.147^{s} $\quad -9.1678^{s}$

" $\frac{1}{r} = +0.4239^{r}$

" $h = +1.2771^{r}$ ✓

" $\sin(H+L) = +9.9789^{s}$

" $\sec\delta = +0.0704^{s}$

$+1.414^{s}$ $\quad +0.1503^{s}$

-0.428^{r} ✓

-0.147^{s} ✓

-0.575^{r} ✓

$+1.414^{r}$ ✓

$+0.839$ = Cor. in α

Log $g = +0.5623^{s}$

" $\sin(\delta+\alpha) = +9.9249^{s}$

$+0.77^{s}$ $\quad +9.8872^{s}$

" $h = +1.2771^{r}$ ✓

" $\cos(H+L) = +9.4829$ ✓

" $\sin\delta = +9.7211$ ✓

$+3.03^{r}$ ✓ $\quad +0.4811$ ✓

" $c' = -0.4424^{r}$ ✓

" $\cos\delta = +9.9296^{s}$

-6.58^{s} $\quad -0.8180^{s}$

$+0.77^{r}$ ✓

$+3.03^{r}$ ✓

$+3.80^{r}$ ✓

-6.58^{r} ✓

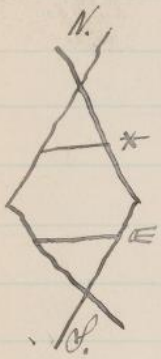
-2.78 = Cor. in δ

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1888phae.proj..505.

March 7, 1889

Comet f 1888 Barnard (R 50 p. 171)



	∈		*		∈ − *		
7h	57	32.5	56	45.0			
	58	19.5	57	19.6			
	115	52.0	114	4.6	+ 1m	47.4s	+ 0 53.70s
	60	6.0	59	10.4			
	60	44.6	59	53.2			
	120	50.6	119	3.6	1	47.0	0 53.50
8h	2	15.5	1	20.0			
	2	55.0	2	2.8			
	125	10.5	3	22.8	1	47.7	0 53.85
	4	35.5	3	40.0			
	5	14.2	4	22.8			
	129	49.7	8	2.8	1	46.9	0 53.45
	6	38.4	5	43.9			
	7	18.1	6	26.5			
	133	56.5	12	10.4	1	46.1	0 53.05
	9	6.0	8	11.6			
	9	45.5	9	54.0			
	13~~8~~	51.5	18	5.6	1	45.9	0 52.95
	12	22.0	11	27.4			
	13	1.5	12	10.0			
	14~~5~~	23.5	23	37.4	1	46.1	0 53.05
							23.55
							+ 0 53.36

905 294.3

Mean Sat. 8h 4 59.6 M.R.

+ 0 19.2

8 5 8.8

23 2 21.4

9h 2 47.4

−1 28.9

9 1 18.5 C. m. T.

~~9h 1 24.2 = Camb. m. T. of obs.~~

~~4 44 31.0~~

~~13h 45 55.2 = Gr. m. T. of obs~~

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Δ ∈	Δ ☀	∈ + ☀
47.0	34.6	81.6
38.6	42.8	81.4
39.5	42.8	82.3
38.7	42.8	81.5
39.7	42.6	82.3
39.5	42.4	81.9
39.5	42.6	82.1

13.1

81.87

3 7.0

33 30 32.1

33 ~~38~~ 27 ~~39.1~~ 25.1

Log. 81.87 = 1.91312

" 75 = 0.87506

" cos. δ = 9.92106

512.0 = 2.70924

886.0

~~98.0~~

374.0 = 6 14.0

1.91312

0.87506

9.92 ~~080~~ 132

2.70 ~~888~~ 950

512.3

~~5116~~

886.0

~~374.1~~ 373.7 = 6 13.7

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March 7 1889

Comet f 1888 Barnard

Comp. Stat = D.M. +33° 1879 (8.2 K)

D.M. place = 9h 25 24.9 +33° 38.8

Yr. 9h	9 23 34.90	+33 47 16.6
	+1 6.29	−2 17.9
Mid. Pl. =	9 24 31.19	+33 34 58.7
	141 22 47.2	

Log $\frac{m}{r}$ = +0.1261 — Log u = +1.3022

" sin α = +9.7992 — " cos α = −9.4922

" tan δ = +9.4232 — 6K. = +1.4061

Sum logs. = +9.7469 — −1002".9 = −3.0012

+0.0000

+3.0719

+3.6207 = 0.0960

6K. = 1.4061

232.16 = 2.3657

* 1425.0 =	9 23 34.90	+33 47 16.6
	+3 2.16	−16 42.9
* 1449.0 =	9 27 27.06	+33 30 33.7
	+0.40	−1.6
Ap. pl. * =	9 27 27.46	+33 30 32.1
	+0 3.36	−6 13.7
Ap. pl. E =	9 24 21.22	+33 24 18.4

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1888phae.proj..505.

Mar. 7. 1889.

Comet f. 1889 (Barnard) Mp. Pl.

$f = -0.8157$	$\mathfrak{H} = 9^h\ 18^m.3$	$H = 18^h\ 52^s.2$
$g = 9^h\ 18^m.3$	$t = 9\ \ 27.5$	$t = 9\ \ 27.5$
$h = 18^h\ 52^s.2$	$(\mathfrak{H}+H) = 16\ 51.8$	$(H+h) = 8\ \ 20.3$

$\log g = +0.5550$
" $h = +1.2769$
" $c = -0.9008$

$\log \frac{1}{r} = +0.4239$		$\log g = +0.5550$
" $f = +0.5550$		" $\cos(\mathfrak{H}+H) = +9.2548$
" $\sin(\mathfrak{H}+H) = -9.9924$		$+0.^{m}76$ $\quad +9.8135$
" $\sin \delta = +9.8209$		
$-0.^{m}156$ $\quad -9.1926$		" $h = +1.2769$
		" $\cos(H+h) = +9.6247$
$\log \frac{1}{r} = +0.4239$		" $\sin \delta = +9.7820$
" $h = +1.2769$		$+4.^{s}32$ $\quad +0.6816$
" $\sin(H+h) = +9.9976$		
" $\sec \delta = +0.0749$		" $c = -0.9008$
$+1.^{s}366$ $\quad +0.1373$		" $\cos \delta = +9.9911$
		$-6.^{s}6$ $\quad -0.8219$

$-0.^{m}8157$
$-0.^{m}156$
$-0.^{m}971$
$+1.^{s}366$
$+0.^{m}395$ = Mp. pl. cor. in R. A.

$+0.^{m}6$
$+4.^{s}32$
$+5.^{s}03$
$-6.^{s}6$
$-1.^{m}61$ = Mp. pl. cor. in δ.

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Apr. 2, 1889 (R50, p. 214)

Comet b, (1889 Barnard)



	∈		*		∈ − *	
9h	32	43.4 v	33	55.8 v		
	33	33.0 v	34	10.0 v		
	66	16.4 c	68	5.8 cc	− 1m 49.4 cc	0m 54.70 cc
	35	35.0 v	36	48.0 v		
	36	23.8 v	37	1.8 v		
	71	58.8 c	73	49.8 cc	− 1m 51.0 cc	0m 55.50 cc
	38	25.5 v	39	39.0 v		
	39	15.0 v	39	52.2 v		
	77	40.5 c	79	31.2 cc	− 1m 50.7 cc	0m 55.35 cc
	41	52.4 v	43	6.0 v		
	42	41.5 v	43	19.4 v		
	84	33.9 c	86	25.4 cc	− 1m 51.5 cc	0m 55.75 cc
	44	12.5 v	45	25.1 v		
	45	0.8 v	45	38.1 v		
	89	13.3 c	91	3.2 cc	− 1m 49.9 c	0m 54.95 cc
						1.25
						− 0m 55.25 cc

387 12 2.9 T

Mean Sid. 9h 38 5 8.3 T S R

+ 1m 18.0 c

9h 40 16.3 v

0 44 51.7 m v

9h 55 24.6 v

− 1 27.7 T

9h 53 56.9 v = Comb. M. T. of obs.

4 44 31.0

13h 38 27.9 m v = G. M. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	$\alpha - \delta$
49.6″	14.2″	35.4″
48.8″	13.8″	35.0″
49.5″	13.2″	36.3″
49.1″	13.4″	35.7″
48.3″	13.0″	35.3″

$\sqrt{2 \times 3} = 49.06$ ✓ $\quad \sqrt{67.6} = 13.2$ ✓ $\quad \frac{35.3}{2.7} = 35.54''$ ✓

$\log 35.54 = 1.55072$ ″

$\log 7.5 = 0.87506$ ″

$\log \cos\delta = 9.98$ ~~088~~ ✓

$\log \frac{2\sqrt{2}\sqrt{6.1''}}{124.0''} = 2.80436$ ✓

$16 - 7 = 9$ ✓ $\quad 1.6 = 4.0$ ✓ $\quad \frac{16}{6.2} = 2.6$ mid dy

1.55072 ✓

0.87506 ✓

9.9866 ✓

$-2\sqrt{6.1''} = 2.80446$ ✓

$-4' 16.1''$ ✓

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1888phae.proj..505.

Apr. 2, 1889

Comet a, 1889 Barnard

Comp. Stat = D.M. +16° 778 (7.3 K)

D.M. place = 5h 18 16.6 +16° 5.6

Str. 5h 19-22 = 5 16 33.42 +16° 3' 27.7 (4)

Mid. Pl. = 5 16 23.72 +16 5 26.7

79° 35' 56."

Log $\frac{a}{r}$ = +0.12611 log w = +1.30221

" sin ϕ = +9.99241 " cos ϕ = +9.25657

" tan δ = +9.46011 " 6K. = +1.40618

Sum Logs. = +9.57903 +231.7 = +2.36496

Cor. No. = +0.3793

+0.3793

+3.0707

+3.4500 = +0.37422

6K. = +1.40618

220".40 = 2.34400

(1425.0) 5h 16m 33.42 +16° 3' 27.7

+3 40.40 +3 51.7

*1425.0 = 5 20 14.22 +16 7 19.4

−0.24 −5.2

Ap. pl. α = 5 20 13.38 +16 7 14.2

−0 55.25 −4 16.1

Ap. pl. δ = 5 19 14.13 +16 2 58.1

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1888phae.proj...505.

Aug. 2. 1889.

Barnard 05 (dec. Mar. 31.)

Aug. Pl.

$f = -0.^{r}271^{r}$

$g = 4\ 37.4^{r}$

$h = 17\ \ 0.7^{r}$

$\log g = +0.4400^{r}$

$\log h = +1.2754^{r}$

$\log i = -0.8945^{r}$

4 37.4
r 20.2
13 r4.0
(5+4)

17 0.7
r 20.2
22 20.9
(H+4)

$\log \frac{1}{r} = +4.4239^{r}$.

$\log g = +0.4400^{r}$.

$\log \sin(5+K) = -9.6923^{r}$.

$\log \cos \delta = +9.4609^{r}$.

-0.026^{r} -4.4171^{r}.

$\log \frac{1}{r} = +4.4239^{r}$

$\log L = +1.2754^{r}$

$\log \sin(H+4) = -9.6223^{r}$

$\log \sec \delta = +0.0174^{r}$

-0.1424^{r} -9.7390^{r}.

-0.026^{r}

-0.271^{r}

-0.4415^{r}.

$\log g = +0.4400^{r}$.

$\log \cos(5+4) = -9.9397^{r}$.

-2.40^{r} -0.3797^{r}.

$\log L = +1.2754^{r}$

$\log \cos(H+4) = +9.9141^{r}$.

$\log \sin \delta = +9.4434^{r}$.

$+4.7^{r}$ $+0.6770$

$\log i = -0.8941^{r}$.

$\log \cos \delta = +9.9426^{r}$.

-7.60^{r}. -0.4407^{r}.

-2.40^{r}

-10.00^{r}.

$+4.7^{r}$

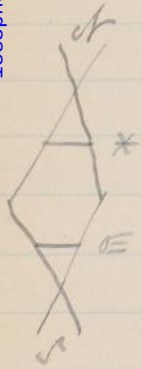
-5.12^{r} = Cor. to Aug. Pl.

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1888phae.proj..505.

Apr. 6. 1889. (Book 51. p. 3.)

Comet b Barnard (dec. Mar. 31)



	E	*	E − *
9	29 12.2	28 49.2	
	29 10.1	29 22.7	
	59 2.3	58 11.9	0 50.4 0 25.20
	30 37.0	30 18.3	
	31 18.4	30 47.4	
	61 51.4	61 1.7	0 49.7 0 24.85
	32 3.3	31 39.7	
	32 40.0	32 12.0	
	64 43.3	63 51.7	0 51.6 0 25.80
	33 27.5	33 3.4	
	34 3.3	33 36.7	
	67 28.8	66 40.1	0 48.7 0 24.35
	35 32.0	35 10.0	
	36 10.4	35 42.9	
	71 42.4	70 52.9	0 49.5 0 24.75
			4.95
			+ 0 24.99

Mean Sidereal Time

32 2	16 8.2	
32	28.8	M R
+1	26.5	
9h 33	55.3	
1 0	37.9	
8h 33	17.4	
−1	24.1	
8h 31	53.3	
4 44	31.0	
13h 16	24.3	= Gr. M. T. of obs.

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1888phae.proj..505.

1 ∈	1 ★	∈ + ★
37.9″	33.5″	71.4″
37.4″	33.1″	70.5″
36.7″	32.3″	69.0″
37.8″	33.8″	71.1″
38.4″	32.9″	71.3″

$\sqrt{1422.2} = 37.6$ ✓ $\qquad \sqrt{1086.1} = 33.0$ ✓ $\qquad \frac{71.3}{3.3} = 70.66$″

Log 70.66 = 1.84917 ✓.
" 7.5 = 0.87506 ✓.
" cos δ = 9.99292 ✓
509.″7 = 2.70717 ✓
$\frac{\Delta\alpha 6.0}{376.″7} = -6'\ 16.″$ ✓

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1888phae.proj..505.

Aftr. 6. 1889.

Comet = Barnard (dec. Mar. 31.)

Comp. Star = 2 Aq. +15° 799 (7.2 K)

Fr. 5h 392-3 — 5h 12 19.40 — +15° 56 39.6 — (1+2+3.0)
+1 50.40 — +2 5.1
Mid. Pl. = 5 14 10.20 — +15° 58 44.7
78° 32′ 33″

Log $\frac{a}{r}$ = +0.12611 — log h = 1.30220
" sin ϕ = +9.99126 — log cos ϕ = 9.29807
" tan ϕ = +9.47690 — " 6K. = 1.40618
+0.37572 = +9.57427 — 25K.″9 = 2.40647
3.0707
+3.44579 = +0.57371
6K. = +1.40618
220.″5K = +2.34349

(* 1+2+3.0) = 5 12 19.40 — +15 56 39.6
+3 40.5K — +4 15.9
(* 1+4+9.0) = 5 16 0.3K — +16 0 55.5
−0.92 — −5.4
(Ap. pl. *) = 5 15 59.42 — +16 0 49.1
+0 24.99 — −6 16.5
" " δ = 5 16 24.41 — +15 55 32.6

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1888phae.proj..505.

Apr. 6. 1889.

Comet b Barnard (disc. Feb. 31)

$f = -0^{\circ}.237$,7 $\quad G = 8\ 17.5$,7 $\quad H = 16\ 43.7$,7

$g = 24\ 17.5$,7 $\quad \alpha = 5\ 16.0$,7 $\quad \alpha = 5\ 16.0$,7

$H = 16\ 43.7$,7 $\quad G+\alpha = 13\ 33.5$,7 $\quad H+\alpha = 21\ 59.7$,7

$\log g = +0.1431$,7

$\log h = +1.2764$,7 $\quad \delta = 16^{\circ}\ 0.9$,7

$\log i = -0.0494$,7

25

$\log 1/\Delta = +8.8239$,7

$\log g = +0.4314$,7

$\log \sin(G+\alpha) = -9.5985$,7

$\log \tan\delta = +9.4579$,7

-0.020 ,7 $= -8.3117$,7

$\log 1/\Delta = +8.8239$,7

$\log h = +1.2768$,7

$\log \sin(H+\alpha) = -9.7000$,7

$\log \sec\delta = +0.0172$,7

-0.658 ,7 $= -9.8179$,7

-0.237 ,7

-0.020 ,7

-0.915 ,7 = Cor. in R.A.

$\log g = +0.4314$,7

$\log \cos(G+\alpha) = -9.9628$,7

-2.48 ,7 $= -0.3942$,7

$\log h = +1.2768$,7

$\log \cos(H+\alpha) = +9.9372$,7

$\log \sin\delta = +9.4407$,7

$+4.52$,7 $= +0.6547$,7

$\log i = -0.8898$,7

$\log \cos\delta = +9.9828$,7

-7.46 ,7 $= -0.8726$,7

-2.48 ,7

-9.94 ,7

$+4.52$,7

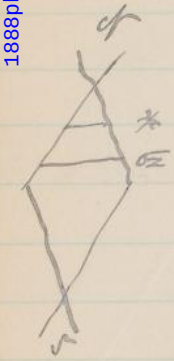
-5.42 ,7 = Cor. in Dec.

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Aftr. 19. 1889. (51. 30)

Comet b 1889 (Barnard Febr. 31.)



	Ω	*	Ω − *
10	11 46.6 ν	14m 37.4 ν	
	11 42.ν ν	14 ν1.9 ν	
	22 51.1 ν	31 29.3 ν	− 8m 38.2 − 4m 19.10
	17 9.ν ν	21 36.0 ν	
	17 42.ν ν	21 ν1.7 ν	
	34 52.0 ν	43 29.7	8 37.7 4m 18.85
	22 49.0 ν	27 17.7 ν	
	23 21.1 ν	27 30.ν ν	
	46 10.1	54 48.2	8 38.1 4m 19.05
	29 9.9 ν	33 39.4 ν	
	29 41.4 ν	33 ν0.2 ν	
	58 ν1.3	67 29.6	8 38.3 4m 19.15
	46 10.0 ν	ν0 34.0 ν	
	46 ν5.4 ν	ν0 νΚ.Α ν	
	92 55.4	101 32.8	8 37.4 4m 18.70
			94.85
			− 4m 18.970

Mean Sidereal 0h

	252	219.9
	25	34.0
	+ 1m	54.4
10	27	28.4
1	51	53.1
8h	35	35.3
	− 1	24.5
8h	34	10.8
4	44	31.0
13h	18	41.8 = Gr. M. T. of obs.

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1888phae.proj..505.

$\Delta \alpha$	$\Delta \delta$	$\alpha - \delta$
33.9	14.5	19.4
33.0	13.7	19.3
32.1	12.8	19.3
31.5	10.18	20.7
35.4	16.8	18.6

$\sqrt{165.9}$ = 33.1 ✓

$\sqrt{64.6}$ = 13.72 ✓

2.3

0m 19.46

log 19.46 = 1.28914 ✓

" 7.5 = 0.87506 ✓

" cos. δ * = +9.98387 ✓

= +2.14807 ✓

2 | 140.6

− 70.3

15 13 18.1 *

−1 10.3

15 12 7.8

1.28914 '

0.87506 '

9.98453

" 140.8 = 2.14873

− 21. 20."8

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1888phae.proj..505.

Apr. 19. 1889.

Comet b. 1889 (Barnard Febr. 31)

Comp. Star = Dm. +15° 790 (4.0 K)

Dm. pos. = 5h 12m 24.4s +15° 29' 2" (1 Vars.)

Yr. 5h 346. = 5h 10m 41.89s +15° 26' 59.6" (4.9)

	+1 49.79	+2 17.0
Mid. Place =	5 12 31.68	15° 29 16.6
	78° 7' 55.20"	

Log. $\frac{u}{15}$ = +0.12611

" sin α = +9.99062

" tan δ = +9.44256 (64)

+0.3625 = +9.55927

+3.0707

+3.4332 = 0.53570

64 = 1.80618

219.72 = +2.34188

Log. u = +1.30220

" cos. δ = +9.31315

" 64 = +1.80618

264.0 = +2.42153

(* 1825.0)	5h 10m 41.89s	+15° 26' 59.6"
	+3 39.72	+4' 24.0
(* 1889.0) =	5h 14 21.61	15° 31 23.6
	-1.09	-5.5
(Ap. pl. *) =	5h 14 20.52	+15° 31 18.1
	-4 16.97	-2 20.2
" " =	5 10 1.55	+15 24 57.3

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1888phae.proj..505.

Apr. 19, 1889

Comet b 1889 (Barnard Mar. 31)

f = −0.156 ″
G = 7ʰ 33.5 ″
H = 15ʰ 50.0 ″
$(G+\alpha)$ = 12ʰ 47.9 ″
$(H+\alpha)$ = 21ʰ 4.4 ″
α = 5ʰ 14.4 ″
$\log g$ = +0.3996 ″
$\log h$ = +1.2833 ″
$\log i$ = −0.8467 ″
δ = 15° 31.4 ″

Log 1/15 = +8.8239 ″
" g = +0.3996 ″
" $\sin(G+\alpha)$ = −9.3170 ″
" $\tan\delta$ = +9.4437 ″
− 0.010 ″ = −7.9842 ″

Log 1/15 = +8.8239 ″
" h = +1.2833 ″
" $\sin(H+\alpha)$ = −9.8410 ″
" $\sec\delta$ = +0.0161 ″
− 0.921 ″ = −9.9643 ″
~~− 0.156~~
− 0. ″
~~− 2.041~~ = ~~cor. in R.A.~~
− 0.921 ″
− 0.156 ″
− 0.010 ″
− 1.087 ″ cor. in R.A.

Log. g = +0.3996 ″
" $\cos(G+\alpha)$ = −9.9904 ″
− 2.46 ″ = −0.3900 ″

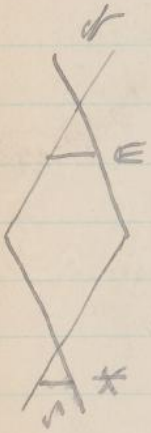
Log h = +1.2833 ″
" $\cos(H+\alpha)$ = +9.8577 ″
" $\sin\delta$ = +9.4275 ″
+ 3.70 ″ = +0.5685 ″
" i = −0.8467 ″
" $\cos\delta$ = +9.9839 ″
− 6.77 ″ = −0.8306 ″
− 2.46 ″
− 9.23 ″
+ 3.70 ″
− 5.53 ″ = Cor. in Dec.

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1888phae.proj..505.

Comet b 1849 (Bernard Mar. 31.

Apr. 23. 1849.



	E	*	E − *
10	26 vA.L ν	29 1.5 ν	
	27 26.5 ν	29 16.7 ν	
	54 25.3 a.	58 18.2 a.	− 3 52.9 a. − 1 56.45 a.
	30 33.1 ν	32 37.4 ν	
	31 1.0 ν	32 51.7 ν	
	61 34.1 a.	65 29.1 a.	3 55.0 a. 1 57.50 a.
	33 K5.7 ν	35 K2.6 ν	
	34 12.0 ν	36 2.0 ν	
	67 57.7 a.	71 50.6 a.	3 52.9 a. 1 56.45 a.
	37 5.3 ν	39 2.7 ν	
	37 30.9 ν	39 21.4 ν	
	74 36.2 a.	78 30.1 a.	3 53.9 a. 1 56.95 a.
	40 4.9 ν	42 2.0 ν	
	40 29.0 ν	42 19.6 ν	
	80 33.9 a.	84 27.6 a.	3 53.7 a. 1 56.85 a.
			4.20 a.
			− 1m 56.84 a.

(Mean retro 4 33 54:7 R.R.

	336	187.2 a.
	+2	4.4
10	35	59.1 a.
2	7	39.3 a.
8	28	19.8 a.
	−1	23.3 a.
8	26	56.5 a.
4	44	31.0 a.
13	11	27.5 = Gr. m. T. of obs.

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1888phae.proj..505.

$-\Delta\alpha$ $+\Delta\delta$ $\in -\delta$

-27.7^{s} $+15.2^{s}$ -12.5^{s}

27.9^{s} 14.3^{s} 13.6^{s}

26.3^{s} 13.4^{s} 12.9^{s}

25.6^{s} 12.7^{s} 12.9^{s}

24.1^{s} 11.6^{s} 12.5^{s}

$\sqrt{131.6}$ $\sqrt{67.2}$ 4.4

26.3 13.44 $= 0^{m}\ 12.88^{s}$

$\log -12.88 = -1.10992^{s}$

$\log 7.5 = +0.87506^{s}$

$\log \cos\delta = +9.98466^{?}$

$\log -93.2'' = -1.96964^{?}$

-1.10992^{s}

0.87506^{s}

$9.98450^{?}$

-1.96941^{s}

$-93.2''$

$2\overline{)792.8''}$ $396.4''$ $= +6\ 36.4^{?}$

$15\ 15\ 5.5$

$\frac{886.0''}{792.8''} = +13'\ 12.8''$

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Comet b 1889 (Barnard Mar. 31.)

Apr. 23. 1889.

Comp. Stat = 2M. +15° 779 (P.T.K)

Pos. 1855 = 5^h 4^m $50^s.2$ +15° 5'.4

Gr. 5^h 2K0 = 5^h 7^m 4.33 ✓ +15° 3' 4K"6 ✓ (9)

	+1 49.44	+2 26.9
Mid. Place. =	5^h 8 57.77	15 6 12.5
	77° 14 26.55	

Log. $\frac{11}{15}$ = +0.12611
" sin. δ = +9.98914
" tan. γ = +9.43118
+0.3519 = +9.54643

+3.0707
+3.4226 = 0.53486

Log. 64 = 1.80618
219.05 = 2.34054

Log. 11 = +1.30220
" cos. δ = +9.34411
" 64 = +1.80618
283.5 = +2.45249

(*1825.0) =	5^h 7^m 8.33	+15° 3' 45.6"
	+3 39.05	+4' 43.5
(*1889.0) =	5^h 10 47.38	+15° 8 29.1
	-1.12	-5.5
app. Pl. * =	5^h 10 46.26	+15 8 23.6
	-1 56.84	+13 12.8
app. Pl. α =	5^h 8 49.42	+15 21 36.4

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Comet b 1889 (Barnard Mar. 31)

Aph. 23 1889

$f = -0.111$ ″

$G = 7^h 9.9$ ″ $\quad \Delta G = 7^h 9.9$ ″ $\quad H = 15^h 33.9$ ″

$H = 15^h 33.9$ ″ $\quad \alpha = 5^h 10.8$ ″ $\quad \alpha = 5^h 10.8$ ″

$(G+\alpha) = 12\ 20.7$ ″ $\quad (H+\alpha) = 20^h 44.7$ ″

$\log g = +0.3702$ ″

″ $h = +1.2857$ ″ $\quad \delta = +15^\circ\ 8.5$ ″

″ $i = -0.8281$ ″

$\log 1/15 = +8.8239$ ″

″ $g = +0.3702$ ″

″ $\sin(G+\alpha) = -8.9551$ ″

″ $\tan \delta = +9.4323$ ″

-0.004 ″ $= -7.5815$ ″

$\log 1/15 = +8.8239$ ″

″ $h = +1.2857$ ″

″ $\sin(H+\alpha) = -9.8766$ ″

″ $\sec \delta = +0.0154$ ″

-1.004 ″ $= -0.0016$ ″

-0.111 ″

-0.004 ″

-1.119 ″ = cor. in R.A.

$\log g = +0.3702$ ″

″ $\cos(G+\alpha) = -9.9982$ ″

-2.34 ″ $= 0.3684$ ″

$\log h = +1.2857$ ″

″ $\cos(H+\alpha) = +9.8184$ ″

″ $\sin \delta = +9.4170$ ″

$+3.32$ ″ $+0.5211$ ″

$\log i = -0.8281$ ″

″ $\cos \delta = +9.9846$ ″

-6.50 ″ $= -0.8127$ ″

-2.34 ″

-8.84 ″

$+3.32$ ″

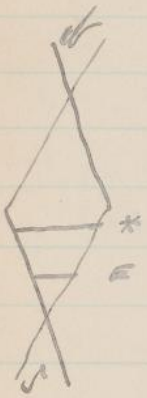
-5.52 = cor. in Dec.

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1888phae.proj..505.

Comet f. 1848 V (Barnard Oct. 30)

Apr. 26. 1849.



	E		*		E − *			
12	2	0.0 v	0	v.v v				
	2	37.1 v	1	22 v				
	4	37.1	1	7.7	+3	29.4	1	44.70
	v	10.6 v	3	17.2 v				
	v	46.6 v	4	12.v v				
	10	57.2	7	28.3	3	28.9	1	44.45
	4	29.v v	6	3v.4 v				
	9	7.0 v	7	32.3 v				
	17	36.5	14	v.7	3	28.8	1	44.40
	12	17.6 v	10	23.6 v				
	12	vv.v v	11	21.2 v				
	25	13.3	21	44.8	3	28.5	1	44.25
	1v	20.1 v	13	2v.0 v				
	1v	v7.0 v	14	22.4 v				
	31	17.1	27	47.3	3	29.8	1	44.90
								2.70
					+	1m		44.54

This object comes out to be a star.

	87	161.2	
12h	8	58.1	
	+2	6.8	
12	11	4.9	
2	11	35.9	
9	59	29.0	
	1	28.4	
9	58	0.6	
4	44	31.0	
14	42	31.6	= Gr. m. T. of obs.

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Reject; not the comet

$\Delta\alpha\cos\delta$	$\Delta\delta$	$\alpha - \delta$
37.1'	56.7'	19.6'
36.4'	56.7'	20.3'
37.5'	56.9'	19.4'
37.7'	57.6'	19.9'
36.9'	57.3'	20.4'

4.6

α^m 19.92

Log 19.92 = 1.29929

1. 7.5 = 0.87506

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Comet f. 1888 V. (Barnard Oct. 30)

Nov. 24. 1889.

Comp. star = 2 M. +37° 199 (A.2 K)

* 1455 = 9h 23m 24.6 +37° 44' 40"

This object turns out to be a star.

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1888phae.proj..505.

Comet of 1888 V (Barnard Oct. 30)

Aph. 24, 1889

f =
G =
H =
Log q =
" n =
" i =

Log $1/15$ = +8.8239
" g =
" $\sin(G+\Omega)$ =
" $\tan \delta$ =

" $1/15$ =
" h =
" $\sin(H+\Omega)$ =
" $\sec \delta$ =

Log g =
" $\cos(G+\Omega)$ =

Log h =
" $\cos(H+\Omega)$ =
" $\sin \delta$ =

Log i =
" $\cos \delta$ =

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Computation of Parallaxes for Comet b. 1889 (Barnard Mar. 31)

Apr. 2.

H. A. = +4h 21.0m +16° 3′

Log. 0.″396 = 9.7999
0.0161
Log. p. Δ. = +9.6160

Log. 4.″20 = 0.6212
0.0161
+0.6373

Apr. 6.

H. A. = +4h 17.7m +15° 57′

Log 0.396 = 9.7977
0.0161
Log. p. Δ. = +9.6138

4.″74 = 0.6756
0.0161
+0.6917

Apr. 19.

H. A. = + 3h 17.3m +15° 29′

Log. 0.431 = 9.6342
0.0161
Log. p. Δ. = +9.6426

3.″24 = 0.7193
0.0161
+0.7354

Apr. 23.

H. A. = +3h 29.2m +15° 22′

Log. 0.434 = 9.6377
0.0161
Log. p. Δ. = +9.6516

3.″30 = 0.7243
0.0161
+0.7384

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Dec. 19, 1888 (see p. 24)

Unlettered * joined to Lettered *

Lettered * = 42 Dr. −7° 159 (7.3 K)

Dm. Place = 0h 54 14.5 −7° 34.5

W. 0h 9 K A = 0h 52m 44.05s −7° 44′ 41.″4 (1825)

+1 35.41 +10 15.2

Mid. Pl. = 0h 54 19.46 −7° 34 26.2

13° 34 51.90

Log. $\frac{m}{15}$ = +0.12611

" sin. α = +9.37074

" tan. δ = −9.49613

−0.04417 = −9.49304

= −8.62059

+3.07707 +0.48130

+2.76995 = +0.43083

+3.02907

63 = +1.79934

+16.99 = +2.23017

190.83 = 2.28064

Log. m = +1.30220

" cos. α = +9.98768

" 63 = +1.79934

+1228.0 = +3.08922

(* 1825.0) = 0h 52m 44.05s −7° 44 41.4

+3 10.83 +2.0 28.0

(* 1888.0) = 0h 55 54.88 −7° 24 13.4

+0 2.29 +0 9.3

app. Pl. Let. * = 0h 55 57.17 −7° 24 4.1

−3 3.06 −11 9.5

app. Pl. Un. * = 0h 52 54.11 −7° 35 13.6

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Dec. 19, 1888

Aspp. Place.

$f = +1.999$ $\quad \mathcal{G} = 1^h\ 9.7$

$\mathcal{G} = 1^h\ 9.7$ $\quad \alpha = 0\ 55.6$

$H = 0^h\ 4.3$ $\quad 2^h\ 5.3$

$\log g = +1.1364$

$\log h = +1.3106$

$\log i = +9.2201$

$\mathcal{H} = 0^h\ 4.3$

$\alpha = 0\ 53.7$

$\mathcal{H}+\alpha = 1^h\ 0.2$

$\delta = -7^\circ\ 24\ 13$

$\log .1/15 = +8.8239$

$\log g = +1.1364$

$\log \sin(\mathcal{G}+\alpha) = +9.7139$

$\log \tan \alpha = -9.1137$

$-0.062 = -8.7909$

$\log .1/15 = +8.8239$

$\log h = +1.3106$

$\log \sin(\mathcal{H}+\alpha) = +9.4128$

$\log \sec \alpha = +0.0036$

$+0.355 = +9.5583$

$+1.999$

$+2.3546$

-0.062

$+2.2924$ = cor. in R.a.

$\log g = +1.1364$

$\log \cos(\mathcal{G}+\alpha) = +9.9312$

$+11.1768 = +1.0680$

$\log h = +1.3106$

$\log \cos(\mathcal{H}+\alpha) = +9.9850$

$\log \sin \alpha = -9.1101$

$-2.54 = -0.4053$

$\log i = +9.2201$

$\log \cos \alpha = +9.9964$

$+0.16 = +9.2165$

$+11.7168$

$+11.8733$

-2.54

$+9.333$ = cor. in Dec.

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Computation of Parallaxes for Olbers's Comet, 1887 & 1888

1887
Sept. 16

H.A. =

1888
Jan. 11

H.A. = $-3^h\ 34^s$ $\checkmark$ $-2°.3$

Log. 0.340 = 9.5315 5.90 = 0.7709

0.0141 0.0141

Log p. Δ = w9.5456 0.7850

1888
Jan. 18

H.A = -3^h 52 $-3°.3$

Log. 0.359 = 9.5551 5.95 = 0.7745

0.0141 0.0141

Log. p. Δ = w9.5692 0.7886

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Computation of Parallaxes for Comet a Barnard 1888

1888 Oct. 29

H.a. = −3 41 | +3.5

Log. 0.348 = 9.5416 | 5.52 = 0.7419

0.0141 | 0.0141

n9.5557 | 0.7560

Oct. 30

H.a. = −3h 39.6 | +3°.2

Log. 0.347 = 9.5403 | Log. 5.54 = 0.7435

0.0141 | 0.0141

Log. p. Δ = n9.5544 | 0.7576

Oct. 31

H.a. = −3h 19.5 | +2°.0

Log. 0.323 = 9.5092 | 5.61 = 0.7490

0.0141 | 0.0141

Log. p. Δ = n9.5233 | 0.7631

Nov. 1

H.a. = −3h 10 | +2°.7

Log. 0.312 = 9.4942 | 5.54 = 0.7435

0.0141 | 0.0141

Log. p. Δ = n9.5083 | 0.7576

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Computation of Parallaxes

Comets a Barnard con.

Nov. 3

$-3^h 8$ $\quad +2.0$

Log $-0.309 = 9.4900$ $\quad 5.59 = 0.7474$

0.0141 $\quad 0.0141$

9.5041 $\quad 0.7615$

Nov. 7

H.a. $= -2^h 32.6$ $\quad +0.8$

Log. $0.261 = 9.4166$ $\quad 5.68 = 0.7543$

0.0141 $\quad 0.0141$

Log. p. $\Delta = 9.4307$ $\quad 0.7684$

Nov. 12

H.a. $= -1^h 47$ $\quad -0.8$

Log. $0.189 = 9.2765$ $\quad 5.83 = 0.7657$

0.0141 $\quad 0.0141$

Log. p. $\Delta = 9.2906$ $\quad 0.7798$

Nov. 14

$-3\ 44$ $\quad -1.4$

Log $0.350 = 9.5440$ $\quad .584 = 0.7664$

0.0141 $\quad 0.0141$

9.5582 $\quad 0.7805$

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Computation of Parallaxes

Comet e Barnard

1888
Nov. 14

H.a. = -3^h 26 ~~457~~ $\quad -1.4$

Log 0.331 = 9.5198 $\quad$ 5.84 ~~0.350~~ = 0.7664
0.0141 $\quad$ 0.0141
n 9.5339 $\quad$ 0.7805

Nov. 21

H.a = -2^h 0 $\quad -3.8°$

Log. 0.212 = 9.3263 $\quad$ 6.11 = 0.7860
0.0141 $\quad$ 0.0141
Log. p. Δ = n 9.3404 $\quad$ 0.8001

Dec. 22 ~~Nov. 7~~

+4 28 $\quad -7.8$

0.393 = 9.5944 $\quad$ 6.03 = 0.7803
0.0141 $\quad$ 0.0141
+ 9.6085 $\quad$ 0.7944

Dec. 6

H.a = $+2^h$ 20 $\quad -7.1°$

Log. 0.244 = 9.3874 $\quad$ 6.35 = 0.8028
0.0141 $\quad$ 0.0141
Log. p. Δ = + 9.4015 $\quad$ 0.8169

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Computation of Parallaxes

Comet 2, 1884 Barnard

1888

Dec. 12.

H.a. = +1h 44 — 7°.5

Log. 0.187 = 9.2718 — 6.44 = 0.8089

0.0141 — 0.0141

Log. p. Δ = +9.2859 — 0.8230

Dec. 14.

H.a. = +0h 42 — −7°.6

Log. 0.078 = 8.8921 — 6.53 = 0.8149

0.0141 — 0.0141

Log. p. Δ = +8.9062 — 0.8290

Dec. 14

H.a. = +1h 48 — −7°.6

Log. 0.194 = 9.2878 — 6.44 = 0.8089

0.0141 — 0.0141

Log. p. Δ = +9.3019 — 0.8230

+

Dec. 18

H.a. = +2h 5 — −7°.7

Log. 0.222 = 9.3464 — 6.43 = 0.8082

0.0141 — 0.0141

Log p. Δ = +9.3605 — 0.8223

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Computation of Parallaxes

Comet a 1888 Barnard

1888
Dec. 19

H.a = +1h 24 — −7°.7

Log. 0.153 = 9.1847 — 6.49 = 0.8122

0.0141 — 0.0141

Log. p. Δ = +9.1988 — 0.8263

1889
Jan 9

H.a. = +3h 56 — −7°.2

Log. 0.365' = 9.5623 — 6.12' = 0.7868

0.0141 — 0.0141

Log p. Δ = +9.5764 — 0.8009

Jan 19

H. a. = +4h 38 — −6°.3

Log. 0.399 = 9.6010 — 5.97' = 0.7760

0.0141 — 0.0141

Log. p. Δ = +9.6151 — 0.7901

Jan 21

H.a. = +5h 29 — −5.9°

Log 0.422' = 9.6253 — 5.83' = 0.7657

0.0141 — 0.0141

Log p. Δ = +9.6394 — 0.7798

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Computation of Parallaxes

Comet f, 1888 Barnard

1888
Nov. 1

H. a = −2h 51 −15.°0

Log. 0.297 = 9.4728 6.77 = 0.8306
0.0141 0.0141
Log. fr. Δ = n9.4869 0.8447

1889
Jan. 25

H. a. = −2h 24 +16.°5

Log. 0.259 = 9.4133 4.05 = 0.6075
0.0141 0.0141
Log. fr. Δ = n9.4274 0.6216

Jan. 29

H. a. = −2h 17 +18.°6

Log. 0.251 = 9.4000 3.79 = 0.5786
0.0141 0.0141
Log. fr. Δ = n9.4141 0.5927

Jan. 30

H. a. = −2h 20 +19.°3

Log. 0.257 = 9.4099 3.71 = 0.5694
0.0141 0.0141
Log. fr. Δ = n9.4240 0.5835

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Computation of Parallaxes

Comet of 1888 Barnard.

Feb. 1

H.a. = $-1^h\,58$ $\quad +20°.3$

Log. 0.222 = 9.3464 $\qquad$ 3.48 = 0.5416

0.0141 $\qquad$ 0.0141

Log. pr. Δ = n9.3605 $\qquad$ 0.5557

Feb. 28

H.a. = $-1^h\,31$ $\quad +31.6°$

Log. 0.192 = 9.2833 $\qquad$ 1.84 = 0.2648

0.0141 $\qquad$ 0.0141

Log. pr. Δ = n9.2974 $\qquad$ 0.2789

Mar. 1

H.a. = $-2^h\,44$ $\quad +31.9°$

Log. 0.327 = 9.5146 $\qquad$ 2.36 = 0.3729

0.0141 $\qquad$ 0.0141

Log. pr. Δ = n9.5287 $\qquad$ 0.3870

Mar. 7

H.a. = $-1^h\,23$ $\quad +33°.4$

Log. 0.179 = 9.2528 $\qquad$ 1.53 = 0.1847

0.0141 $\qquad$ 0.0141

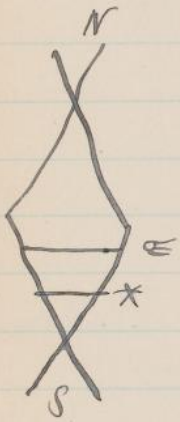
Log. pr. Δ = n9.2669 $\qquad$ 0.1988

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July 6, 1889

Supposed to be Comet Swift (disc July 6)



	∈	*	∈ − *	∈ − * / 2
21	16 58.0	19 42.5		
	17 42.0	20 10.7		
	34 40.0	39 53.2	5 13.2	2 36.60
	25 33.5	28 18.0		
	26 15.1	28 44.4		
	51 48.6	57 2.4	5 13.8	2 36.90
	29 55.8	32 39.5		
	30 36.5	33 5.8		
	60 32.3	65 45.3	5 13.0	2 36.50
	36 9.7	38 57.1		
	36 51.5	39 20.6		
	73 1.2	78 14.7	5 13.5	2 36.75
				2.75
				− 2 36.69

This turns out to be Nebula Dreyer 7396.

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$\Delta \epsilon$	$\Delta *$	$\epsilon - *$
44.0	28.2	15.8
41.6	26.4	15.2
40.7	26.3	14.4
41.8	26.5	15.3
		0.7
		0 15.18

Log 15.18 =
" 7.5 =
" cot. α =

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Comp. * = DM. +0° 4939 (6.8 K)

W I 22h 988 = 22 46 2.48″ +0 8 4.8″ (1825)

	+1	38.21		+10	9.6
22	47	40.69	+0	18	13.9
341	55	10.35			

Log. $\frac{m}{15}$ = 0.12611
" sin δ = −9.49186
" tan δ = 7.72445
−0.00022 = −7.34242
+3.0707
+3.0685 = 0.48698
64 = 1.80618
196.79 = 2.29316

Log m = 1.30220
" cos δ = −9.97800
" Δ 64 = 1.80618
1220.0 = −3.08638

22	46	2.48	+0	8	4.3
	3	16.39		20	20.0
22	49	18.87	+0	28	24.3
	−2				

(* 1889.0) =

See previous page.

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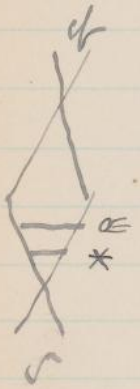
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(See p. 112)

Comet d 1889 (Brooks July 6.)

July 20. 1889



20									
	10	4	12.7	108	41.6	4	28.9	2	14.45
	11	2	55.0	117	23.0	4	28.0	2	14.00
20				2					
21				2					
	120		27.4	124	54.8	4	27.4	2	13.70
	139		37.9	144	5.4	4	27.5	2	13.75
	147		38.5	152	5.9	4	27.4	2	13.70
									4.60
									− 2 13.92
	622		171.5						
21	2		29.2	13	11	16.8			
	5		33.9	4	44	31.0			
21	8		3.1	17	55	47.8	= Gr. M. T. (Cor.)		
	7	54	36.3						
13	13		26.8						
	− 2		10.0						
13	11		16.8						

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A⊏	A*	⊏−*
44.3	25.6	18.7
44.0	25.0	19.0
43.8	25.0	18.8
43.3	24.4	18.9
43.5	24.1	19.4
3.9	5|124.1	4.8
43.78 ✓	24.82 ✓	18.96

Log. 18.96 = 1.27784
" 75 = 0.87506
" cos L = 9.99588
140.9 = 2.14878
+2 20.9

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(See p. 110)

Comet d 1889 (Brooks July 6)

July 20. 1889.

Comp. Star = SD −2° 6241 (9.0 S.)

Sch. 9984 = 23h 5m 1.64s −2° 1′ 42.2″ (9.0) (1865)

+0 36.89 +4 0.7

Mid. Pl. = 23 58 38.53 −7° 57 41.5″

359° 39′ 37.95

Δ

log u/15 = +0.12607 log u = 1.30216

" sin α = −7.77268 " cos α = +9.99999

" tan α = −9.14569 " 24 = 1.38021

+0.00011 = +7.04444 481.2″ = +2.68236

+3.0711

3.0722 = 0.48745

24 = 1.38021

73.73″ = 1.86766

* 1865.0 = 23 58 1.64 −8 1 42.2

+1 13.73 +8 1.2

* 1889.0 = 23 59 15.37 −7 53 41.0

Asp. Pl. cor. +0 1.30 +0 11.0

asp. Pl. * = 23 59 16.67 −7 53 30.0

Ξ − * = −2 13.92 +2 20.9

" " Ξ = 23 57 2.75 −7° 51 9.1

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(See p. 116.)

Comet d 1889 (Brooks. July 6)

July 23. 1889.



	E		*					
21	4	20.5	3	46.5				
	4	52.5	4	35.6				
	9	13.0°	8	22.1°	0	50.9°	0	25.45°
	7	33.5	6	59.6				
	8	5.4	7	48.5				
	15	38.9°	14	48.1°	0	50.8°	0	25.40°
	9	15.5	8	41.5				
	9	47.4	9	30.5				
	19	2.9°	18	12.0°	0	50.9°	0	25.45°
	11	7.1	10	32.9				
	11	38.8	11	21.8				
	22	45.9°	21	54.7°	0	51.2°	0	25.60°
	12	55.0	12	21.0				
	13	26.9	13	10.0				
	26	21.9°	25	31.0°	0	50.9°	0	25.45°
								2.35
							+ 0	25.47°

$21^h\ 9\ 18.^3_{26}$ ✓
$+\ 5\ 43.3$ ✓
$21\ 15\ 1.6$ ✓
$8\ 6\ 26.0$ ✓
$13\ 8\ 35.6$ ✓
$-\ 2\ 9.2$ ✓
$13\ 6\ 26.4$ ✓
$4\ 44\ 31.0$ ✓
$17\ 50\ 57.4$ = Gr. M. T. of obs.

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32.0° 49.1' 17.1"

31.9° 48.9' 17.0"

31.9° 49.0' 17.1"

31.7° 48.9' 17.2"

31.9° 49.0' 17.1"

0.5

3 1.88 | 4.4 | 9449 | 48.98 | 0 17.10

log 17.10 = 1.23300°
" 7.5 = 0.87506°
" cos δ = 9.99618
-127.1" = 2.10424"
-2' 7.1"

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1888phae.proj..505.

See p. 114.

Comet d 1889 (Brooks July 6)

July 23. 1889.

Comp. Mer = 23d 21h 42m -7° 61' 42" (2.0 K)

Du. 1855 = 23h 57m 52s -7° 46' 3"

M. 23d 1170.

23	55	32.53	-7	56	18.4
	+1	38.37		+10	41.6
23	57	10.90	-7	45	36.8
359	17	43.50			

Log. $\frac{n}{\delta}$ = 0.12611

" sin t = -8.08980

" tan t = -9.13440

+0.0022 = +7.35031

+3.0707

3.0729 = 0.48755

64 = 1.80618

196.67 = 2.29373

Log. n = 1.30220

" cos t = +9.99997

" 64 = 1.80618

1283.4 = 3.10835

* 1889.0

23	55	32.53	-7	56	18.4
	+3	16.67		+21	23.4
23	58	49.20	-7	34	55.0
	+0	1.39		+0	11.4
23	58	50.59	-7	34	43.6
	+0	25.47		-2	7.1
23	59	16.06	-7	36	50.7

Ap. Pl. Mer =

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1888phae.proj..505.

Comet d. 1889 (Brooks July 6).

July 23, 1889

APP. PLACE Reduction

$f = +0.746$ ''
$G = 1^h\ 29.3$ '
$H = 10\ 2.8$ '
$\log g = +0.7232$ ''
" $h = +1.3010$ '
" $i = +0.6280$ ''

$G = 1^h\ 29.3$ ''
$\alpha = 23\ 58.8$ '
$1\ 28.1$ '

$H = 10\ 2.8$ ''
$\alpha = 23\ 58.8$ ''
$34\ 1.6$ ''
24
$10\ 1.6$ '

$\delta = -7\ 34\ 55.0$ ''

Log. $f/5 = +8.8239$ ''
" $g = +0.7232$ '
" $\sin(G+\alpha) = +9.5741$ ''
" $\tan\delta = -9.1242$ ''
-0.018 '' $= -8.2454$ '

Log $f/5 = +8.8239$ '
" $h = +1.3010$ ''
" $\sin(H+\alpha) = +9.6937$ ''
" $\sec\delta = +0.0038$ ''
$+0.664$ '' $= +9.8224$ ''
$+0.746$ ''
$+1.410$ ''
-0.018 '
$+1.392$ '' = cor. in R.A.

Log $g = +0.7232$ '
" $\cos(G+\alpha) = +9.9671$ '
$+4.90$ '' $= +0.6903$ ''

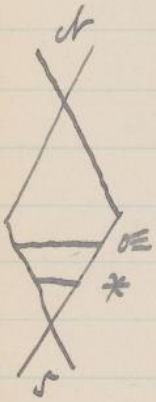
" $h = +1.3010$ '
" $\cos(H+\alpha) = -9.9393$ ''
" $\sin\delta = -9.1204$ '
$+2.29$ '' $= +0.3607$ ''

" $i = +0.6280$ '
" $\cos\delta = +9.9962$ '
4.21 '' $= +0.6242$ ''
4.90 '
2.29 ''
$+11.40$ = cor. in Dec.

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1888phae.proj..505.

Comet d 1889 (Brooks July 6)
July 24. 1889.



	E		*			
20h	9m	24.2s	2m	29.0s		
	10	2.0	2	46.4		
	19	26.2s	17	17.4s	2 8.8s	1 4.40s
	11	30.3	10	35.0		
	12	7.5	10	56.1		
	23	37.8s	21	29.1s	2 8.7s	1 4.35s
	13	51.5	12	56.3		
	14	29.0	13	15.4		
	28	20.5s	26	11.7s	2 8.8s	1 4.40s
	16	16.6	15	23.3		
	16	56.2	15	42.4		
	33	15.0s	31	5.7s	2 9.3s	1 4.65s
This set considered doubtful when taken.	19	6.5	16	10.5		
	19	42.5	19	29.0		
	38	49.0	36	39.5	2 9.5	1 4.75
	22	57.0	22	1.5		
	23	34.1	22	19.8		
	46	31.1s	44	21.3s	2 9.8s	1 4.90s
						2.70
						+1 4.54s

Mean of sets = 20h

	149	30.6m	12	10	29.7s	m
	15	7.1s		1	59.7s	m
	+5	45.1s	12	8	30.0s	s
20h	20	52.2s	4	44	31.0s	s
8	10	22.5m	16	53	1.0	= Gr. M. T. of obs.
12	10	29.7s				

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1888phae.proj..505.

$\Delta\varepsilon$	$\Delta\pi$
37.8″	19.4″	18.4″
37.2″	19.1″	18.1″
37.5″	19.1″	18.4″
37.4″	19.1″	18.3″
~~36.0~~	~~18.5~~	~~17.5~~

37.1″ / 2,0 ✓ / 37.40 ✓

18.3″ / 5 ⌐ 95.0 ✓ / 19.00

18.8″ / 2.0 / 18.4

Log 18.4 = 1.26482″ + 2 16.8′ = $\frac{\varepsilon - \pi}{\Delta\sigma}$

" 7.5 = 0.87506″

" cos. δ ′ = 9.99618

136.8′ = 2.13606″

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1888phae.proj..505.

(See p. 114)

Comet d 1889 (Brooks July 6)

July 24. 1889.

Comp. Cler same as on July 23.

Comp. Cler = √2. −7° 61 K2 (2.0 K)

Gr. 23h 11m 0s =	23	√5 32.√3	v	−7 √6 14.K v
Prec. =	+3	16.67	v	+21 23.K v
* 1889.0 =	23	√4 K9.20	v	−7 3K √√.0 v
		+1.K2	v	+11.√ v
App. pl. * =	23	√4 √0.62	v	−7 3K K3.√ v
	+1	4.54		+2 16.8
App. Pl. ⊕ =	23	59 55.16		−7° 32 26.7

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Parallax Computations for Comet d 1889 Brooks (Obsn. July 6)

July 20, 1889

H.a.	Dec.
-2 49	-7.9

Log. 0.287 = 9.4579 — 6.34 = 0.8021

" p. Δ = n9.4720 — 0.8162

July 23,

H.a.	Dec.
-2 44	-7.6

Log. 0.280 = 9.4472 — 6.33 = 0.8014

" p. Δ = n9.4613 — 0.8155

July 24

H.a.	Dec.
-3 39	-7.5

Log. 0.349 = 9.5428 — 6.18 = 0.7910

" p. Δ = n9.5569 — 0.8051

July 25

H.a.	Dec.
-2 39	-7.5

Log. 0.273 = 9.4362 — 6.33 = 0.8014

" p. Δ = n9.4503 — 0.8155

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1888phae.proj..505.

July 25. 1889.

Comet d 1889 (Brooks July 6)



	≡		*		≡ − *	
21h	9m	26.5s	7m	42.1s		
	10	5.5	4	17.4		
	19	32.0″	16	0.9″	3 31.1″	1 45.55″
	12	23.4	10	55.4		
	13	2.5	11	9.5		
	25	25.9″	21	54.9″	3 31.0″	1 45.50″
	15	19.7	13	41.4		
	15	59.2	14	5.6		
	31	18.9″	27	47.0″	3 31.9″	1 45.95″
	14	24.4	16	45.9		
	19	3.2	17	10.0		
	37	28.2″	33	55.9″	3 32.3″	1 46.15″
	21	19.6	19	41.1		
	21	59.2	20	5.1		
	43	18.8″	39	46.2″	3 32.6″	1 46.30″
						4.45
						+1 45.89″

Mean Sets 21

	155	123.8″	
	15	42.4	M.R.
	+5	46.8	
21	21	29.2″	
8	14	19.1	
13	7	10.1″	
	2	9.0	
13	5	1.1″	
4	44	31.0	
17	49	32.1	= G.M.T. of obs.

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1888phae.proj..505.

ΔE	$\Delta *$	$E - *$
39.0″	24.7″	63.7″
39.1″	24.1″	63.2″
39.5″	24.2″	63.7″
39.4″	24.1″	63.5″

$$\frac{39.6''}{1.6\ \checkmark} \qquad \frac{24.0''}{5)121.1\ \checkmark} \qquad \frac{63.6''}{2.7'}$$

$39.32\ \checkmark$ $\qquad 24.2''\ \checkmark$ $\qquad 63.54'$

log 68.54 = 1.80305″
" 7.5″ = 0.87506″
" cos. δ = 9.99618
472.4′ = 2.67429″
886.0
413.6′ = +6° 53.6′

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July 25. 1889.

Comet d 1889 (Brooks July 6)

Comp. Star same as last night.

" " = SD −7° 6162 (A.0 K)

M, 23h 11m 7o	=	23h	32m.3	−7°	56′ 18″.4
		+3	16.67	+21	23.4
* 1889.0	=	23	49.20	−7°	34′ 41″.0
			+1.45		+11.6
Ap. pl. *	=	23	50.65	−7	34′ 53″.4
		+1	45.89	+6	53.6
Ap. Pl. α δ	=	24	0 36.54	−7	27 49.8

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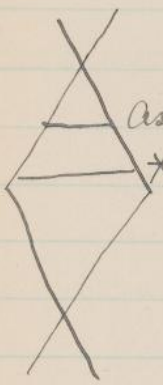
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Peters New Asteroid
Sept. 19, 1889

	Ast.		*		Ast − *		Ast − * / 2
21h	17	31.4	16	27.5			
	18	1.5	17	10.5			
	35	32.9	33	38.0	1	54.9	57.45
	19	38.5	18	34.5			
	20	8.5	19	17.5			
	39	47.0	37	52.0	1	55.0	57.50
	21	48.4	20	44.6			
	22	18.5	21	27.5			
	44	6.9	42	12.1	1	54.8	57.40
	24	3.5	23	0.3			
	24	34.5	23	43.1			
	48	38.0	46	43.4	1	54.6	57.30
	26	11.8	25	8.1			
	26	42.5	25	51.2			
	52	54.3	50	59.3	1	55.0	57.50
							2.15
							+ 0m 57.43



Mean of set 21h

	21.8	17.9.1
	22	5.9
	+0	19.3
21	22	25.2
11	55	6.1
9	27	19.1
	1	32.9
9	25	46.2
4	44	31.0
14	10	17.2 = Gr. M. T. of obs.

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Δ Ast	Δ ☆	Ast. − ☆
30.1″	43.0″	12.9″
30.0″	43.0″	13.0″
30.1″	42.9″	12.8″
31.0″	42.8″	11.8″

30.7″ / .9 / 30.16″ — 43.1″ / 14.2″ / 42.96″ — 12.4″ / 2.9 / 12.58″

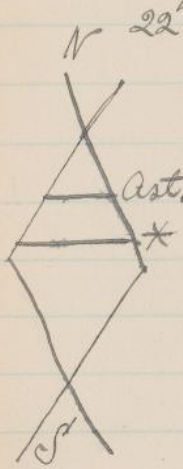
Log 12.58 = 1.09968″
" 7.5 = 0.87506″
" cos δ = 9.97943″
90.0″ = 1.95417″
45.0″ = +0 45.0″
−17 29 42.4
−17 28 57.4″

1.09968″
0.87506″
9.97946″
+90.0″ = 1.95420″

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Peter's New Asteroid
Sept. 19 1889



	Ast		*		Ast − *		$\frac{ast - *}{2}$
22h	49	0.5 ✓	48	0.8 ✓			
	49	39.6 ✓	48	49.0 ✓			
	98	40.1	96	49.8	1	50.3	55.15
	51	16.2 ✓	50	15.9 ✓			
	51	44.9 ✓	50	54.0 ✓			
	103	1.1	101	9.9	1	51.2	55.60
	53	18.0 ✓	52	17.3 ✓			
	53	46.0 ✓	52	55.2 ✓			
	107	4.0	105	12.5	1	51.5	55.75
	57	36.5 ✓	56	36.5 ✓			
	58	5.0 ✓	57	14.5 ✓			
	115	41.5	113	51.0	1	50.5	55.25
							∓1.75
	423	86.7				+ 0m	55.44

New Asts 22h 53 3.3 ✓ N.R.
+0 19.3

22	53	22.6	
11	55	6.1	
10	58	16.5	
	1	47.8	
10	56	28.7	
4	44	31.0	
15	40	59.7	= Gr. M. T. of obs.n

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1888phae.proj.:505.

Δ Ast.	Δ x	Ast − x
39.1″	48.2″	9.1″
28.7″	38.1″	9.4″
28.0″	37.9″	9.9″
28.5″	38.0″	9.5″

4 | 124.3″ → 31.0″

4 | 416.2 → 40.2″

9.5″ / 1.9 = 9.48″

Log 9.48 = 0.97681″

" 7.5 = 0.87506″

" cos δ = 9.97943″

+ 67.8″ = 1.83130″

~~+ 2° 67.8″~~

+ 1′ 7.8″

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1888phae.proj..505.

Peters New Asteroid

Sept. 19, 1889

Comp. Star = LD − 17° 6422 (6.8 B)

{B.B. VI (−14° 40 to −31° 20) No 70} = 21h 54 13.87 −17° 41 3.5 (mean of 3 pos.) (1850) (Boll. comp.)
+1 4.25 +5 33.2
21 55 18.12 −17 35 30.3
328 49 31.80

Log u/15 = 0.12608
" sin α = −9.71403
" tan δ = −9.50114
+0.2194 = +9.34125
+3.0710
3.2904 = 0.51725°
39 = 1.59106
128.32 = 2.10831°

Log u = 1.30218
" cos α = +9.93227
" 39 = 1.59106
669.1 = 2.82548 51

* 1850.0	21	54	13.87	−17	41	3.5
		+2	8.32		+11	9.1
* 1889.0	21	56	22.19	−17	29	54.4
			+2.40			+12.0
appr. Pl. α =	21	56	24.59	−17	29	42.4
		+0	57.43		+1	30.0
appr. Pl. Ast.	21	57	22.02	−17	28	12.4	1st ν series.

	21	56	24.59	−17	29	42.4
		+0	55.44		+1	7.8
appr. Pl. Ast.	21	57	20.03	−17	28	34.6	2 d/dν series.

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1888phae_proj..505.

Peters's New Asteroid
Sept 19, 1889

{App. Place Reduction}

$\delta\delta = +1.172''$ $\quad G = 0^h\ 20.5^s$ $\quad H = 6^h\ 11.3^s$

$\alpha\alpha = 0^h\ 20.5^s$ $\quad \alpha = 21\ 56.4^s$ $\quad \alpha = 21\ 56.4^s$

$H = 6^h\ 11.3^s$ $\quad 22\ 16.9^s$ $\quad 24\ 7.7^s$

$\log g = +0.8864''$

$\log h = +1.2732''$ $\quad \delta = -17^\circ\ 29'\ 54''$

$\log i = +0.9101''$

$\log g = +0.8864''$

$\log \sin 15 = +8.8239''$

$\log \sin GH = -9.6385''$

$\log \tan \delta = -9.4987''$

$+0.070'' = +8.8475^\circ''$

$\log h = +1.2732''$

$\log \sin 15 = +8.8239''$

$\log \sin HA = +9.9456''$

$\log \sec \delta = +0.0206''$

$+1.157'' = +0.0633^\circ''$

$+0.070$

$+1.172''$

$+2.399^\circ'' = \text{cor. in R.A.}$

$\log g = +0.8864''$

$\log \cos GH = +9.9545''$

$+6.93'' = +0.8409^\circ''$

$\log h = +1.2732''$

$\log \cos HA = +9.6727''$

$\log \sin \delta = -9.4781''$

$-2.65'' = -0.4240^\circ''$

$\log i = +0.9101''$

$\log \cos \delta = +9.9794''$

$+7.75'' = +0.8895^\circ''$

$6.93''$

$+14.68^\circ''$

$-2.65''$

$+12.03'' = \text{cor in Dec.}$

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1888phae.proj..505.

Peters New Asteroid

Sept 19/23 1889

Comp ✶. δ D -17°6422 = A.G.C. 30147

Mean of ~~D.~~ BB and A.G.C. places taken.

Log $\frac{u}{5}$ = 0.12606
" sin t = -9.71403
" tan L = -9.50114
0.2194 = +9.34123°

3.0712
3.2906° = 0.51728
14 = 1.14613°
460.7 = 1.66341°

Log - u = 1.30215
" cos L = +9.93227
" 14 = 1.14613
240.2 = 2.38055°

✶ 1875.0 = 21 55 36.18 ✓ | -17 33 54.9 ✓
+0 46.07 | +4 0.2
21 56 22.25° | 17 29 54.7°
+2.40 | +12.0
Ap. pl. ✶ 21 56 24.65° | -17 29 42.7°
+0 57.43 | +1 30.0
21 57 22.08° | -17 28 12.7° With A.G.C. ✶
1st π corr. 21 57 22.02 | -17 28 12.4 " BB ✶
Ap. pl. Astr. 1 = 21 57 22.05 | -17 28 12.6 Mean.
21 56 24.65 | -17 29 42.7
0 55.44 | +1 7.8
21 57 20.09° | -17 28 34.9° With A.G.C. ✶
21 57 20.03 | -17 28 34.6 " BB ✶
Ap. pl. Astr. 2 1/2 corr. = 21 57 20.06° | -17 28 34.8 Mean of

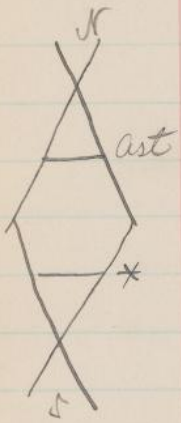
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Peters New Asteroid
Sept. 23, 1889



	ast	*		
21	28 46.4 ✓	27 26.0 ✓		
	29 30.2 ✓	28 6.0 ✓		
	58 16.6°	55 32.0°	2 44.6°	1 22.30°
	31 17.0 ✓	29 56.6 ✓		
	32 1.0 ✓	30 36.8 ✓		
	63 18.0°	60 33.4°	2 44.6°	1. 2230°
	33 57.5 ✓	32 31.4 ✓		
	34 35.5 ✓	33 11.4 ✓		
	68 27.0°	65 42.8°	2 44.2°	1 22.10°
	36 23.5 ✓	35 3.1 ✓		
	37 7.4 ✓	35 43.1 ✓		
	73 30.9°	70 46.2°	2 44.7°	1 22.35°
	38 52.6 ✓	37 32.8 ✓		
	39 37.0 ✓	38 ~~43.6~~ 12.8		
	78 29.6°	75 45.6°	2 44.0°	1 22.00°
				1.05
				+1 22.21°

New Sat 21h

340	12 2.1	7
34	12 2	M.R.
+0	31.5	
21	34 43.7°	
12	10 52.4	7
9	23 51.3°	
	1 32.4	7
9	22 18.9°	
4	44 31.0	
14	6 50° =	Gr. m. T. of obs.

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Last Δ $\Delta *$

43.8° 40.0° 83.8°

44.0° 40.2° 84.2°

44.0° 40.0° 84.0°

43.9° 40.0° 83.9°

44.4° 40.0° 84.4°
20.1' .2 .3
44.02' 40.04' 84.06°

Log 84.06 = 1.92459°
" 7.5 = 0.87506°
" cos Δ = 9.97857
600.1' = 2.77822°
8860
285.9' = + 4 45.9'

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Peters New Asteroid (287)

Sept. 23, 1889

Comp. Place δ D − 18° 6052 (7.8 a.)

Ge. A. (−15−31) 21791 = 21h 52 5.19s − 18 6 6.0″ (1850)

+1 20.92 +6 56.5

21 53 26.11 −17 59 9,5

328 21 31.65

Log. $\frac{n}{15}$ = 0.12607

" sin λ = −9.71983

" tan λ = −9.51142

+0.2217 y = +9.35732

+3.0711

3.2988 = 0.51835

49 = 1.69020

161.64 = 2.20855

Log n = 1.30217

" cos λ = +9.93011

" 49 = 1.69020

836.5 = 2.92248

	2	52	5.19	−18	6 6.0
	+2	41.64		+1 3	86.5
* 1889.0	21	54	46.83	−17	59.5
		+2.36			+11.5
	21	54	49.19	−17	50 58.0
	+1	22.21		+4	45.9
App. Pl. Ast.	21	56	11.40	−17	46 12.1

This Place reduction wrong see pa. 144
49 years procession used instead of 39

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Peters New Asteroid Sept 23 1889

{ Appr. Place Reduction }

$\phi = +1.183^{\nu}$
$G = 0\ 15.6^{\nu}$
$H = 5\ 54.1^{\nu}$
$\log g = +0.8898^{\nu}$
$\log h = +1.2732^{\nu}$
$\log i = +0.9104^{\nu}$

$G = 0\ 15.6^{\nu}$
$\alpha = 21\ 54.8^{\nu}$
$22\ +0.4^{s}$
9.2
$\alpha = -17\ 51\ 10$

$H = 5\ 54.1^{\nu}$
$\alpha = 21\ 54.8^{\nu}$
$3\ 48.9^{s}$

$\log 1/15 = +8.8239$
$\log g = +0.8898$
$\log \sin G+H = -9.6629$
$\log \tan \alpha = -9.5086$
$+0.077^{\nu} = +8.8846^{s}$
$\alpha\ 4^{\nu}$

$\log 1/15 = +8.8239$
$\log h = +1.2732$
$\log \sin H+H = +9.9247$
$\log \sec \alpha = +0.0214$
$+1.105 = +0.0432^{s}$
$+0.077$
$+1.183$
$+2.365^{s} =$ cor. in R.a.

$\log g = +0.8898$
$\log \cos G+H = +9.9483$
$+6.89 = +0.8381^{s}$

$\log h = +1.2732$
$\log \cos H+H = +9.7335$
$\log \sin \alpha = -9.4865$
$-3.11 = -0.4932^{s}$

$\log i = +0.9104$
$\log \cos \alpha = +9.9786$
$+7.74 = +0.8890^{s}$
$+6.89$
$+14.63^{s}$
-3.11
$+11.52^{s} =$ cor. in Dec.

The above very slightly in error but not enough to make any appreciable difference.

H.

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1st series

Peters's new Asteroid

Sept. 24 1889

		Ast.		*					
20	53	16.9	52	15.9					
	63	49.5	52	48.8					
	107	6.4	105	4.7	2	1.7	1	0.85	
	55	43.5	54	42.2					
	56	16.0	55	15.1					
	111	59.5	109	57.3	2	2.2	1	1.10	
	57	47.6	56	46.1					
	58	19.5	57	19.2					
	116	7.1	114	5.3	2	1.8	1	0.90	
	59	49.2	58	48.0					
	60	21.6	59	21.1					
	120	10.8	118	9.1	2	1.7	1	0.85	
21	1	55.3	0	54.5					
	2	27.9	1	27.5					
	4	23.2	2	22.0	2	1.2	1	0.60	
								4.30	
							+ 1	0.86	



New $\sqrt{}$=20

5	58	107.0			
	57	58.7	8	42	18.9
	+0	34.9	4	44	31.0
20	58	33.6	13	26	49.9 = G. m. T.
12	14	48.9			
8	43	44.7			
	1	25.8			
8	42	18.9			

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Δ Ast	Δx	
32.6^c	32.9^c	0.3^c
32.5^c	32.9^c	0.4^c
31.9^c	33.1^c	1.2^c
32.4^c	33.1^c	0.7^c

$\frac{32.6^c}{10.0}$ ✓ 32.60 ✓ $\quad \frac{33.0^c}{10.0}$ 33.00 ✓ $\quad \frac{0.4^c}{3.0}$ 0.60 '

Log 0.60 = 9.77815 :
" 7.5 = 0.87506 :
" cos. δ = 9.99857
4.3' = 0.63178^c
∴ + 0 4.3'

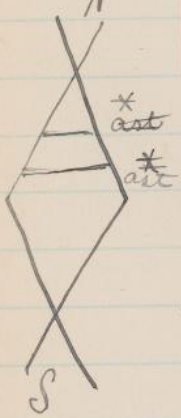
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2nd series.

Peters New Asteroid
Sept 24, 1889

	Obs.		*					
23	22	38.8	21	42.0				
	23	20.9	22	21.0				
	45	59.7 c	44	3.0 c	1	56.7 c	0	58.35 c



~~26 18.4 25 21.6~~
~~26 49.0 25 50.0~~
~~53 7.4 51 11.6~~
~~1 55.8 0 57.90~~

	28	44.8	27	48.2				
	29	16.7	28	16.1				
	58	1.5 c	56	4.3 c	1	57.2 c	0	58.60 c
	30	46.2	29	49.5				
	31	17.7	30	17.5				
	62	3.9 c	60	7.0 c	1	56.9 c	0	58.45 c
	32	55.4	31	58.9				
	33	27.0	32	26.8				
	66	22.4 c	64	25.7 c	1	56.7 c	0	58.35 c
	34	53.4	33	57.0				
	35	25.0	34	24.5				
	70	18.4 c	68	21.5 c	1	56.9 c	0	58.45 c
								2.20
30	1	105.9 ?	11	16	2.6 ?		+ 0	58.44 c
Mean = 23	30	16.6 ? R.A.		1	50.8 ?			
	+0	34.9 ?	11	14	11.8 ?			
23	30	51.5 ?	4	44	31.0			
12	14	48.9 ?	15	58	42.8 =	Gr. M. T. of obs.		
11	16	2.6 ?						
	+5							

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Δ ast.	Δ ☀	ast − ☀	
42.1ᵐ	39.0ᵐ	3.1ᵐ	
~~30.6~~	~~28.4~~	~~2.2~~	Rej. see B. 52.
31.9ᵐ	27.9ᵐ	4.0ᵐ	
31.5ᵐ	28.0ᵐ	3.5ᵐ	
31.6ᵐ	27.9ᵐ	3.7ᵐ	
31.6ᵐ	27.5ᵐ	4.1ᵐ	
162.7 ✓	150.3 ✓	18.4	
33.7 ✓	30.06 ✓	○ 3.68ᵐ	

Log. 3.68 = 0.56585 n

" ~~87~~ 7.5 = 0.87506 ᵐ

" cos. δ = 9.97857

−☀ 26.8 = 1.41948 ᵐ

☀ ○ 26.8

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Data new Asteroid

Sept. 24, 1889

Comp. Stat = same as on Sept 23

app. Pl. * =	21	54	49.19	−17	50	58.0	
		+1	0.86		+0	4.3	
ap. Pl. ast =	21	55	50.05	−17	50	53.7	1st series

ap. Pl. * =	21	54	49.19	−17	50	58.0	
		+0	58.44		−0	26.3	
ap. Pl. ast =	21	55	47.63	−17	51	24.3	2nd series

ap. Pl. of * is wrong. See below.

ap. Pl. * =	21	54	16.22″ ✓	−17	54	49.2″ ✓	
		+1	0.86″		+0	4.3″	
ap. Pl. Ast.	21	55	17.08″	−17	54	44.9″	

ap. Pl. *	21	54	16.22″	−17	54	49.2″	
		+0	58.44″		−0	26.3″	
ap. Pl. Ast.	21	55	14.66″	−17	57 5	22.7″ 15.5″	

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Peters New Asteroid (247)

Sept. 23, 1889.

Comp. * = S.D. -18 6052 (7.8)a

De. a(-15-31) = 21791 = 21 52 5.19
+1 4.41
21 53 9.60

Mist. Pl. = 328 17 24

-18 6 6.0 1850
+5 31.5
-18 0 34.5

log n/15 = 0.12608
" sin α = -9.72067
" tan α = -9.51202
+0.2284 = +9.35877
3.0710
+3.2994 = 0.51843
39 = 1.59106
128.67 = 2.10949

log. n = 1.30218
" cos α = +9.92979
" 39 = 1.59106
665.3 = +2.82303
+ 11' 5.3"

21 52 5.19
+2 8.67
21 54 13.86
+2.36
21 54 16.22
+1 22.21
21 55 38.43

-18 6 6.0
+11 5.3
-17 55 0.7
+11.5
-17 54 49.2
+4 45.9
-17 50 3.3

*1889.0 =
Apr. Pl. * =
Apr. Pl. α =

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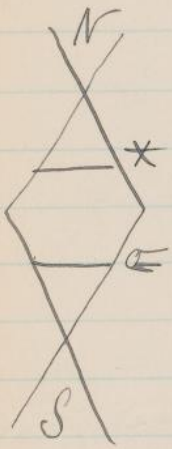
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Comet d 1889 (Brooks July 6)

Oct. 2, 1889



	E	*	E − *
22	14 30.5	14 42.7	
	15 4.8	15 32.2	
	29 35.3	30 14.9	− 0 39.6 0 19.80
	16 6.1	16 18.1	
	16 41.0	17 7.9	
	32 47.1	33 26.0	− 0 38.9 0 19.45
	19 50.8	20 3.6	
	20 25.8	20 53.4	
	40 16.6	40 57.0	0 40.4 0 20.20
	22 18.3	22 31.0	
	22 53.0	23 20.5	
	45 11.3	45 51.5	0 40.2 0 20.10
	23 58.1	24 10.2	
	24 32.0	25 0.0	
	48 30.1	49 10.2	0 40.1 0 20.05
	25 52.0	26 4.5	
	26 26.0	26 54.2	
	52 18.0	52 58.7	0 40.7 0 20.35
	27 23.7	27 36.0	
	27 58.4	28 26.0	
	55 22.1	56 2.0	0 39.9 0 19.95
	301 180.5		6.90
	Mean 7=22 21 42.9		− 0 19.99

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1888phae.proj..505.

Δ ℰ	Δ ϰ	ℰ + ϰ
34.3	49.5	83.8
34.9	49.8	84.7
35.0	49.8	84.8
34.7	49.5	84.2
33.9	49.8	83.7
34.0	49.7	83.7
34.7	50.0	84.7
3.5		1.6
34.5		84.23

22 21 42.9
+1 0.3
22 22 43.2
12 46 21.3
9 36 21.9
1 34.4
9 34 47.5
4 44 31.0
14 19 19 = G.M.T.

log. 84.23 = 1.92547
" 7.5 = 0.87506
" cos 2 = 9.99841
629.4 = 2.79894
886.0
256.6 = − 4 16.6

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Comet d 1889 (Brooks July 6)

Oct. 2 1889.

Comp. * = D. −5°6070 (9.0K)

W.	23^h	9^m	15^s =	23^h	43^m	42.68^s	$-5°$	$16'$ $2.2''$ (9.0) (1825)
					+1	38.53		+10 40.3
Mid Pl. =				23	45	21.21	−5	5 21.9
				356	20	18.15		

Log. $\frac{w}{15}$ = 0.12611
" sin α = −8.80525
" tan α = −8.94969
+0.0076 = +7.88105

3.07017
3.0783 = 0.48831
64 = 1.80618
197.01 = 2.29449

log. w = 1.30220
" cos α = +9.99911
" 64 = 1.80618
1280.8 = +3.10749

(* 1825) =	23	43	42.68		−5	16	2.2	
		+3	17.01			+21	20.8	
(* 1889.0) =	23	46	59.69		−4	54	41.4	
			+2.47				+15.8	
ap Pl. *	23	47	2.16		−4	54	25.6	
		−0	19.99			−4	16.6	
ap Pl. ☌ =	23	46	42.17		−4	58	42.2	

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Comet d 1889 (Brooks July 6)

Oct 2 1889

Ap. Race Reductions

$f = +1.246''$ $G = 0^h\ 17.8''$ $H = 5\ 15.7''$

$g = 0\ 17.8''$ $\alpha = 23\ 47.0''$ $\alpha = 23\ 47.0''$

$H = 5\ 15.7''$ $G+\alpha = 0\ 4.8''$ $H+\alpha = 5\ 2.7''$

$\log g = +0.9127''$

$\log h = +1.2744''$ $\delta = -4\ 54\ 41''$

$\log i = +0.9037''$

$\log 1/15 = +8.8239''$

$\log g = +0.9127''$

$\log \sin G+\alpha = +8.3194''$

$\log \tan \delta = -8.9341''$

$-0.008'' = -6.9901''$

$\log 1/15 = +8.8239''$

$\log h = +1.2744''$

$\log \sin H+\alpha = +9.9863''$

$\log \sec \delta = +0.0016''$

$+1.220'' = +0.0862''$

$+1.246''$

$+2.466''$

-0.000

$+2.466'' = \text{cor. in R.A.}$

$\log g = +0.9127''$

$\log \cos G+\alpha = +9.9999''$

$+8.18'' = +0.9126''$

$\log h = +1.2746''$

$\log \cos H+\alpha = +9.3937''$

$\log \sin \delta = -8.9325''$

$-0.40'' = -9.6068''$

$\log i = +0.9037''$

$\log \cos \delta = +9.9984''$

$+7.98'' = +0.9021''$

$+8.18''$

$+16.16''$

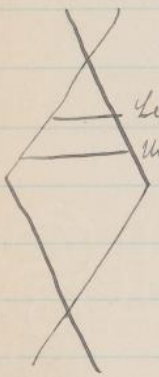
$-0.40''$

$+15.76 = \text{cor. in Dec.}$

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Transits to join Unlett. comp. +1°965 of Nov 3, 1888
to Let. * +1° 967



Un.*	Let.*	Un.* − Let.*	
0 17 21.4	17 10.2		
17 58.6	17 39.2		
35 20.0	34 49.4	0 30.6	0 15.30
18 31.5	18 ~~31.5~~ 20.0		
19 8.5	18 49.5		
37 40.0	37 9.5	0 30.5	0 15.25
19 38.2	19 26.7		
20 16.4	19 56.5		
39 54.6	39 23.2	0 31.4	0 15.70
20 53.7	20 42.5		
21 31.5	21 12.0		
42 25.2	41 54.5	0 30.7	0 15.35
22 27.2	22 15.8		
23 5.4	22 46.1		
45 32.6	45 1.9	0 30.7	0 15.35
23 45.5	23 34.5		
24 24.3	24 4.9		
48 9.8	47 39.4	0 30.4	0 15.20
25 4.5	25 ~~4.5~~ 4 525		
25 45.0	25 ~~45.0~~ 24.4		
50 49.5	~~50~~ ~~49.5~~ 50 17.9	0 31.6	0 15.80
			2.95
			+0 15.42

~~21 25.1~~

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A Ur.	A Let
37.2	29.0
37.0	29.5
38.2	29.8
37.8	29.5
38.2	30.3
38.8	30.4
40.5	30.9

8.2	
7.5	
8.4	
8.3	
7.9	
8.4	
9.6	
2.3	
8.33	

Log. 8.33 = 0.92065
" 7.5 = 0.87506
" 202 = 9.99974
624 = 1.79545

− 1 2.4

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1888phae.proj..505.

Oct. 8 1889 (see B. 6 P. 190)

Let x = Dm. +1° 967

Dm. Place =	5	10	57.5	+1° 56.0 9.0 B.
B.D. VI +1° 967 =	5	10	57.75 ✓	+1° 55 58.4 ✓ (1855)
		+0	52.97'	+1 12.2'
Mid. Pl. =	5	11	50.72'	+1° 57 10.6
	77	57	40.80'	

Log. 4/5 = 0.12608'
Log. sin α = 9.99035'
" tan α = +8.53268'
+0.0446 = +8.64911'
+3.0710'
+3.1156" = 0 49354' –
34 = 1.53148'
105.93' = 2.02502'

Log. n = 1.30217.
" cos δ = 9.31926'
" 34' = 1.53148"
142.2' = 2.15291'

	5	10	57.75 ✓	+1 55 58.4 ✓
		+1	45.93 ✓	+2 22.2 ✓
(* 1889.0)	5	12	43.68 ✓	+1 58 20.6 ✓
		+0	15.42 ✓	−1 2.4 ✓
	5	12	59.10 ✓	+1 57 18.2 ✓
~~Appl. Mn. x =~~			~~+1.91~~	~~+8.5~~
~~Appl. Pl. Mn. x =~~	~~5~~	~~13~~	~~1.01"~~	~~+1 57 26.7~~
~~Deduct 1 yr per =~~			~~−3.12~~	~~+0.0~~
	~~5~~	~~12~~	~~57.89~~	~~+1 57 22.5~~

Wrong Appl. Pl. Cor. see B 6 p 190

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1888phae.proj...505.

Oct. 8 1889 {app. Place Reduction}

$g = +1.270$ $G = 0^h 13.7$ $H = 4^h 50.1$

$G = 0^h 13.7$ $\alpha = 5\ 12.7$ $\alpha = 5\ 12.7$

$H = 4^h 50.1$ $G+\alpha = 5\ 26.4$ $H+\alpha = 10\ 28$

$\log g = +0.9204$

$\log R = +1.2763$ $\lambda = +1\ 58\ 20$

$\log i = +0.8931$

$\log \frac{1}{5} = +8.8239$

$\log g = +0.9204$

$\log \sin G+\alpha = +9.9953$

$\log \tan \lambda = 8.5370$

$+0.019 = +8.2766$

$\log g = +0.9204$

$\log \cos G+\alpha = +9.1646$

$+1.22 = +0.0850$

$\log \frac{1}{5} = +8.8239$

$\log R = +1.2763$

$\log \sin H+\alpha = +9.6897$

$\log \sec \lambda = 0.0003$

$+0.617 = +9.7902$

$+0.019$

1.270

$+1.906 =$ cor. in R.a.

$\log R = +1.2763$

$\log \cos H+\alpha = -9.9406$

$\log \sin \lambda = +8.5367$

$-0.57 = -9.7536$

$\log i = +0.8931$

$\log \cos \lambda = +9.9997$

$+7.81 = +0.8928$

$+1.22$

$+9.03$

-0.57

$+8.46 =$ cor. in Dec.

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1888phae.proj..505.

Oct. 10 1889

Transits to join Unlettered Comp. Star of Dec. 22, 1888 to Lettered Star -7° 130 (8.6 mi)

	Unlet.	Let.	Unlet. – Let	
0^h	4 3.0	8 10.6		
	4 29.0	8 59.0		
	8 32.0	17 9.6	8 37.6	4 18.80
	9 34.0	13 41.7		
	9 59.7	14 30.0		
	19 33.7	28 11.7	8 38.0	4 19.00
	15 31.7	19 39.3		
	15 57.6	20 27.7		
	31 29.3	40 7.0	8 37.7	4 18.85
	21 5.9	25 13.5		
	21 31.5	26 2.0		
	42 37.4	51 15.5	8 38.1	4 19.05
	26 38.6	30 46.5		
	27 5.0	31 35.0		
	53 43.6	62 21.5	8 37.9	4 18.95
	32 16.5	36 24.4		
	32 42.6	37 13.0		
	64 59.1	73 37.4	8 38.3	4 19.15
	38 45.2	42 52.9		
	39 12.9	43 43.0		
	77 58.1	86 35.9	8 37.8	4 18.90
				6.70
				– 4 18.96

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Δ Mulet	+ Let.	☆ Mulet - Let
26.0"	48.4"	22.4"
25.7"	48.3"	22.6"
25.9"	48.4"	22.5"
25.6"	48.5"	22.9"
26.4"	48.5"	22.1"
26.1"	48.6"	22.5"
27.7"	50.1"	22.4"

log. 22.49 = 1.352199"
" 75 = 0.87506"
" cos δ = 9.99603
167.3' = 2.22308'
+ 2 47.8"

3.64
0 22.58"
49

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* Reduced to 1888.0 Oct. 10, 1889 (Rec p. 30).

Comet 2 1888 Barnard

Let. * = SD -7° 130 (8.6 m.)

Dm. Place = 0h 44 34.9 . -7° 54.7

{Bruennow (-3-9) no. 51} = 0h 44 19.49 -7° 56 29.8 (1850)

+0 57.66 +6 13.9

0 45 17.15 -7 50 15.9

11 19 17.25

Log $\frac{r}{\Delta}$ = 0.12608, log n = 1.30217

" sin d = +9.29295 " cos d = 9.99146

" tan d = -9.13879 " 38" = 1.57978

-0.0361' = -8.55782' +747.2 = 2.87341'

+3.0710'

+3.0349' = 0.48215'

38" = 1.57978

+115.33" = 2.06193'

	0h 44 19.49"	-7° 56 29.8"
	+1 55.33	+12 27.2
* 1888.0 =	0h 46 14.82	-7 44 2.6
	+2.21	+0 9.4
ap. Pl. * =	0h 46 17.03	-7° 43 53.2
	-4 18.96	+2 47.1
ap. Pl. Hubet * =	0h 41 58.07	-7° 41 6.1

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App. Place Reduction for Dec. 22 1888

$f = +2.032^{s}$
$G = 1^{h}\,6.4^{s}$
$H = 23^{h}\,53.1^{s}$
$\log g = +1.1418^{s}$
$\log h = +1.3105^{s}$
$\log i = -9.4281^{s}$

$\alpha G = 1^{h}\,6.4^{s}$
$\alpha = 0\ 46.2^{s}$
$G + \alpha = 1^{h}\,52.6^{s}$

$H = 23\ 53.1^{s}$
$\alpha = 0\ 46.2^{s}$
$0\ 39.3^{s}$

$\nu = -7^{\circ}\,43'\,53''$

$\log 1/15 = +8.8239^{s}$
$\log g = +1.1418^{s}$
$\log \sin(G+\alpha) = +9.6738^{s}$
$\log \tan \alpha = -9.1329^{s}$
$-0.059^{s} = -8.7724^{s}$

$\log 1/15 = +8.8239^{s}$
$\log h = +1.3105^{s}$
$\log \sin H + \alpha = +9.2321^{s}$
$\log \sec \alpha = +0.0040^{s}$
$+0.234^{s} = +9.3705^{s}$

$+2.032^{s}$
$+2.266^{s}$
-0.059^{s}
$+2.207^{s}$ = Cor in R.A.

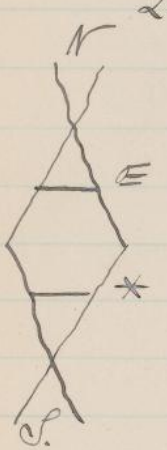
$+9.4$ = Cor in Dec. (by interpolation)

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1888phae.proj..505.

Comet d 1889 (Brooks July 6)

Oct. 15 1889



	E	*	E − *	$\frac{E-*}{2}$
21	32 26.1 ✓	34 2.3 ✓		
	32 54.8 ✓	34 46.8 ✓		
	65 20.9	68 49.1	3 28.2	1 44.12
	35 31.0 ✓	37 6.9 ✓		
	35 59.0 ✓	37 51.4 ✓		
	71 30.0	74 58.3	3 28.3	1 44.15
	~~39 28.8 ✓~~	~~41 5.0 ✓~~		
	~~39 56.4 ✓~~	~~41 49.4 ✓~~		
	~~79 25.2~~	~~82 54.4~~	~~3 29.2~~	
	43 9.8 ✓	44 45.5 ✓		
	43 37.4 ✓	45 30.0 ✓		
	86 47.2	90 15.5	3 28.3	1 44.15
	49 31.7 ✓	51 7.9 ✓		
	50 0.2 ✓	51 52.2 ✓		
	99 31.9	103 0.1	3 28.2	1 44.10
	52 42.0 ✓	54 17.5 ✓		
	53 9.5 ✓	55 2.0 ✓		
	105 51.5	109 19.5	3 28.0	1 44.00
				0.50
				−1 44.10

42.6 181.5

Mean sets 21 42 54.2

+1 41.1 = Chron. ~~corr.~~ (by interpolation

21	44	35.3	
13	37	36.5	
8	6	58.8	
−1	19.8		
8	5	39.0	

8	5	39.0	
4	44	31.0	
12	50	10.0	= G. M. T.

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$\Delta\varepsilon$	$\Delta\alpha$	$\varepsilon+\alpha$
28.7″	44.5″	73.2″
28.0″	44.5″	72.5″
27.6″	44.5″	72.1″
28.5″	44.3″	72.8″
27.5″	44.5″	72.0″
0.3		2.6
28.06″		72.52″

Log. 72.52″ = 1.86046″
" 7.5 = 0.87506″
" sin α = 9.99880
+ 542.4″ = +2.73432″
886.8
436.6″ + 5 436″

1888phae.proj..505.

Comet d 1889 (Brooks July 6)

Oct. 15, 1889

Comp. Star = AD −4° 59 59 (9.0 Sf.)

Dm. Place = 23 41 19.5 −4 26.8

Sf. 9844 = 23 41 50.47' −4 23 19.2 (1865)
+0 36.96" +3 59.9"
Mid. Place = 23 42 27.43' −4 19 19.3'
355 36 51.45

Log. $\frac{u}{15}$ = 0.12607'
" sin t = −8.88350'
" tan L' = −8.87815'
+0.0077' = +7.88772"
+3.0711
3.0788' = 0.48838'
24 = 1.38021'
73.89" = 1.86859"

Log u = 1.30216,
" cos t = +9.99873
" 24 = 1.38021
479.9" = +2.68110

(* 1865.0) = 23 41 50.47' −4 23 19.2"
+1 13.89" +7 59.9"
(* 1889.0) = 23 43 4.36" −4 15 19.3"
+2.43" +15.4"
ap. Pl. * = 23 43 6.79" −4 15 3.9"
−1 44.10 +5 43.6"
ap. Pl. = 23 41 22.69" −4 9 20.3'

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1888phaa.proj...505.

Comet d 1889 (Brooks July 6)
Oct. 15, 1889

{Ap. Place. Reduction}

$f = +1.321^{\tau}$ $\quad G = 0\ 17.9^{\tau}$ $\quad H = 4\ 20.5^{\tau}$

$g = 0\ 17.9^{\tau}$ $\quad h = 23\ 43.1^{\tau}$ $\quad h = 23\ 43.1^{\tau}$

$H = 4\ 20.5^{\tau}$ $\quad G+h = 0\ 1.0^{\tau}$ $\quad H+h = 4\ 3.6^{\tau}$

$\log g = +0.9380^{\tau}$

$\log k = +1.2793^{\tau}$ $\quad \delta = -4\ 15\ 19^{\tau}$

$\log i = +0.8745^{\tau}$

$\log 1/15 = +8.8239^{\tau}$
$\log g = +0.9380^{\tau}$
$\log \sin(G+h) = +7.6398^{\tau}$
$\log \tan\delta = -8.8716^{\tau}$
$-0.000^{\tau} = -6.2733^{\tau}$

$\log g = +0.9380^{\tau}$
$\log \cos(G+h) = 10.0000^{\tau}$
$+8.67^{\tau} = +0.9380^{\tau}$

$\log 1/15 = +8.8239^{\tau}$
$\log k = +1.2793^{\tau}$
$\log \sin(H+h) = +9.9414^{\tau}$
$\log \sec\delta = +0.0012^{\tau}$
$+1.111^{\tau} = +0.0458$
$+1.321^{\tau}$
$+2.432^{\tau}$
-0.000^{τ}
$+2.432^{\tau}$ = cor. in R.A.

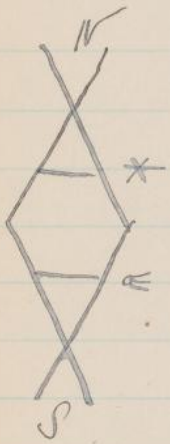
$\log k = +1.2793^{\tau}$
$\log \cos(H+h) = +9.6870^{\tau}$
$\log \sin\delta = -8.8704^{\tau}$
$-0.69^{\tau} = -9.8367^{\tau}$

$\log i = +0.8745^{\tau}$
$\log \cos\delta = +9.9988^{\tau}$
$+7.47^{\tau} = +0.8733$
$+8.67^{\tau}$
$+16.14^{\tau}$
-0.69^{τ}
$+15.45^{\tau}$ = cor. in Dec.

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Comet d (Brooks July 6 1889)
Oct. 16, 1889



⊏	*		
22 11 31.0	10 49.8		
12 16.8	11 38.2		
23 47.8	22 28.0	1 19.8	0 39.90
13 42.2	13 0.9		
14 27.6	13 49.8		
28 9.8	26 50.2	1 19.6	0 39.80
16 56.4	16 15.1		
17 42.1	17 3.5		
34 38.5	33 18.6	1 19.9	0 39.95
18 58.0	18 16.9		
19 43.9	18 5.5		
38 41.9	37 22.4	1 19.5	0 39.75
22 20.8	21 39.3		
23 6.8	22 28.2		
45 27.6	44 7.5	1 20.1	0 40.05
27 14.0	26 32.5		
27 59.0	27 21.5		
55 13.0	53 54.0	1 19.0	0 39.50
			4.95
22 3 178.6	8 39 1.7		+0 39.83
Members = 22 18 49.9	1 25.0		
+1 44.9	8 37 36.7		
22 20 34.8	4 44 31.c		
13 41 33.1	13 22 7.7 = Gr. M. T.		
8 39 1.7			

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1888phad.proj...505.

$\Delta\alpha$	$\Delta\delta$	
45.8	48.4	94.2
45.4	48.4	93.8
45.7	48.4	94.1
45.9	48.6	94.5
46.0	48.9	94.9
45.0	49.0	94.0

.38
45.76

125
94.23

log. 94.23 = 1.97419
" 7.5 = 0.87506
" cos δ = 9.99892
= 2.84817

705.0 .7
886.0
181.0 = 3 1.0

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Oct. 16, 1889

Comet d, 1889 (Brooks July 6)

Comp. Star — ΔD — 4° 5949

Sg. 9824 = 23h 39m 12.s00 −4° 9′ 40.″4 (1865)

+0 36.97 +3 59.6

Mid. Place. 23 39 48.97. −4 5 40.8..

354 57 14.55

log. n/5 = 0.12607

" sin ϕ = −8.94425

" tan. δ = −9.99889

+C. +173 = +9.06921

+3.0711 +7.95515

+3.1884 = 0.50357

+3.0801

24 = 1.38021

73.92 = 1.86877

log. n = 1.30216

" cos δ = +9.99831

" 24 = 1.38021

+479.4 = +2.68068

(* 1865.0) = 23 39 12.00 −4 9 40.4

+1 13.92 +19 59.4

(* 1889.0) = 23 40 25.92 −4 1 41.0

+0 39.83 −3 1.0

α 1889.0 = 23 41 5.75 −4 4 42.0

ap. Pl. cor. = +2.43 +15.4

" " α = 23 41 8.18 −4 4 26.6

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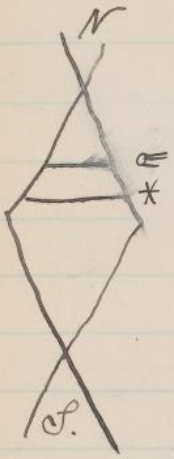
1888phas.proj..505.

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1888phae.proj..505.

Oct. 17, 1889

Comet d, 1889 (Brooks July 6)



	E	*	E − *	
21	24 35.5	24 1.4		
	25 10.1	24 49.5		
	49 45.6	48 50.9	+0 54.7	0 27.35
	26 13.9	25 40.0		
	26 48.5	26 28.0		
	53 2.4	52 8.0	0 54.4	0 27.20
	28 42.5	28 8.5		
	29 17.5	28 57.0		
	58 0.0	57 5.5	0 54.5	0 27.25
				.80
				+0 27.27

160 − 48.0 ″

Mean 3 sets = 21 26 48.0 ″ M R

+1 48.1 ″

21 28 36.1 ″

13 45 29.6 ″

7 43 6.5 ″

1 15.9 ″

7 41 50.6 ″

4 44 31.0 ″

12 26 21.6 = Gr. M. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	
34.6	48.1	13.5
34.6	48.0	13.4
35.0	48.5	13.5
2.2		1.4
34.73		13.47

$\log 13.47 = 1.12937$
$\log 7.5 = 0.87506$
$\log \cos\delta = 9.99892$
$100.8' = 2.00335'$
$+ 1\ 40.8$

1888phae.proj..505.

Oct. 17 1889

Comet d 1889, (Brooks July 6)

Comp. Star = − 4° 59 49 (8.8 Mg.) = same star as used on Oct. 16.

✳ 1889.0	=	23	40	25.92	′	− 4	1	41.0	″
			+ 0	27.27	′		+ 1	40.8	″
≡ 1889.0	=	23	40	53.19	′	− 4	0	0.2	
ap. Pl. cor	=			+ 2.42	′			+ 15.4	″
" " ≡	=	23	40	55.61	′	− 3	59	44.8	″

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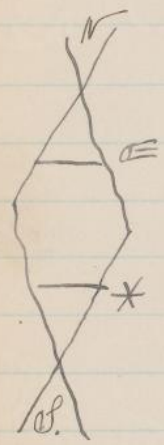
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Oct 18 1889

Comet d 1889 Brooks (July 6)



	E		*			
21	30	6.6 ✓	29	47.0 ✓		
	30	36.0 ✓	30	22.2 ✓		
	60	42.6"	60	9.2"	0 33.4"	0 16.70"
	31	35.5 ✓	31	16.0 ✓		
	32	4.5 ✓	31	51.0 ✓		
	63	40.0"	63	7.0"	0 33.0"	0 16.50"
	33	7.0 ✓	32	48.1 ✓		
	33	36.2 ✓	33	23.0 ✓		
	66	43.2"	66	11.1"	0 32.1"	0 16.05"
	34	45.5 ✓	34	26.4 ✓		
	35	15.0 ✓	35	1.5 ✓		
	70	0.5"	69	27.9"	0 32.6"	0 16.30"
	41	18.5 ✓	40	59.1 ✓		
	41	47.3 ✓	41	34.0 ✓		
	83	5.8"	82	33.1"	0 32.7"	0 16.35"
					190	
					+0 16.38"	

	34 2	132.1 '
Mean results	34	25.2 ' N.R
	+1	51.6 '
21	36	16.8 '
13	49	26.2 '
7	46	50.6 '
	1	16.5 '
7	45	34.1 '
4	44	31.0 '
12	30	5.1 = Gr. M. T.

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1888phaeproj..505.

29.4″ 35.2′ 64.6″

29.0″ 35.0′ 64.0″

29.2″ 34.9′ 64.1″

29.5″ 35.1′ 64.6″

28.8″ 34.9′ 63.7″

0.9 1.0′

29.48° 64.20″

log. 64.20 = 1.80754″

" 7.5 = 0.87506″

" cos L = 9.99892′

480.37 = 2.68152″

886.0″

405.7 = +6 45.7′

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1888phae.proj..505.

Oct. 12. 1889.

Comparison Comet to Comet d 1889 (Brooks of July 6)

	⋐		✶				
21	52	36.5 ✓	52	5.9 ✓			
	53	1.5 ✓	52	22.9 ✓			
	105	38.0	104	28.8	/ 9.2	o 34.60	
	57	11.1 ✓	56	41.0 ✓			
	57	37.5 ✓	56	58.0 ✓			
	114	48.6	113	39.0	/ 9.6	o 34.80	
22	o	10.0 ✓	59	37.0 ✓			
	o	32.5 ✓	59	56.0 ✓			
	120	42.5	119	33.0	/ 9.5	o 34.75	
	4	48.5 ✓	4	16.4 ✓			
	5	12.5 ✓	4	34.9 ✓			
	130	1.0	128	51.3	/ 9.7	o 34.85	
						3.00	
						+o 34.75	

469 130.1 ,7

Mean Factor 2 h 58 53.8 ,7 R.

+1 51.6

20 o 45.4 ,7

13 49 26.2 ,7

28 11 19.2 ,7

-1 20.5 ,7

8 9 58.7 ,7

4 44 31.0

12 54 29.7 = Gr. M. T.

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1888phaet.proj..505.

25.0″ 17.0″ 42.0″

26.4″ 17.0″ 43.4″

22.5″ 19.0″ 41.5″

24.0″ 18.5″ 42.5″

$$\frac{42.5}{1.4}$$

0 42.35

Log 42.35 = 1.62685″

" 7.5 = 0.87506

" cos ℒ = 9.99892

316.8′ = 2.50083″

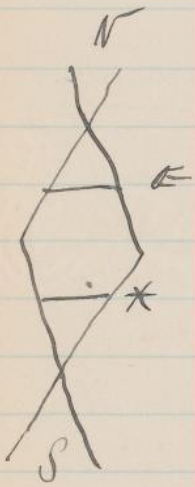
$\frac{886.0}{569.2}$′ = +9 29.2″

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1888phae.proj..505.

Oct. 16. 1889.

Comparison Comet to Comet d 1889 (Brooks July 6)



	⊏	*			
22	8 44.4 ✓	8 11.5 ✓			
	9 7.9 ✓	8 30.2 ✓			
	17 52.3	16 41.7	1 10.6	0 35.30	
	10 13.9 ✓	9 40.3 ✓			
	10 37.6 ✓	10 0.9 ✓			
	20 51.5 ✓	19 41.2	1 10.3	0 35.15	
	11 39.8 ✓	11 6.9			
	12 2.3 ✓	11 26.1 ✓			
	23 42.1 ✓	22 33.0	1 9.1	0 34.55	
	13 21.7 ✓	12 48.6 ✓			
	13 43.5 ✓	13 7.4 ✓			
	27 5.2 ✓	25 56.0	1 9.2	0 34.60	
	14 55.4 ✓	14 23.4 ✓			
	15 19.4 ✓	14 41.8 ✓			
	30 14.8 ✓	29 5.2	1 9.6	0 34.80	
	16 39.8 ✓	16 7.3 ✓			
	17 2.9 ✓	16 25.9 ✓			
	33 42.7 ✓	32 33.2	1 9.5	0 34.75	
	18 2.4 ✓	17 29.6 ✓			
	18 25.9 ✓	17 48.7 ✓			
	36 28.3 ✓	35 18.3	1 10.0	0 35.00	
	186 ~~20.9~~ 36.8 ✓ 21.2 ✓			6.15	
				+0 34.88	

Nov 7 sky 22 13 ~~21.6~~

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1888phaet.proj..505.

23.5 18.7 42.2

22 13 ~~31.6~~ 21.2
+1 51.6
22 1 12.8

23.7 20.6 44.3

13 49 26.2
8 25 ~~16.6~~ 16.6
−1 22.9
Gm.T.=8 24 23.7

22.4 19.2 41.6

~~4 44 34.0~~
~~+13 9 55.1 = Gm.T.~~

21.8 ~~19.8~~ 18.8 ~~39.6~~ 40

log 42.06 = 1.62387 521
" 7.5 = 0.87506
" cos δ = 9.99892
315.6 = 2.49919

886.0
570.4 = +9 30.4

24.0 18.4 42.4

23.1 18.6 41.7

15

23.5 19.1 42.6

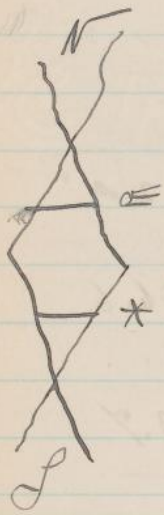
78.4
0 42.06
19

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Oct. 14. 1889

Comparison Comet to Comet d 1889 (Brooks July 6)



	E	*		
1	6 43.6 v	6 14.8 v		
	7 5.3 v	6 27.6 v		
	13 48.9	12 42.4	1 6.5	33.25
	7 56.7 v	7 28.2 v		
	8 19.1 v	7 41.9 v		
	16 15.8	15 10.1	1 5.7	32.85
	9 10.2 v	8 43.0 v		
	9 33.5 v	8 56.2 v		
	18 43.7	17 39.2	1 4.5	32.25
	10 23.1 v	9 54.9 v		
	10 44.9 v	10 8.5 v		
	21 8.0	20 3.4	1 4.6	32.30
	11 36.0 v	11 8.2 v		
	11 58.8 v	11 22.4 v		
	23 34.8	22 30.6	1 4.2	32.10
				2.75
				+0 32.55

≠ 9 1 15 12.7

Mean Sat = 9 21.1 GMT

+1 51.6

1 11 12.7

13 49 26.2

11 21 46.5

1 51.7

11 19 54.8

4 44 31.0

16 4 25.8 = G.M.T. of obs.

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21.7″ 12.8″ 34.5″

22.4″ 13.7″ 36.1″

23.3″ 13.2″ 36.5″

21.8″ 13.6″ 35.4″

22.8″ 14.2″ 37.0″

1.5′

0 36.30

5.90″

5.90 509″

Log 36.30 = 1.55991

" 7.5 = 0.87506″

" cos δ = 9.99892

2686′ 2716 = 2.43887″

8860 8860 2907″

617.4′ 614.4 = +10 14.4

+10 17.4′

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Oct 18 1889

Comet 1889 d Brooks (July 6) and companion (C?)

Comet d.

Comp. Star = AD. -4° 5949 (8.8 Mag.) = same as on Oct 16 & 17.

*1889.0 =	23 40 25.92	-4 1 41.0
	+0 16.38	+6 45.7
α 1889 =	23 40 42.30	-3 54 55.3
ap. Pl. cor.	+2.42	+15.4
ap. Pl. α =	23 40 44.72	-3 54 39.9

Companion (C?) 1st series

*1889.0 =	23 40 25.92	-4 1 41.0
	+0 34.75	+9 29.2
	23 41 0.67	-3 52 11.8
ap. Pl. α =	+2.42	+15.4
	23 41 3.09	-3 51 56.4

Companion (C?) 2nd series

*1889.0 =	23 40 25.92	-4 1 41.0
	+0 34.88	+9 31.4
	23 41 0.80	-3 52 10.76
ap. Pl. cor.	+2.42	+15.4
ap. Pl. α =	23 41 3.22	-3 51 55.36

Companion (C?) 3rd series

*1889.0 =	23 40 25.92	-4 1 41.0
	+0 32.55	+10 17.4
	23 40 58.47	-3 51 23.6
ap. Pl. cor.	+2.42	+15.4
ap. Pl. α =	23 41 0.89	-3 51 8.2

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Oct. 18. 1889

Red. to App. Place

$f = +1.344''$
$g = 0^h 15.4''$
$H = 4^h 7.9''$
$\log g = +0.9451''$
$\log h = +1.2809''$
$\log i = +0.8641''$

$G = 0^h 15.4''$
$\alpha = 23\ 40.7''$
$23\ 56.1''$

$H = 4^h 7.9''$
$\alpha = 23\ 40.7''$
$3\ 48.6''$

$\delta = -3\ 54\ 55''$

$\log 1/5 = +8.8239''$
$\log g = +0.9451''$
$\log \sin G+\alpha = -8.2294''$
$\log \tan \delta = -8.8353''$
$+0.001 = +6.8337''$

$\log 1/5 = +8.8239''$
$\log h = +1.2809''$
$\log \sin H+\alpha = +9.9243''$
$\log \sec \delta = +0.0010''$
$+1.072'' \quad +0.0301''$
$+1.344''$
$+2.416''$
$+0.001$
$+2.417 = \log \sin R.A.$

$\log g = +0.9451''$
$\log \cos G+\alpha = +9.9999''$
$+8.81'' = +0.9450''$

$\log h = +1.2809''$
$\log \cos(H+\alpha) = +9.7343''$
$\log \sin \delta = -8.8343''$
$-0.71'' = -9.8495''$

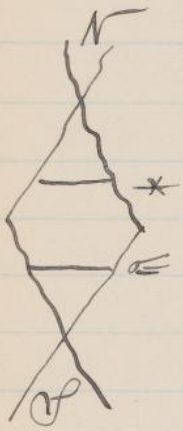
$\log i = +0.8641''$
$\log \cos \delta = +9.9990''$
$+7.30'' = +0.8631''$
$+8.81''$
$+16.11''$
$-0.71''$
$+15.40'' = \log \sin Dec.$

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Oct. 23 1889

Comet d 1889 (Brooks July 6)



	⊏		*		⊏ − *	
23	5 23.0 ✓		7 18.6 ✓			
	5 58.7 ✓		8 4.8 ✓			
	11 21.7		15 23.4		4 1.7	2 0.85
	8 45.6 ✓		10 41.0 ✓			
	9 21.2 ✓		11 27.5 ✓			
	18 6.8		22 8.5		4 1.7	2 0.85
	12 55 ✓		14 0.5 ✓			
	12 41.1 ✓		14 47.5 ✓			
	24 46.6		28 48.0		4 1.4	2 0.70
	15 42.5 ✓		17 37.8 ✓			
	16 17.9 ✓		18 24.4 ✓			
	32 0.4		36 2.2		4 1.8	2 0.90
	19 1.5 ✓		20 57.2 ✓			
	19 37.5 ✓		21 44.0 ✓			
	38 39.0		42 41.2		4 2.2	2 1.10
						4.40
						− 2 0.88

123 11 4.5

Mean sets = 23 12 29.4 Sr. R

+ 2 9.1

23 14 38.5

14 13 5.5

9 +5 29.6

− 1 28.7

9 04 0.2

4 44 31.0

13 44 35.3 = Gr. M. T.

13 48 31.2

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$\Delta\alpha$	$\Delta\delta$	$\alpha+\delta$
35.7	46.2	81.9
35.6	46.5	82.1
35.6	47.0	82.6
35.4	46.6	82.0
36.0	46.8	82.8
3.3		1.4
35.66		82.28

$\log 82.28 = 1.91529$

$\log 7.5 = 0.87506$

$\log \cos\delta = 9.99924$

$616.0 = 2.78959$

886.0

$-270.0 = -4\ 30.0$

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Companion Comet to Comet d

Oct. 23 1889



	C	*			
23	27 7.0 ✓	28 58.2 ✓			
	27 42.0 ✓	29 18.3 ✓			
	54 49.0 :	58 16.5 "	3	27.5 "	1 43.75 "
	31 14.0 ✓	33 4.6 ✓			
	31 49.8 ✓	33 25.6 ✓			
	63 3.8 :	66 30.2 "	3	26.4 "	1 43.20 "
	34 19.4 ✓	36 9.3 ✓			
	35 ~~23~~ 3.5 ✓	36 29.8 ✓			
	~~69~~ 72.9 :	72 39.1 "	3	26.2 "	1 43.10 "
	41 19.4 ✓	43 9.9 ✓			
	4 ~~2~~ 1 55.3 ✓	43 30.8 ✓			
	8 ~~4~~ 3 14.7 :	86 40.7 "	3	26.0 "	1 43.00 "
	44 35.9 ✓	46 25.3 ✓			
	45 9.8 ✓	46 45.9 ✓			
	89 45.7 :	93 11.2 "	3	25.5 "	1 42.75 "
					0.80
					1 43.16

358 16 6.1

23 36 2.6

+2 9.1

23 38 9.7

14 13 5.5

9 ~~25~~ 4 2

1 ~~37~~ 1.7

9 ~~28~~ 3 ~~7~~ 1.5

4 44 31.0

14 ~~8~~ 12 ~~2~~ 28 6.5

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35.0″ 20.1″ 14.9″

35.8″ 21.0″ 14.8″

34.1″ 20.5″ 13.6″

35.9″ 20.9″ 15.0″

33.9″ 20.6″ 13.3″

21.6

0 14.32″

Log. 14.32 = 1.155946″

" 7.5 = 0.875061″

" cos ℒ = 9.999240′

107.2′′ = 2.030247″

1 47.2″

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Oct. 23, 1889

Comet d 1889 Brooks July 6

Comp. Star = AD −3° 5707 (5.4 K)

W. $23^h 823^v$ = $23^h\ 38^m\ 57.08^s$ $-3\ 44\ 4.6''$ (1825)

$+1\ 38.50'$ $+10\ 39.0'$

Mid. Place = $23\ 40\ 35.58'$ $-3\ 33\ 25.6''$

$355\ 8\ 53.70'$

Log. m/5 = 0.12611

" sin t = −8.92725

" tan Σ = −8.79336

+0.0070' = +7.84672

+3.0707

+3.0777 = 0.48823

64 = 1.80618

+1978.7 = 2.29441

Log m = +1.30220

" cos t = +9.99844

" 64 = +1.80618

+1278.8 = +3.10682

	$23\ 38\ 57.08^s$	$-3\ 44\ 4.6''$
	$+3\ 16.97'$	$+21\ 18.8'$
(*1889.0) =	$23\ 42\ 14.05'$	$-3\ 22\ 45.8''$
	$+2.39'$	$+15.3'$
	$23\ 42\ 16.44'$	$-3\ 22\ 30.5''$
	$-2\ 0.88'$	$-4\ 30.0$
= d. =	$23\ 40\ 15.56'$	$-3\ 27\ 0.5''$

	$23\ 42\ 16.44$	$-3\ 22\ 30.5$
	$-1\ 43.16$	$-1\ 47.2$
= (comp.) a/p. =	$23\ 40\ 33.28'$	$-3\ 24\ 17.7''$

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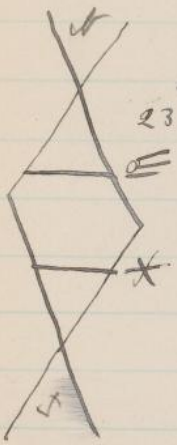
1888phae.proj..505.

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Nov. 5, 1889

Comet (Brooks July 6) d 1889



⊂		✳	
12	49.6	11	47.8
13	14.6	12	21.3
26	4.2	24	9.1

1 551 +0 57.55

23^h 26 4.2

mean = 23 13 2.1

47.8
+2 ~~52.4~~
49.9
23 15 ~~54.5~~

15 4 20.7
29.1
8 11 ~~33.8~~
1 20.5
8.7
8 10 ~~33.3~~
4 44 31.0
~~44~~
12 54 ~~40~~ = Gr. M. T.

23 15 49.9 ✓
15 0 24.2 ✓
8 15 25.7 ✓
1 21.2 ✓
8 14 4.5 ✓
4 44 31.0 ✓
12 58 35.5 = Gr. M. T. ✓

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~~A~~

~~1E~~ 1*

25.0" 33.5" 0 58.5"

Log 58.50 = 1.76716 ✓
" 7.5 = 0.87506 ✓
" cos δ = 9.99970 ✓
= 2.64192 ✓

448.6
886.0
437.4 = +17 27.6 ✓

×324
246.0
4K7.6 = 7′ 27.6

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1888phae.proj..505.

Nov. 5 1889

Comet d 1889 (Brooks July 6)

Comp. Star = 12 − 2° 6037 (8.8 B)

B.D. VI =	23h 39m 56.46s ✓		−2° 18′ 50.6″ ✓ (1855) (mean of 2 pos)
	+0 52.31 ✓		+5 39.7 ✓
Mod. Pl. =	23 40 48.77 ✓		−2 13 10.9 ✓
	355 12 11.55 ✓		

Log m/5	= 0.12608 ✓	+0.12608 ✓	Log m = +1.30217 ✓
" sin t	= −8.92231	= 2.92231	" cos δ = +9.99847 ✓
" sin 1″	= −9.99967	= 2.53239	" 34 = +1.53148 ✓
+0.1117	−9.04806	+7.63678	679.4 = +2.83212
+3.0710 ✓		+0.00453	
3.1827 =	0.50280	+3.0710	
34 =	1.53148	+3.07573	
108.21 =	2.03428	+0.54729	
		+1.53148	
		+2.01937	
		104.576	

* 1855.0	23 39 56.46 ✓		−2 18 50.6 ✓
	+1 48.21 ✓		+11 19.4 ✓
* 1889.0	23 41 44.67		−2 7 31.2 ✓
	+2.29		+14.9 ✓
ap. Pl. * =	23 41 46.96 ✓		−2 7 16.3 ✓
	+0 57.55		+7 2.7.6
ap. Pl. α =	23 42 44.51		−1 59 58.9 (2nd set)
			−1 59 48.7
ap. Pl. *	23 41 46.96	43.33 ✓	−2 7 16.3 ✓
	+0 56.32 ✓		+7 14.8 ✓
ap. Pl. α =	23 42 43.28 ✓	39.6 ✓	−2 0 1.5 ✓

(using all 4 sets)

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Nov. 5 1889

Brooks July 6 d 1889

$q = +1.466$ ' ✓ $G = 0\ 17.3$ ' ✓ $H = 2\ 54.1$ ' ✓

$f = 0\ 17.3$ ' ✓ $\ell = 23\ 41.7$ ' ✓ $\alpha = 23\ 41.7$ ' ✓

$H = 2\ 54.1$ ' ✓ $G+\ell = 23\ 59.0$ ' ✓ $H+\alpha = 2\ 35.8$ ' ✓

$\log q = +0.9830$ ' ✓

" $h = +1.2920$ ' ✓ $\qquad \alpha = -2^{\circ}\ 7'\ 31''$

" $i = +0.7673$ ' ✓

$\log \sin \tfrac{1}{2}5 = +8.8239$ ' ✓

" $q = +0.9830$ ' ✓

" ~~$\sin(G+\ell)$~~ -2.6388 ✓ $= -2.6699$ '

" $\tan \ell = -8.5698$ ✓

$+0.000$ ' ✓ $= +6.0466$ '

$+6.016$ ✓

$\log \sin \tfrac{1}{2}5 = +8.8239$ ' ✓

" $h = +1.2920$ ' ✓

" ~~$\sin$~~ ~~$\cos$~~ $H+\alpha = +9.7984$ ' ✓

" ~~$\cos \ell$~~ $= +0.0003$ ' ✓

$+0.822$ ' ✓ $= +9.9146$ ' ✓

$+0.466$ ' ✓

$+2.288 =$ corr in R.A.

$\log q = +0.9830$ ' ✓

" $\cos G+\ell = 10.0000$ ' ✓

$+9.62$ ' ✓ $= +0.9830$ ' ✓

$\log h = +1.2920$ ' ✓

" $\cos H+\alpha = +9.8908$ ' ✓

" $\sin \ell = -8.5695$ ' ✓

-0.56 " ✓ $= -9.7523$ ' ✓

$\log i = +0.7673$ ' ✓

" $\cos \ell = +9.9917$ ✓

$+5.85$ ' ✓ $= +0.7670$ ✓

$+9.62$

$+15.47$ ✓

-0.56 ✓

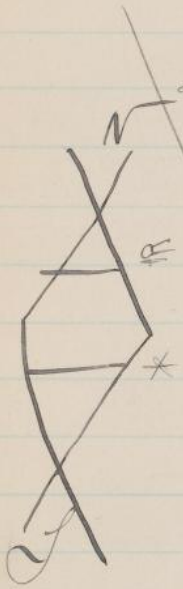
$+14.91 =$ corr in Dec. ✓

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Nov. 5 1889

Comet d 1889 (Brooks July 6)



	α		*		α - *		
23	12	49.6	11	47.8			
	13	14.6	12	21.3			
	26	4.2	24	9.1	1	55.1	0 57.55
	5 ≠0	50.8	49	52.7			
	51	17.1	50	26.6			
	102	7.9	100	19.3	1	48.6	0 54.30
	53	4.9	52	6.0			
	53	33.3	52	40.3			
	106	38.2	104	46.3	1	51.9	0 55.95
	55	11.6	54	13.8			
	55	41.0	54	43.8			
	110	52.6	108	57.6	1	55.0	0 57.50
							25.30
							+0 56.32

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$\Delta\alpha$	$\Delta\delta$	
25.0	33.5	58.5
26.3	33.9	60.2
28.4	34.3	62.7
29.4	30.0	59.4
29.1		0.8
27.28		0.60.20

log 60.20 = 1.77960
" 7.5 = 0.87506
" cos α = 9.99970
451.2 = 2.65436
886.0
434.8 = +7 14.8

log 60.77 = 1.78369
7.5 = 0.87506
cos α = 9.99997
451.2 = 2.65872
886.0
430.7 = +7 10.7
Only 1st set used.

log 60.77 = 1.78369
7.5 = 0.87506
cos α = 9.99997
434.2 = 2.65872
886.0
447.8 = +7 27.8
Only 1st set used.

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Nov. 5. 1849.

Comet d 1849 (Brorsen July 6)



50	50.8	49	52.7		
51	27.1	50	26.6		
102	17.9	100	19.3	1 48.6	0 54.30
53	4.9	52	6.0		
53	33.3	52	40.3		
106	38.2	104	46.3	1 51.9	0 55.95
55	11.6	54	13.8		
55	41.0	54	43.8		
110	52.6	108	57.6	1 55.0	0 57.50
					+0 55.92

3 1 8	98.17	
23 53	16.4	
+2	47.8	
23 56	42	23 56 4.2
~~15 4~~	~~20.7~~	15 0 24.2
~~8 51~~	~~43.5~~	8 55 40.0
~~1~~	~~27.0~~	1 27.8
~~8 50~~	~~16.5~~	8 54 12.2
~~4 44~~	~~31.0~~	4 44 31.0 = Gr. m. T. of obs.
~~13 34~~	~~47.5~~ = Gr. m. T.	13 38 43.2

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1888phaet.proj..505.

~~26.3~~ ~~25.0~~ 33.9 60.2

28.4 34.3 62.7

29.4 30.0 59.4

2.3

0 60.77

Log 60.77 = 1.78369

" 7.5 = 0.87505

" cos 2 = 9.99970

455.5 = 2.65845

8860

430.5 = +7 10.5

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1888phae.proj..505.

Nov. 5 1889

Comet d, 1889 (Brooks July 6)

Comp. Star = $\sqrt{D} - 2^{\circ}6037$

Ap. Pl. * =	23	41	40.~~00~~ 3,33		− 2	7	16.3	
		+ 0	55.92		+ 7	10.5		
Ap. Pl. =	23	41	36.88 39.25		− 2	0	5.8	

This is Ap. Pl. using last 3 sets

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Expts with new Tin Foil (provisional) / Bar micrometer. (Jan. 12, 1889)

1st Bars parallel and perpendicular to diurnal motion.

Transits near South Bar.

r	15	0.0	60.r
	16	0.r	
	16	23.r	60.4
	17	24.3	
	17	r3.r	60.r
	18	r4.0	
	19	17.2	60.7
	20	17.9	
	20	47.r	60.4
	21	47.9	2.9
			60.r4

Transits ½ from South Bar.

r	31	20.6	60.4
	32	21.0	
	32	r9.r	60.6
	34	0.1	
	34	36.0	60.9
	35	36.9	
	36	r1.r	60.6
	37	r2.1	
	38	36r	60.r
	39	37.0	.30
			60.60

Transits ¼ from S. Bar.

r	22	41.9	60.3
	23	42.r	
	24	36.4	60.4
	25	36.4	
	26	13.4	60.6
	27	14.4	
	27	43.r	60.6
	28	44.1	
	29	16.r	60.3
	30	16.4	2.7
			60.44

Transits ¾ from S. Bar.

r	42	34.0	60.4
	43	34.4	
	44	19.r	60.r
	45	20.0	
	45	r2.r	60.r
	46	r3.0	
	47	14.2	60.3
	48	14.r	
	48	46.0	60.r
	49	46.r	.22
			60.44

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1888phae.proj..505.

Effets continued.

(Jan. 12. (444.)

Transits near North Bar.

r	r0	30.6	60.4
	r1	31.K	
	r2	1.2	60.4
	r3	2.0	
	r3	27.9	60.r
	rK	2K.K	
	rK	rK.K	60.F
	rr	rr.6	
	r6	20.6	60.9
	r7	21.r	.3F
			60.76

Resume.

Transits with Sq. Bar. removed.

Means.

60.rA

60.KK

60.60

60.KK

60.76

2.A2

60.r6K✓ Gen. mean.

Square turned 90°. Mean = 60.r2

Trans. near South Bar / " = 60.62

" 1/K from " " / " = 60.62

" 1/2 " " " / " = [60.93]

" 3/K " " " / " = [60.r7]

" near North " / 3.26

60.6r2✓

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Expts. with New (provis.) Bar Micrometer.
(Jan. 14. 1889.)

Transits near S. Bar. (mean) = 60.6 2
" 1/4 from " " " = 60.6 4
" 1/2 " " " " " = 60 6 2
" 3/4 " " " " " = 606 2
" near North Bar " = 60.76
3.3 2

60.66 4 = Gen. mean.

Pos. Circle turned 90°.

Transits near S Bar (mean) = 60.70
" 1/4 from " " " = 60.72
" 1/2 " " " " = 60.64
" 3/4 " " " " = 60.60
" near North Bar " = 60.66
3.36

60.67 2 = Gen. mean

Results from Transits parallel to bars.

60.2624
60.6252
60.6624
60.6752
2.2252

Log. 60.634 = 1.782725
Log. cos δ = 9.99972
" " √2 = 0.150252
" 15. = 1.17609
" 12 & √.6 = 3.10911

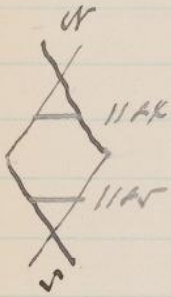
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Expts. with Stur (Prov's.) Bar micrometer.

Jan. 15. 1889.

Trans. of two stars of Kurrus dec. through opposite halves.



6	20 5.1 ✓	20	30.5 ✓		
21	12.5 ✓	21	36.2 ✓		
41	17.6	42	6.7	K9.1	2 K.5 5
22	12.4 ✓	22	37.7 ✓		
23	20.1 ✓	23	K3.4 ✓		
45	32.9	46	21.5	K4.6	2 K.30
24	15.0 ✓	24	39.4 ✓		
25	22.2 ✓	25	K6.0 ✓		
49	37.2	50	25.4	K4.6	2 K.30
26	15.3 ✓	26	K0.1 ✓		
27	22.3 ✓	27	K6.1 ✓		
53	37.6	54	26.2	K4.6	2 K.30
28	10.0 ✓	28	35.0 ✓		
29	17.4 ✓	29	K1.0 ✓		
57	27.4	58	16.1	K4.7	2 K.35
30	16.2 ✓	30	K0.4 ✓		
31	23.1 ✓	31	K7.2 ✓		
61	39.3	62	24.0	K4.7	2 K.35
32	12.2 ✓	32	36.5 ✓		
33	19.1 ✓	33	K3.0 ✓		
65	31.3	66	19.5	K4.2	2 K.10

1	7.4 ✓	1	5.7 ✓	2 13.1 ✓
1	7.3 ✓	1	6.1 ✓	2 13.4 ✓
1	7.2 ✓	1	6.2 ✓	2 13.4 ✓
1	7.0 ✓	1	6.0 ✓	2 13.0 ✓
1	7.4 ✓	1	6.0 ✓	2 13.4 ✓
1	6.9 ✓	1	6.4 ✓	2 13.3 ✓
1	6.9 ✓	1	6.5 ✓	2 13.4 ✓
				2 13.03 ✓

133.03 = 2. 12 39 ✓ 7

7.5 = 0.47 ✓ 06 7

log. cos δ = 9.9997 ✓

997.1 7 = 2.99 476 7

277.5

1274.6 7

Final results

From transits par. to base = 1246 ✓ 6

" " of two K stars

in opposite halves = 1274.6

mean = 1260.1 ✓

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Expts with New (Gravs.) Bar Micrometer.

Jan. 15. 1889.

Trans. of two stars of Kumm. dec. through opposite halves.

Square turned 90°.

6	36	21.2		36	46.5		
	37	29.0		37	52.1		
	3A	15.0		3A	40.5		
	39	22.9		39	46.0		
	40	7.9		40	33.0		
	41	15.4		41	3A.A		
	42	1.0		42	26.2		
	43	A.A		43	31.9		
	43	52.A		44	17.9		
	45	0.2		45	23.5		
	45	44.A		46	9.9		
	46	52.2		47	15.4		
	47	41.5		4A	6.6		
	4A	49.0		49	12.3		
1	7.A		1	5.6	2	13.4	
1	7.9		1	5.5	2	13.4	
1	7.5		1	5.A	2	13.3	
1	7.A		1	5.7	2	13.5	
1	7.4		1	5.6	2	13.0	
1	7.4		1	5.5	2	12.9	
1	7.5		1	5.7	2	13.2	
						22.7	
					2	13.24	
					2	13.03	
					2	13.14	= 133.140

127.5
1274.6
Mean 127.0

Log. 133.14 = 2.12431
" 7.5 = 0.47506
" cos δ = 9.99974

99A.0 = 2.99912
277
127.5

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Nov. 14 1889

Comet d 1889 (Brooks) (July 6)



	∈	*	∈ − *		
o	37 15.0	38 5.9			
	37 46.0	38 34.5			
	75 1.0	76 40.4	−1	39.4	o 49.70
	39 14.2	40 5.4			
	39 44.9	40 34.0			
	78 59.1	80 39.4	−1	40.3	o 50.15
	41 11.4	42 3.2			
	41 43.5	42 31.5			
	82 54.9	84 34.7	−1	39.8	o 49.90
	43 23.9	44 15.9			
	43 56.0	44 44.0			
	87 19.9	88 59.9	−1	40.0	o 50.00
	45 25.5	46 16.9			
	45 57.0	46 45.4			
	91 22.5	93 2.3	−1	39.8	o 49.90
					4.65
					− o 49.93

Mean Sat. 0h

413	157.4	A.R.
41	33.7	
+3	15.9	
0h 44	49.6	
15 35	58.2	
9 8	56.4	
−1	29.9	
9 7	26.5	
4 44	31.0	
13 51	57.5	= Gr. Mn. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	
31.0″	28.6″	59.6″
30.7″	28.6″	59.3″
32.1″	28.3″	60.4″
32.1″	28.1″	60.2″
31.5″	28.5″	60.0″
7.4		4.5 :
31.48		59.90″

$\log. \not\equiv 59,90 = 1,777743''$

$\quad\quad \| \quad T.5 \quad = 0.875066''$

$\quad\quad \| \quad \cos 2' \quad = \underline{9.999997'}$

$\quad\quad 449.2'' = 2.652246''$

$\quad\quad 886.0$

$\quad\quad 436.8'' = -7 \quad 16.8''$

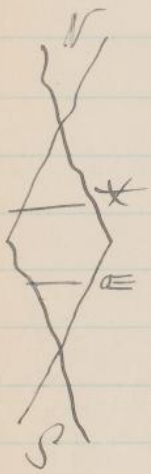
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Nov. 14 1889

Companion Comet Brooks

	≡	✳	≡ − ✳
1	17 2.2	17 30.3	
	17 35.8	18 15.1	
	34 38.0	35 45.4	−1 7.4 0 33.70
	20 40.0	21 9.3	
	21 15.5	21 53.9	
	41 55.5	43 3.2	1 7.7 0 33.85
	22 59.6	23 28.9	
	23 34.9	24 13.2	
	46 34.5	47 42.1	1 7.6 0 33.80
	25 38.9	26 6.8	
	26 13.2	26 52.7	
	51 52.1	52 59.5	1 7.4 0 33.70
	27 50.5	28 18.4	
	28 25.7	29 4.2	
	56 16.2	57 22.6	1 6.4 0 33.20
	38 39.9	39 9.0	
	39 16.1	39 53.9	
	77 56.0	79 2.9	1 6.9 0 33.45
			3.7 0
			−0 33.62



30 5 25 23

Mean Locate = α 25 4 26 0 ✓ H.R.
+3 15.9 ✓
≡ 29 15.9 ✓
15 35 53.2 ✓
9 53 37.7 ✓
−1 37.2
9 51 35.5

1. 9 51 35.5 = C. M. T.
4 4 4 31.0
4 36 4.5 = G. M. T.
2

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1888phae.proj..505.

$\Delta\alpha$	$\Delta\delta$	$\Sigma+\delta$
33.6″	44.8″	78.4″
35.5″	44.6″	80.1″
35.3″	44.3″	79.6″
34.3″	45.9″	80.2″
35.2″	45.8″	81.0″
36.2″	44.9″	81.1″

$-.4'$

$80.07''$

$\log 80.07 = 1.90347''$

$117.5 = 0.87508''$

$\log \cos\delta = 9.99991$

$600.5'' = 2.77850''$

$600.5''$

$886.0''$

$285.5'' = -4\ 45.5''$

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1888phae.proj..505.

Nov. 14 1889

Transits joining Unlet. Comp. * to Dm. −0 4585 (6.2 L)



	Unlet. *	Let *		
0h	50 14.7	51 20.5		
	50 33.0	51 36.0		
	100 47.7 ″	102 56.5 ″	−2 ~~8.8~~ ″	1 4.40 ″
	52 20.0	53 26.0		
	52 39.0	53 41.5		
	104 59.0 ″	107 7.5 ″	2 8.5 ″	1 4.25 ″
	~~54 22.0~~	55 28.4		
	~~55 28.4~~ 40.6	~~54 22.0~~		
	54 43.9	55 43.9		
	~~55 47.7~~	~~54 40.6~~		
	~~111 12.3~~	~~109 2.6~~	2 9.7 ″	1 4.85 ″
	109 2.6 ″	111 12.3 ″		
	56 14.4	57 20.5		
	56 33.0	57 36.1		
	112 47.4 ″	114 56.6 ″	2 9.2 ″	1 4.60 ″
	58 9.0	59 15.5		
	58 28.0	59 30.7		
	116 37.0 ″	118 46.2 ″	2 9.2 ″	1 4.60 ″
	0 9.1	1 15.7		
	0 28.0	1 ~~31~~.0	9.6 ″	
	0 37.1 ″	2 ~~52~~.7 ″	2 ~~15.6~~	1 4.80 ″
		46		
	1 58.0	3 4.2		
	2 16.7	3 19.5		
	4 14.7 ″	6 23.7 ″	−2 9.0 ″	1 4.50 ″
				4.00 ″
				−1 4.57

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1888phae.proj..505.

Nov. 14 1889

1 Ullet * Uet * Ullet + Uet *

18.3	15.5	33.8
19.0	15.5	34.5
18.6	15.5	34.1
18.6	15.6	34.2
19.0	15.2	34.2
18.9	15.3	34.2
18.7	15.3	34.0

10

34.14

Log. 34.14 = 1.53326
" 75 = 0.87506
" Cos. δ = 9.99998
256.0' = 2.40830

886.0
630.0' = − 10 30.0

1888phae.proj..605.

Nov. 14 1889

Comet Brooks (July 6) 1889

Comp. Star = Dm. −0° 45′ 8.6 (9.3)
joined to Dm. −0° 45′ 8.5 (6.2 L)

Gr. 46857-60 (means) =	23h 44m 32.56s	−1° 0′ 7.4″	(1800)
	+2 16.66	+14 50.6	
Mid Place =	23 46 49.22	−0 45 16.8	
	356° 42′ 18.30″		

Log 14/15 = 0.12614
" sin d = −8.75949
" tan L = −8.12388 (1.966)
+0.0010 = +7.00944 (7.00529)
3.0705
3.0715 = 0.48735
89. = 1.94939
273.36 = 2.43674

Log n = 1.30223
" cos d = +9.99928
" 89. = 1.94939
1782.0 = 3.25090

* 1800.0 =	23 44 32.56	−1 0 7.4
	+4 33.36	+29 42.0
* 1889.0 =	23 49 5.92	−0 30 25.4
	+2.26	+15.0
Ap. Pl. Let * =	23 49 8.18	−0 30 10.4
	−1 4.57	−10 30.0
Ap. Pl. Mn. *	23 48 3.61	−0 40 40.4
	−0 49.93	−7 16.8
Ap. Pl. ∈ =	23 47 13.68	−0 47 57.2

ap. Pl. *	23 48 3.61	−0 40 40.4
	−0 33.62	−4 45.5
" " ∈ (comp.)	23 47 29.99	−0 45 25.9 = Comparison ∈

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1888phae.proj..505.

Nov 14 1889

Comet Brooks July 6 { Ap. R. Reduction

$H_1 = +1.5599''$ $G = 0\ 19.5''$ $H_1 = 2\ 18.3''$

$G = 0\ 19.5''$ $L = 23\ 49.1''$ $L = 23\ 49.1''$

$H = 2\ 18.3''$ $G++ = 0\ 8.6''$ $H++ = 2\ 7.4''$

$\log g = +1.0101''$

$\log h = +1.2978''$ $\lambda = -0\ 30\ 25''$

$\log i = +0.6892''$

$\log \sin/5 = +8.8239''$

$\log g = +1.0101''$

$\log \sin G++ = +8.5735''$

$\log \tan L = -7.9469 - 2.0531$

$2.888'' = -0.4606 - 6.3544$

0.000

$\log \sin/5 = +8.8239''$

$\log h = +1.2978''$

$\log \sin G++ = +9.7224''$

$\log \sec \lambda = 0.0000''$

$+0.698'' = +9.8441''$

$+1.559''$

$+2.257'' =$ corr. in R.A.

2.888

$-0.631 =$ corr. in R.A.

$\log \cos g = +1.0101''$

$\log \cos G++ = +9.9987''$

$+10.23'' = +1.0098''$

$\log h = +1.2978''$

$\log \cos H++ = +9.9291''$

$\log \sin L = -7.9483 - 7.9468$

$-0.15'' = -9.1752$

$3\ 17.$

$\log i = +0.6892''$

$\log \cos L = +0.0000''$

$+4.89'' = +0.6892''$

$+10.23''$

$15.12''$

$-0.15''$

$+14.97'' =$ corr. in Dec.

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Nov. 15 1889

Comet d 1889 Brooks (July 6)

h	α		δ		α − δ	
23	54	23.4	55	42.7		
	54	46.0	56	1.3		
	109	9.4	111	44.0	− 2 34.6	− 1 17.30
	56	38.5	57	57.0		
	57	0.6	58	15.7		
	113	39.1	116	12.7	2 33.6	1 16.80
	58	47.5	0	6.8		
	59	10.4	0	25.1		
	117	57.9	120	31.9	2 34.0	1 17.00
	1	1.8	2	20.6		
	1	24.5	2	39.4		
	2	26.3	5	0.0	2 33.7	1 16.85
	3	18.2	4	37.0		
	3	40.6	4	65.9		
	6	58.8	9	32.9	2 34.1	1 17.05
						− 1 17.00



~~347~~
58.7 191.5

Mean Ratio = 23 59 1.2 Ph.A.
+3 19.5

24 2 20.7
15 39 49.7
8 22 31.0
1 22.3
8 21 18.7
4 44 31.0
13 5 39.7 = Gr. M. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	$\alpha+\delta$
22.6"	18.6"	41.2"
22.1"	18.7"	40.8"
22.9"	18.3"	41.2"
22.7"	18.8"	41.5"
22.4"	18.9"	41,3
		1.0
2.7		
22.54	0	41.20"

$\log 41.20'' = 1.61490''$

$\log 7.5 = 0.87506'$

$\log \cos\delta = 9.99997'$

$309.0'' = 2.48993$

$\frac{886.0''}{577.0} = -9\ 37.0''$

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Nov. 15, 1889

Comet Brooks (July 6) 1889.

Comp. Star = Dm. −0° 4585 (6.2 L.)

" " = Lettered star joined to intermediate star on Nov. 14

ap. Pl. ✳ =	23	49	8.18		−0	30	10.4
		−1	17.00			−9	37.0
ap. Pl. =	23	47	51.18		−0	39	47.4

ap. Pl. ✳ =	23	49	8.18		−0	30	10.4
		−1	2.06			−7	21.1
ap. Pl. (comp.) =	23	48	6.12		−0	37	$\frac{2}{3}$1.5 = companion =

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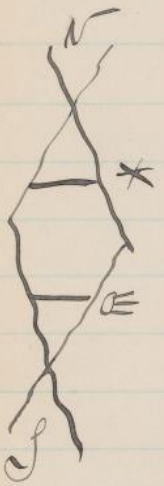
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Nov. 15 1889

Companion Comet to Brooks 1889 d



	E		*					
23	35	18.3	36	31.8				
	35	58.2	36	50.4				
	71	16.5	73	22.2	2	5.7	1	2.85
	38	11.2	39	21.8				
	38	48.4	39	42.8				
	76	59.6	79	4.6	2	5.0	1	2.50
	41	34.9	42	39.5				
	42	7.4	43	7.4				
	83	42.3	85	46.9	2	4.6	1	2.30
	44	46.8	45	50.2				
	45	18.3	46	17.9				
	90	5.1	92	8.1	2	3.0	1	1.50
	48	42.9	49	47.1				
	49	16.1	50	14.2				
	97	59.0	100	1.3	2	2.3	1	1.15
								.30
								− 1 2.06

	41 17	182.5	′
Mean Sets	23 42	02	″ N.P.
	15 43	19.5	′
	23 45	19.7	′
	15 39	49.7	′
	8 5	30.0	″
	− 1	19.5	′
	8 4	10.5	′
	4 44	31.0	
	12 48	41.5 =	Gr. Mn. T.

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39.9″ 18.6″ 58.5″

37.2″ 21.0″ 58.2″

32.5″ 27.9″ 57.4″ (60)

31.5″ 27.7″ 59.2″

33.2″ 27.1″ 60.3″

1.6

59.32″

log 59.32 = 1.77320

" 7.5 = 0.87506

" cos δ = 9.99997

444.9″ = 2.64823

886.0′

441.1″ = − 7 21.1″

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All observations of comet d 1889 and Companion Comet, carefully checked. Also star reductions of Struve checked.

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