KG
11365
507

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XG 11865.507

astro-ph.aae.prog. 508.

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For Sidereal Time of G. Mean Noon.

Washington Mean Noon, − 3.8^{s}9

Greenwich " " , + 46.69

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Contents

Obs. of Comet d 1889 from Nov. 16, '89 to Mar. 18 '90
" " Companion Comet of 1889 d, Nov. 16
" " Comet f 1889 from Nov. 18, '89 to Dec. 23, '89.
" " " g, 1889 " Dec. 16 to Dec 23, '89
" " Meridian Circle Stars on Jan 14, 1890 (should have been reduced in Mer. Ci. Star Book No 2)
Obs of Comet a 1890 from Mar 21 '90 to

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Nov. 16, 1889

Comet d, 1889, Brooks (July 6)



	∈		*		∈ − *		
0h	3 3.1 ✓		3 44.0 ✓				
	3 33.5 ✓		4 6.3 ✓				
	6 36.6		7 50.3		1 13.7	0	36.85
	4 38.0 ✓		5 19.0 ✓				
	5 8.5 ✓		5 41.0 ✓				
	9 46.5		11 0.0		1 13.5	0	36.75
	8 13.1 ✓		8 54.0 ✓				
	8 40.2 ✓		9 12.1 ✓				
	16 53.3		18 6.1		1 12.8	0	36.40
	9 40.1 ✓		10 21.0 ✓				
	10 7.0 ✓		10 39.2 ✓				
	19 47.1		21 0.2		1 13.1	0	36.55
	11 11.5 ✓		11 52.0 ✓				
	11 38.0 ✓		12 16.2 ✓				
	22 49.5		24 2.2		1 12.7	0	36.35
							2.90
							− 0 36.58

Mean rate = 0h

72 233.0
7 35.3 M.R.
+3 23.1
0h 10 58.4
15 43 46.3
8 27 12.1
− 1 23.1
8 25 49.0
4 44 31.0
13 10 20.0 = Gr. Mn. T. of obs.

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$\Delta\alpha$	$\Delta\delta$	$\alpha \pm \delta$
30.4″	22.3″	8.1″
30.5″	22.0″	8.5″
27.1″	18.1″	9.0″
26.9″	18.2″	8.7″
26.5″	18.2″	8.3″
		2.6″
		8.52″

~~4.4~~
~~2.88~~
14.14
28.28

Log. 8.52 = 0.93044″
" 7.5 = 0.87506″
" cos δ = 9.99998
−63.9′ = 1.80548″
− 1 3.9″

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Nov. 16 1889

Corrected 1889 Brooks July 6

Comp. Star = Dm. -0° 4585 (6.2 L) = same as on Nov. 15.

✱ 1889.0	23	49	5.92	− 0	30	25.4	
ap. Pl. cor. =			+2.25			+15.0	
ap. Pl. ✱ =	23	49	8.17	− 0	30	10.4	
		− 0	36.58		− 1	3.9	
ap. Pl. ○ =	23	48	31.59	− 0	31	14.3	

ap. Pl. ✱ =	23	49	8.17	− 0	30	10.4	
		− 0	22.13		+ 1	7.39	
ap. Pl. ○ =	23	48	46.04	− 0	29	3.1	= Comp. ○
			.05			2.5	

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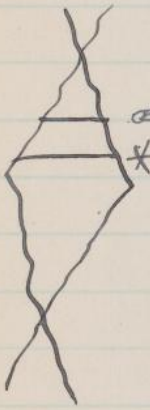
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Nov. 16 1889

Companion Comet of d, 1889

	α		*		α − *	
23h	41	26.8 ✓	41	44.1 ✓		
	41	54.5 ✓	42	21.3 ✓		
	83	21.3	84	5.4	0 44.1	0 22.05



43	31.2 ✓	43	48.4 ✓	
43	59.8 ✓	44	26.1 ✓	
87	31.0	88	14.5	0 43.5 — 0 21.75
45	8.1 ✓	45	25.4 ✓	
45	35.2 ✓	46	2.6 ✓	
90	43.3	91	28.0	0 44.7 — 0 22.35
53	42.8 ✓	54	1.4 ✓	
54	12.7 ✓	54	38.8 ✓	
107	55.5	108	40.2	0 44.7 — 0 22.35

~~57 29.2~~ 57 46.4
23.4
57 57.5 58 ~~5.5~~
115 ~~26.7~~ 115 ~~43.9~~ 9.8
6
367 151.1
~~4 11.4~~

43.1
0 ~~17.9~~ 0 21.55
~~0.05~~
~~− 0 22.01~~
− 0 22.12

~~482 17 7.8~~

23 48 ~~2.8~~ 23 46 11.4
43 23.1 3 23.1
23 51 52.9 2349 34.5
1543 46.3 1543 46.3
8 8 6.6 8548.2
1 20.0 − 1 19.6
8 6 46.6 8 4 28.6
4 44 31.0 4 44 31.0
2 51 17.6 = ~~Gr. m. T.~~ 12 48 59.6 =

Gr. m. T. = 12 48 59.6

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~~$\Delta\alpha$~~ ~~$\Delta\delta$~~

27.7″	37.2″	9.5″
28.6″	37.8″	9.1″
27.1″	37.2″	10.1″
29.9″	37.4″	7.5″

Log. 9.05″ = 0.95665
" 7.5″ = 0.87506
" cos δ = 9.99998
67.9″ = 1.83169
+ 1 7.9″

~~28.3 37.0 8.7~~
~~44.9~~
~~+0 8.98~~
+0 9.05″

~~Log 8.98 = 0.95328~~
" 7.5 = 0.87506
" cos δ = 9.99998
+67.3 = 1.82832
~~+ 1 7.3~~

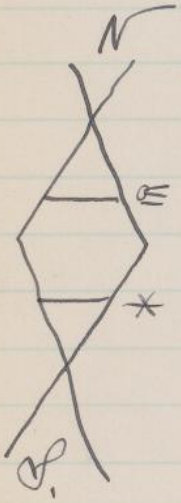
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Nov. 18, 1889.

Comet of 1889, Swift (Nov. 16)

		α		δ		α − δ		
23	56	2.5	55	19.0				
	56	38.5	55	40.9				
	112	41.0	110	69.9	1	41.1	0	50.55
	57	44.4	57	5.4				
	57	25.8	57	23.5				
	115	10.2	114	28.9	1	41.3	0	50.65
	59	27.9	58	54.3				
	0	13.7	59	6.7				
	119	41.6	118	1.0	1	40.6	0	50.30
	1	13.2	0	35.6				
	1	55.7	0	52.3				
	3	8.9	1	27.9	1	41.0	0	50.50
	3	11.5	2	23.5				
	3	47.4	2	50.8				
	6	58.9	5	12.8	1	46.1	0	5



2.00

+0 50.50

46 101.7

23 58 50.2

+3 30.8

24 2 21.0

15 51 39.4

8 10 41.6

−1 20.4

8 9 21.2

4 44 31.0

12 53 52.2 = Gr. M. T.

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$\Delta\alpha$	$\Delta\delta$	$\alpha+\delta$
36.0″	21.9″	57.9″
41.4″	18.1″	59.5″
45.8″	12.4″	58.2″
42.5″	16.7″	59.2″
~~35.9~~	~~26.8~~	~~62.7~~
		34.8′
		0 58.70″

Log 58.70 = 1.76864″
" 7.5 = 0.87506″
" cos δ = 9.99037″
+430.6′ = 2.63407″

886.0
+455.4 = 12 1 19
+227.7′ = +3 47.7′
12 5 7′

1.76864′
0.87506′
9.99027′
430.5′ = 2.63397′

886.0
455.5′ = +17 35.5′

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Nov. 18 1889

Comet f 1889 Swift

Comp. Star. = DM. +11° 4887 (8.9 K)

W. 22h 890 = 22 40 46.70 +11 40 49.4 (1425)

(Correction of 10 secs. in R.A. to Trinc assumed)

22 40 36.70 +11 40 49.4
+1 35.26 +10 3.8
22 42 11.96 +11 50 53.2
340 32 59.40

log $\frac{u}{15}$ = 0.12611
" sin d = − 9.52242
" tan d = +9.32178
−0.0934 = −8.97031

3.0707
2.9773 = 0.47382
64 = 1.80618
190.55 2.28000

log u = 1.30220
" cos d = 9.91748
" 64 = 1.80618
1210.2 = 3.08286

22 40 36.70 +11 40 49.4
+3 10.55 +20 10.2
*1889.0 = 22 43 47.25 +12 0 59.6
+0 50.50 +7 35.5
⊜ " = 22 44 37.75 +12 8 35.1
+1.82 +18.4
ap. Pl. ⊜ = 22 44 39.57 12 8 53.5

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Nov. 18 1889

$\lambda = +1.578$
$\beta = 0\ 18.8$
$H = 2\ 2.7$
$\log q = +1.0151$
" $h = +1.3002$
" $i = +0.6453$

$G = 0\ 18.8$
$L = 22\ 43.8$
$23\ 2.6$

$H = 2\ 2.7$
$L = 2243.8$
$0\ 46.5$

$\alpha = +12\ 1\ 19$

$\log 1/15 = +8.8239$
" $q = +1.0151$
" $\sin G+L = -9.3942$
" $\tan \alpha = +9.3283$
$-0.036 = -8.5569$
$= -8.5615$

$\log 1/15 = +8.8239$
" $h = +1.3002$
" $\sin H+L = +9.3043$
" $\sec \alpha = +0.0096$
$+0.2741 = +9.4380$
$+1.578$
$+1.852$
-0.036
$+1.816$ = cor. in R.A.

$\log. q = +1.0151$
" $\cos G+L = +9.9862$
$+10.03 = +1.0013$

" $h = +1.3002$
" $\cos H+L = +9.9910$
" $\sin \alpha = +9.3187$
$+4.07 = +0.6099$

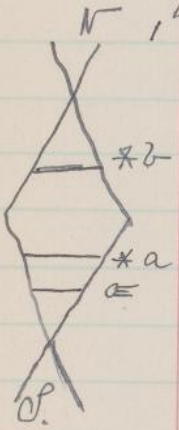
$\log. i = +0.6453$
" $\cos \alpha = +9.9904$
$+4.32 = +0.6357$
$+10.03$
$+4.07$
$+18.42$ = cor. in Dec.

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Nov. 22 1889

Comet f. 1889, Swift (Nov. 16)



	∈		*a		*b		∈ − *a		∈ − *a / 2
	33	59.4	34	57.4	35	7.0			
	34	37.8	35	39.8	35	48.5			
	68	37.2	70	37.2	70	55.5	2	0.0	1 0.00
	36	30.8	37	29.4	37	39.7			
	37	7.7	38	11.9	38	20.6			
	73	38.5	75	41.3	76	0.3	2	2.8	1 1.40
	39	3.9	40	1.7	40	12.0			
	39	42.5	40	44.4	40	52.10			
	78	46.8	80	46.1	81	4.0	1	59.3	0 59.65
	41	30.6	42	28.3	42	38.8			
	42	9.8	43	10.7	43	19.7			
	83	40.4	85	39.0	85	58.5	1	58.6	0 59.30
	44	52.8	45	50.6	46	0.7			
	45	32.0	46	33.8	46	41.6			
	90	24.8	92	24.4	92	42.3	1	59.6	0 59.80
	47	26.6	48	24.9	48	35.2			
	48	7.9	49	7.9	49	15.7			
	95	34.5	97	32.8	97	50.9	1	58.3	0 59.15
	50	55.8	51	53.5	52	4.3			
	51	37.0	52	36.6	52	44.9			
	102	32.8	104	30.1	104	49.2	1	57.32	0 58.65

59.55

2

− 0 59.43

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$\varepsilon - *b$	$\frac{\varepsilon - *b}{2}$	$\Delta\varepsilon$	$\Delta *a$	$\Delta *b$	$\varepsilon - *a$	$\varepsilon + *b$
2 18.3	/ 9.15	38.4	42.4	41.5	4.0	79.9
~~2 21.8~~	~~/ 10.90~~	~~36.9~~	~~42.5~~	~~40.9~~	~~5.6~~	
2 17.2	/ 8.60	39.0	42.7	40.0	3.7	79.0
2 18.1	/ 9.05	39.2	42.4	40.9	3.2	80.1
2 17.5	/ 8.75	39.2	43.2	40.9	4.0	80.1
2 16.4	/ 8.20	41.3	43.0	40.5	1.7	81.8
2 16.4	/ 8.20	41.2	43.1	40.6	1.9	81.8
	3.95				18.5	2.7
	−/ 8.66				0 3.09	80.45

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Nov. 22, 1889

Comet of 1889, Swift. (Nov 17)

Comp Star a. = Dm. +13° 5084 (7.7K)

W I 22^h 11 06 =	22 51 27.41	+12 59 15.2	(1825)
	+1 35.33	+10 13.1	
	22 53 2.74	13 9 28.3	

343° . 15' 41.10

Log $\frac{u}{r_5}$ = 0.10611

$u \sin L$ = 9.45941

$u \tan L$ = 9.36879

−0.0900 = −8.95431

3.0707

2.9807 = 0.417432

64 = 1.80618

190.77 = 2.28050

Log. u = 1.30220

$u \cos L$ = 9.99119

u. 64 = 1.80618

1229.1 = 3.08957

	22 51 27.41	+12 59 15.2	
	+3 10.77	20 29.1	
	22 54 38.18	+13 19 44.3	
×1889.0	−0 59.43	−0 22.6	
∝ " =	22 53 38.75	13 19 21.7	
	+1.83	+18.6	
ap. Pl. ∝ =	22 53 40.58	+13 19 40.3	

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Mean of 6 times = 1 43 18.0"
+3 43.9"
1 47 1.9'
16 7 25.6'
9 39 36.3'
1 35.0"
9 38 1.3'
4 44' 31.0
G.M.T. = 14 22 32.3'

10.45 = 1.90553

log. 3.09 = 0.48996"
" 7.5 = 0.87506"
" cos δ = 9.98814'
-0 22.5. = 1.35316'

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Nov. 22/1889

Comet f, 1889 (Swift (Nov 17))

Comp. Star 2. = Dm. +13° 5037 (8.0 K)

W I 22^h 11 11 = 22^h 51 36.60 +13° 3 49.9 (1825)

*1825.0	22 51 36.60	+13 3 49.9	
Precession =	+3 10.75	+20 29.3	
*1889.0 =	22 54 47.35	+13 24 19.2	
≡ − * =	−1 8.66	−4 59.0	
~~App.~~ ≡ 1889 =	22 53 38.69	+13 19 20.2	
	+1.83	+18.6	
App. Pl. ≡ =	22 53 40.52	+13 19 38.8	

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Nov. 22/1889

Comet f 1889 I Swift (Nov 17)

$f = 1.615^{7}$ $G = 0\ 22.1^{7}$ $H = 1\ 47.2^{7}$

$G = 0\ 22.1^{7}$ $\alpha = 22\ 54.8^{7}$ $\alpha = 22\ 54.8$

$H = 1\ 47.2^{7}$ $23\ 16.9^{c}$ $0\ 42.0^{c}$

$\log g = +1.0257^{7}$

$\log h = +1.3024^{7}$

$\log i = +059.39^{7}$ $\Delta = 13\ 19\ 20^{7}$

$\log f = +8.8239^{c\,7}$

$\log g = +1.0257^{c\,7}$

$\log \sin(G+\alpha) = -9.2717^{7}$

$\log \tan \alpha = +9.3744^{7}$

$-0.031^{7} = -8.4957^{c\,7}$

$\log f = +8.8239^{c\,7}$

$\log h = +1.3024^{7}$

$\log \sin(H+\alpha) = +9.2606^{7}$

$\log \sec \alpha = 0.0918$

$+0.250^{7} = 9.3987^{c\,7}$

$+1.615^{7}$

$+1.865^{9}$

-0.031^{7}

$+1.834^{c\,7}$ = corr in R.A.

$\log g = +1.0257^{7}$

$\log \cos(G+\alpha) = +9.9923^{7}$

$+10.23^{7} = 1.0180^{c\,7}$

$\log h = +1.3024^{7}$

$\log \cos(H+\alpha) = +9.9921^{7}$

$\log \sin \alpha = 9.3625^{7}$

$+4.55^{7} = 0.6576^{7}$

$\log i = +0.5939^{7}$

$\log \cos \alpha = +9.9882^{7}$

$3.82^{7} = 0.5821^{c\,7}$

4.55^{7}

10.23^{7}

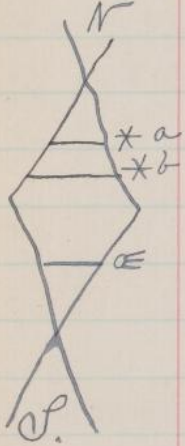
18.60^{c} = corr in Dec.

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Nov. 22 / 889

Comet Brooks d 1889 (July 7)



	∈	*a	*b	∈ − *a	
2	22 7.2	23 19.0	23 47.4		
	22 44.6	23 57.3	24 37.0		
	44 51.8	47 16.3	48 24.4	2 24.5	1 12.25
	25 6.3	26 18.3	26 47.2		
∈	25 44.5	26 56.6	27 36.2		
	50 50.8	53 14.9	54 23.4	2 24.1	1 12.05
	28 16.7	29 28.5	29 57.4		
	28 55.0	30 6.4	30 45.8		
	57 11.7	59 35.1	60 43.2	2 23.4	1 11.70
	32 8.0	33 20.3	33 48.8		
	32 45.9	33 58.1	34 37.4		
	64 53.9	67 18.4	68 26.2	2 24.5	1 12.25
	35 20.8	36 35.3	37 3.5		
	36 1.6	37 10.3	37 50.3		
	71 22.4	73 45.6	74 53.8	2 23.2	1 11.60
					9.85
					− 1 11.97

Mean Facts = 2h 28.6 1906 G.M.T.
2h 28 55.1 G.M.T.
+3 43.9
2h 32 39.0 "
16 7 25.6 "
10 25 13.4 "
− 1 42.4 "
10 23 31.0 "
4 44 31.0
15 8 2.0 = G.M. Tobey

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A ≡

3	32.6	/	~~45~~ 46.30	37.4	38.3	49.6	75.7	87.0
3	32.6	/	4.6.30	38.2	383	49.0	76.5	~~86.5~~
3	31.5	/	4.5.75	38.3	37.7	48.4	76.0	~~8~~6.0
3	323	/	46.15	37.9	37.8	48.6	75.7	86.5
3	314	/	45.70	40.8	35.0	46.8	75.8	87.6

0.20
− / 46.04

42.6
38.52

4.7 3.6
75.94 86.72

75.94
Log ~~75~~ = 1.880447
" 7.5 = 0.875506
" cos ℓ = 9.99999
569.5′ = 2.755 52

886.0
316.5′ = − 5 16.5′

86.72 = 1.93812
7.5 = 0.875506
cos ℓ = 9.99999
650.4′ = 2.81317

886.0
235.6′ = − 3 55.6′

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~~Nov 22 1889~~ ~~(Smiths. July 61~~

~~Comet d 1889 Swift, (Nov 17)~~

Comp Star = Dm. +0° 50′ 7″ (9.0 K)

W I	23h 10′ 7.5	=	23h 51′ 2.77″	+0	6′ 53.4″	(1825)
			+1 38.24		+10 41.3	
Mid. Place		=	23 52 41.01	+0	17′ 34.7″	
			358 10 15.15		16.05	

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

" sin λ = −8.50405

" tan λ = +7.71066

−0.00002 = −6.34082

3.07075

+3.07075 = 0.48721

64 = 1.80618

196.51 = 2.29339

Log u = 1.30220

" cos λ = +9.99978

" 64 = 1.80618

1282.9 = 3.10816

α 1825 =		23	51	2.77	+0	6 53.4
			+3	16.51	+21	22.9
α 1889.0 =		23	54	19.28	+0	28 16.3
			−1	11.97	−5	16.5
α " =		23	53	7.31	+0	22 59.8
				+2.22		+14.8
app. Pl. α =		23	53	9.53	+0	23 14.6

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Nov. 22 1889

~~Comet c 1889 (Swift (Nov. 17)~~

~~Comet d 1889 (Brooks July 6)~~

Comp. Star 0. = Dm. +0 5080 (8.8K)

W I	23h 10 90 =	23h 51	37.13	+0° 5′	29.1″
		+1	38.24	+10	41.3
		23 53	15.37	+0 16	40.4
		358 18	50.55		16.4

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

" sin α = 8.46871

" tan α = +7.67225

−0.0002 = −6.26707

+3.0707

3.0705 = 0.48721

64 = 1.80618

196.51 = 2.29339

Log u = 1.30220

" cos α = 9.99981

" 64 = 1.80618

1282.9 = 3.10819

*1825.0 =		23 51	37.13	+0 5	29.1
		+3	16.51	+21	22.9
*1889.0 =		23 54	53.64	+0 26	52.0
		−1	46.04	−3	55.6
≏ " =		23 53	7.60	+0 22	56.4
			+2.22		14.8
App. ≏ =		23 53	9.82	+0 23	11.2

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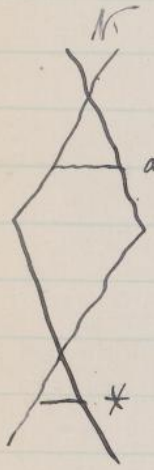
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Nov. 23, 1889

~~Comet d 1889 (Brooks (July 6)~~

Comet f. 1889. (Swift Nov. 27)

	∈		☆		∈ − ☆			
1	42	54.9	41	53.4				
	43	25.4	42	5.3				
	86	20.3	83	58.7	2	21.6	1	10.80
	45	29.2	44	27.2				
	46	2.3	44	41.2				
	91	31.5	89	8.4	2	23.1	1	11.55
	47	33.9	46	31.3				
	48	6.2	46	45.4				
	95	40.1	93	16.7	2	23.4	1	11.70
	49	47.1	48	44.2				
	50	19.8	48	58.6				
	100	6.9	97	42.8	2	24.1	1	12.05
	51	49.5	50	47.4				
	52	21.8	51	1.3				
	104	11.3	101	48.7	2	22.6	1	11.30
								7.40
							+1	11.48



Mean Sect. 1

47.6 110.1
47 47.0
+3 47.1

1 51 34.1
16 11 22.2
9 40 11.9
−1 35.0
9 38 36.9
4 44 31.0
14 23 7.9 ± Gr. M. T.

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Δ∈	*	-∈+*
−30.5″	+11.9″	−18.6″
33.1″	14.0″	−19.1″
32.3″	14.1″	18.2″
32.7″	14.4″	18.3″
32.3″	13.9″	18.4″

2.6

−18.52″

Log −18.52″ = 1.26764″
" 7.5′ = 0.87506″
" cos δ = 9.98800′′
−135.1′′ = 2.13070″

886.0

−10.9′′

+ 18 34.9′′
13 24 37.8′′
13 35 28.7′′

1.26764
0.87506
9.98762
−135.0′′ = 2.13032″
886.0′′
751.0 = +12 31.0′′

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Nov. 23, 1889

Comet of 1889, Swift (Nov. 17)

Comp. Star = Dm. +13° 5037 (8.0 K)

* 1889.0 =	22	54	47.35	+13	24	19.2
			+1.88			+18.61
ap. Pl. * =	22	54	49.18	+13	24	37.8
		+1	11.48		+12	31.0
" " ∝ =	22	56	0.67	+13	37	8.8

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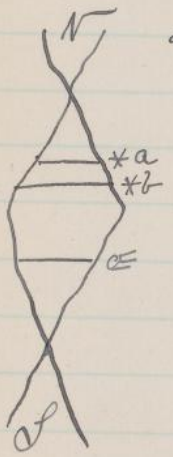
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Nov. 25 1889

Brooks d 1889 (July 6)



	E	*a	*b	E−*a	(E−*a)/2
2h	15 41.0	18 3.1	18 59.1		
	16 18.1	18 25.2	19 44.7		
	31 59.1	36 28.3	38 43.8	4 28.6	2 14.30
	22 2.2	24 25.1	25 21.0		
	22 41.4	24 47.0	26 6.0		
	44 43.6	49 12.1	51 27.0	4 28.5	2 14.25
	27 2.0	29 25.5	30 21.4		
	27 42.0	29 47.0	31 6.0		
	54 44.0	59 12.5	61 27.4	4 28.5	2 14.25
	32 18.5	34 42.3	35 38.2		
	32 59.2	35 3.3	36 22.6		
	65 17.7	69 45.6	72 0.8	4 27.9	2 13.95
	37 36.8	40 0.0	40 56.5		
	38 17.7	40 21.4	41 40.5		
	75 54.5	80 21.4	82 37.0	4 26.9	2 13.45
					0.20
					−2 14.02
					4

Mean Date

2h	269	21 9 5
	27	16.0
	+3	53.8
2h	31	9.8
16	19	15.3
10	11	54.5
	1	40.2
10	10	14.3
4	44	31.0
14	54	45.3 = Gr. M. T.

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$\alpha - *b$ $\quad \Delta\alpha \quad \Delta*a \cdot \Delta*b$

6 44.1 3 22.05 37.7 22.1 45.6 59.8 83.3

6 43.4 3 21.70 39.2 21.9 45.0 61.1 84.2

6 43.4 3 21.70 40.0 21.5 44.6 61.5 84.6

6 43.1 3 21.55 40.7 21.0 44.4 61.7 85.1

6 42.5 3 21.25 40.9 21.4 44.0 62.3 84.9

3.25 48.5 1.4 29.1

−3 21.65 39.70 61.28 84.42

log 61.28 = 1.78782

" 7.5 = 0.87506

" cos 2 = 9.99994

460.1 = 2.66282

886.0

426.9 = − 7 5.9

log 84.42 = 1.92645

" 7.5 = 0.87506

" cos 2 = 9.99994

633.1 = 2.80145

886.0

252.9 = − 4 12.9

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Nov. 25 1889

Brooks 1889.d (July 6)

Comp. Star a = Dm. +0 5082 (90 B)

D.M. VI +0° 5082 = ~~+0~~ 23 56 13.49" + 0 46 43.6" (1855)

+0 52.2 +5 40.8

23 57 5.70 +0 52 24.4

359 16 25.50

$\log \frac{n}{15}$ = 0.12608 $\log n$ = 1.30217

" sin t = -8.10285 " cos t = +9.99996

" tan t = +8.18307 " 34 = 1.53148

-0.00032 = -6.41200 681.7 = 2.83361

199

3.07107

3.07075 = 0.48724

34 = 1.53148

104.40 = 2.01872

	23 56 13.49	+0 46 43.6
	+1 44.40	+11 21.7
* 1889.0 =	23 57 57.89	+0 58 5.3
	+2.20	+14.7
ap. Pl. * =	23 58 0.09	+0 58 20.0
	-2 14.04	-7 5.9
ap. Pl. a =	23 55 46.05	+0 51 14.1

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Nov. 25 1889

Brooks 1889 d July 6

$\log g = +1.663'$ $\Delta = 0\ 22.3'$ $H = 1\ 35.7'$
$\Delta = 0\ 22.3'$ $\alpha = 23\ 58.0'$ $\alpha = 23\ 58.0'$
$H = 1\ 35.7'$ $0\ 20.3'$ $1\ 33.7'$
$\log g = +1.0385'$
" $h = +1.3040'$ $\delta = +0\ 58\ 5'$
" $r = +0.5493'$

$\log \sin 15 = +8.8239'$
" $g = +1.0385'$
" $\sin \Delta \cos \alpha = +8.9466'$
" $\tan \delta = +8.2278'$
$+0.001'$ $= 7.0368^{c'}$

$\log \sin 15 = +8.8239'$
" $h = +1.3040'$
" $\sin \Delta \cos H \alpha = +9.5994'$
" $\sec \delta = 0.0001'$
$0.534'$ $= 9.7274^{c'}$
$+0.001'$
$+1.663'$
$2.198'$ = cor. m R.A.

$\log g = +1.0385'$
" $\cos \Delta \cos \alpha = +9.9983'$
$+10.88'$ $= 1.0368^{c'}$

$\log h = +1.3040'$
" $\cos H \alpha = +9.9626'$
" $\tan \delta = 8.2277'$
$+0.31'$ $= 9.4943^{c'}$

$\log i = +0.5493'$
" $\cos \delta = 9.9999'$
$+3.54'$ $= +0.5492^{c'}$
$0.31'$
$10.88'$
$+14.73'$ = cor. m Dec.

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Nov. 25 1889

Brooks July 6, 1889 d

Comp Star 2 = +0 Dm. +0 5084 (8.3 K)

W I 23^h 1179 = 23 55 49.00 +0 33 47.6 (1825)
1 38.24 +10 41.6
Mid Place = 23 57 27.24 +0 44 29.2
359 21 48 60

Log $\frac{w}{5}$ = 0.12611
" sin t = −8.04578
" tan Σ = +8.11196
− 0.0002 = −6.28385

3.0707 = 0.48721
3.07 0 5 = 64 = 1.80618
196.51 = 2.29339

Log w = 1.30220
" cos t = 9.99997
" " 64 = 1.80618
1283.4 = 3.10835

+1825.0 = 23 55 49.00 +0 33 47.6
+3 16.51 +21 23.4
+1889.0 = 23 59 5.51 +0 55 11.0
+2.20 +4.7
ap. Pl. + = 23 59 7.71 +0 55 25.7
−3 21.65 −4 12.9
ap. Pl. α = 23 55 46.06 +0 51 12.8

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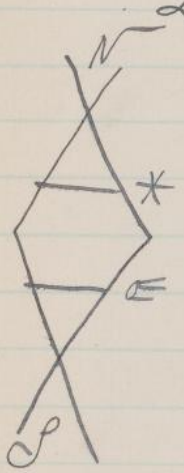
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Nov. 26 1889

Comet of 1889 Swift. (Nov 17)



	∈		*		
2h	19 23.9		20 15.9		
	20 1.6		20 48.4		
	39 25.5		41 4.3	1 38.8	0 49.40
	21 15.8		22 8.3		
	21 53.7		22 40.7		
	43 9.5		44 49.0	1 38.5	0 49.25
	23 20.8		24 5.9		
	23 51.8		24 45.8		
	47 12.6		48 51.7	1 39.1	0 49.55
	28 43.3		29 28.0		
	29 14.2		30 7.1		
	57 57.5		59 35.1	1 37.6	0 48.80
					1.00
					− 0 49.25

Mean of sets 2h

186	10 6.1	7
23	~~15.6~~	N.R.
+3	57.9	
2h 27	~~13.5~~	
16 23	11.8	
10 4	~~1.7~~	
−1	39.0	
10 2	~~22.7~~	C. M. T.
~~4 44~~	~~31.0~~	
~~14 46~~	~~53.7~~	~~G. M. T.~~

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ΔE	Δ*	E**
37.7″	32.5″	70.2″
37.9″	32.4″	70.3″
31.0″	39.9″	70.9″
30.9″	39.1″	70.0″

1.4 · 7

70.35″

Log 70.35″ = 1.84726″
" 7.5 = 0.87506″
" cos α = 9.98573″

510.6″ = 2.70805″

886.0

66 · 1

375.4″ = −6 15.4″

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1889phae.proj..508.

Nov. 26, 1889

Comet of 1889 I Swift (Nov 17)

Comp. Star α = Dm. +14° 4937 (9.0 K)

W I 23h 21	= 23h 0 56.70s	+14 15 27.5″	(1825)
	1 35.52	+10 20.8	
Mid. Pl.	23 2 32.22	+14 25 48.3	
	345 38 3.30		

$\log \frac{n}{5}$ = 0.12611

" sin d = −9.39465

" sin 2 = +9.98608

−0.32012 = 9.50684

+3.0707 −8.93123

2.7495 = 0.43925

2.9853

64. = 1.80618

175.97 = 2.24543

191.06 = 2.28116

$\log n$ = +1.30220

" cos d = +9.98620

" 64 = 1.80618

1243.3 = 3.09458

	23 0 56.70	+14 15 27.5	
	+3 11.06	+20 43.3	
✳ 1889.0	23 4 7.76	+14 36 10.8	
	−e 49.25	−6 15.4	
☉ 1889.0	23 3 18.51	+14 29 55.4	
	+1.85	+18.8	
Ap. Pl. ☉ =	23 3 20.36	+14 30 14.2	

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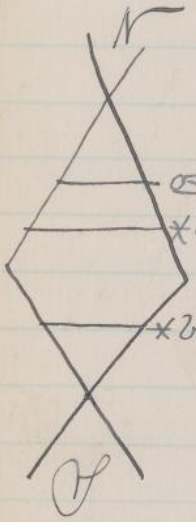
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Nov. 26 1889

Comet, d 1889 (July 6)



	α	α*	*b	α−*a
2	55 32.5	56 40.2	57 50.2	
	56 1.8	57 30.5	58 35.3	
	111 34.3	114 10.7	116 25.5	2 36.4 / 18.20
	59 35.8	0 43.0	1 52.8	
	60 4.5	1 33.0	2 38.0	
	119 40.3	122 16.0	4 30.8	2 35.7 / 17.85
	4 8.5	5 15.6	6 25.0	
	4 37.1	6 5.5	7 10.8	
	8 45.6	11 21.1	13 35.8	2 35.5 / 17.75
				2.80
				−1 17.93

Mean Solar

3 58 12 02 ᵀ

3ʰ ~~59~~ 0 0.0 ᵀ.R

+3 57.9 ᴵ

3ʰ 3 57.9 ᴵ ᵀ

16 23 11.8 ᵀ

10 40 46.1 ᴵ ᵀ

−1 45.0 ᵀ

10 39. 1.1 ᴵ ᵀ

4 44 31.0

15 23 32.1 = Gr. M. T.

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Δδ	Δ*a	Δ*b	δ-*a	δ+*b	δ-*2	δ-*2 / 2
29.3	50.3	45.1	21.0	74.4	4 51.2	2 25.60
28.7	50.0	45.2	21.3	73.7	4 50.5	2 25.25
28.6	49.9	45.8	21.3	74.4	4 50.2	2 25.10
2.6			0.6	0.7		0.95
28.87			21.20	74.23	− 2 25.32	

Log 21.20 = 1.32634
" 7.5 = 0.87506
" cos δ = 9.99994
159.0 = 2.20134
+2 39.0

Log 74.23 = 1.87058
" 7.5 = 0.87506
" cos δ = 9.99994
556.6 = 2.74558
886.0
329.4 = +5 29.4

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Nov. 26/1889

Corrected 1889, Brooks (July 6)

Comp. Star $\overset{a}{=}$ Dm. +0 5082 (9.0 B)

" " $\hat{b}$ – Dm. +0 5084 (8.3 K)

These are the same Comp. Stars as used on Nov. 25.

$*\,a$ 1889.0 =	23 57 57.89	+0 58 5.3
	2.20	+14.7
ap. Pl. $*$ =	23 58 0.09	+0 58 20.0
	−1 17.93	+2 39.0
ap. Pl. α =	23 56 42.16	+1 0 59.0

$*\,b$ 1889.0 =	23 59 5.51	+0 55 11.0
	2.20	+14.7
ap. Pl. $*$ =	23 59 7.71	+0 55 25.7
	−2 25.32	+5 29.4
ap. Pl. α =	23 56 42.39	+1 0 55.1

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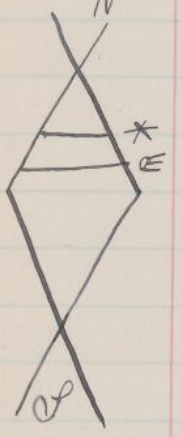
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Nov. 29 1889

Comet d, 1889 (Brooks July 6)



	E		*					
0	33	48.9	31	35.9				
	34	25.4	31	55.3				
	68	14.3	63	31.2	4	43.1	2	21.55
	37	17.8	35	5.7				
	37	56.6	35	25.6				
	75	14.4	70	31.3	4	43.1	2	21.55
	42	9.9	39	56.4				
	42	46.9	40	16.7				
	84	56.8	80	13.1	4	43.7	2	21.85
	51	48.1	49	34.2				
	52	25.8	49	54.1				
	104	13.1	99	28.3	4	44.8	2	22.40
	59	3.3	56	48.8				
	59	39.9	57	8.9				
	118	43.2	113	57.7	4	45.5	2	22.75
	3	49.0	1	33.8				
	4	25.3	1	54.6				
	8	14.3	3	27.8	4	46.4	2	23.20
								1.30
							+ 2	22.22

	577	156.1	8	17	24.0
Means of sets - O	48	18.0	−1	2	1.5
	+4	7.5	8	16	2.5 = C. M. T.
	0	52	25.5	4	44	31.0
	16	35	1.5	13	0	33.5 = G. M. T.
	8	17	24.0			

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Δε	Δx	Ex
36.5	19.4	17.1
38.8	19.8	18.9
37.0	20.3	16.7
36.9	19.9	17.0
36.6	20.1	16.5
36.3	20.3	16.0
0.1		0.2
37.02		17.03

Log. 17.03 = 1.23083
" 7.5 = 0.87506
" cos 2 = 9.99985
127.5 = 2.10544
−2 7.5

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Nov. 29 1889
Comet d 1889 (Brooks July 6)

Comp. Stat = Dm. +1° 4820 (7.7 k)

W I 23h 11 43 = 23 53 49.07 +1 9 36.1 (1825)
+1 38.24 +10 41.63
23 55 27.31 +1 20 17.74
358° 51' 49.65"

Log 14/15 = 0.12611
" sin α = +8.29727
" tan δ = +8.36807
±0.0006 = ±6.79145

+3.07071
3.07 01 = 0.48 732
Log. 64. = 1.80618
196.56 = 2.29350

Log u = 1.30220
" cos δ = 9.99992
" 64 = 1.80618
1283.2 = 3.10830

23 53 49.07 +1 9 36.1
+3 16.56 +2 23.2
*1889.0 = 23 57 5.63 +1 30 59.3
+2 22.23 −2 7.
α = " = 23 59 27.86 +1 28 51.8
+2.17 +14.7
ap. R.E = 23 59 29.9 +1 29 6.

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Nov. 29, 1889

Comet d 1889 (Brooks, July 6)

$\mathfrak{L} = +1.710'$ $\mathfrak{Y} = 0\ 19.3'$ $H = 1\ 20.4'$

$\mathfrak{Y} = 0\ 19.3'$ $\Omega = 23\ 59.5'$ $\Omega = 23\ 59.5'$

$H = 1^h\ 20.4'$ $\mathfrak{Y}+\Omega = 0\ 18.8^{c'}$ $H+\Omega = 1\ 19.9^{c'}$

$\log q = +1.0501''$

" $h = +1.3058''$ $\mathfrak{L} = +1\ 28\ 52'$

" $i = +0.4795'$

$\log 1/15 = +8.8239^{c'}$

" $q = +1.0501^{c'}$

" $\sin \mathfrak{Y}+\Omega = +8.9134'$

" $\tan \mathfrak{L} = +8.4125'$

$+0.002' = +7.1999^{c'}$

$\log 1/15 = +8.8239'$

" $h = +1.3058'$

" $\sin H+\Omega = +9.5336'$

" $\sec \mathfrak{L} = +0.0002'$

$+0.461' = +9.6635^{c'}$

$+0.002'$

$+1.710'$

$+2.173^{c'}$ = corr. in R.A.

$\log q = +1.0501^{c'}$

" $\cos \mathfrak{Y}+\Omega = +9.9985'$

$+11.18' = +1.0486^{c'}$

$\log h = +1.3058'$

" $\cos H+\Omega = +9.9731'$

" $\sin \mathfrak{L} = +8.4124'$

$+0.49' = +9.6913^{c'}$

$\log i = +0.4795'$

" $\cos \mathfrak{L} = +1.9998'$

$+3.02' = +0.4793'$

$+0.49'$

$11.18'$

$14.69'$ = corr. in Dec.

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Dec. 7, 1889.

Comet d, 1889 (Brooks July 6)



	E		*		E − *		
1	39	57.9	40	47.8			
	40	40.0	41	14.8			
	80	37.9	82	2.6	1	24.7	0 42.35
	41	55.4	42	45.9			
	42	38.0	43	13.2			
	84	33.4	85	59.1	1	25.7	0 42.85
	43	46.7	44	37.3			
	44	28.9	45	4.1			
	88	15.6	89	41.4	1	25.8	0 42.90
	~~46~~	33.9	47	19.2			
	47	16.4	~~47~~	51.4			
	~~93~~	50.3	95	10.6	1	20.3	
	48	31.9	49	22.8			
	49	14.3	49	49.6			
	97	46.2	99	12.4	1	26.2	0 43.10
							3.22
							− 0 42.88

	349	133.4
1	43	54.2
	+4	34.2
1	48	28.4
17	6	33.9
8	41	54.5
	1	25.5
8	40	29.0
4	44	31.0
13	25	0.0 = G.M.T.

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$\Delta\alpha$	$\Delta\delta$	
42.1	27.0	69.1
42.6	27.3	69.9
42.2	26.8	69.0
42.4	26.8	69.2
1.3		12
42.32		69.30

$\log$ ~~7.11~~ $= 0.875060$

$\parallel$ $69.30 - 1.840723$

$\parallel$ $\cos\alpha = 9.999946$

$519.1 = 2.715251$

886.0

$366.9 = -$ 6 6.9

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1889phae.proj..508.

Dec. 7 1889.

Comet d, 1889 (Brooks July 6)

Comp. Stars = +2 18 (8.9 B)

B.D. VI +2° 18 = 0 7 3.15 +2 39 53.1 (1855)
+0 52.26 +4 40.17
0 7 55.42 +2 44 14.2
1 58 55.30 +2 45 33.8

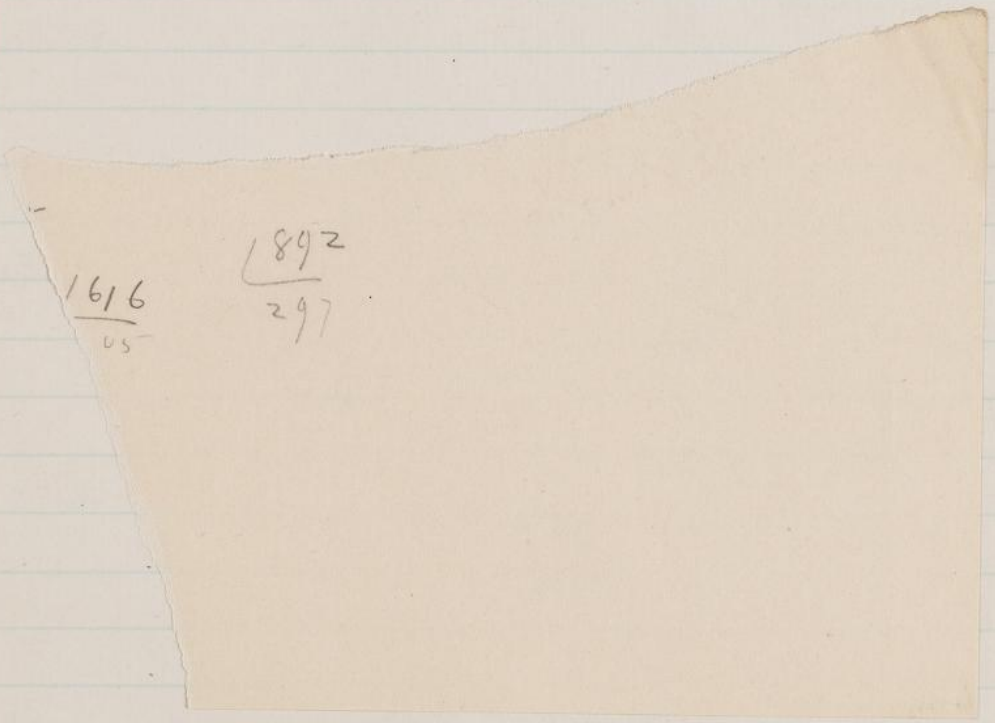
Log 11/5 = 0.12608 +0.12602
11 sin t = 8.53888 +0.53464
11 tan δ = 8.68 30 53' +8.64303
+0.00224 = 7.34477 +7.34477
3.07710
+3.07322 = 0.48759
34 = 1.53148
+104.49 = 2.01907

Log n = 1.30217
11 cos t = 9.99 9 7
11 34 = 1.53148
6814 = 2.83339
6810 = 2.83315

0 7 3.16 +2 39 53.1
+1 44.49 +11 21.5
0 8 47.65 +2 51 14.6
−0 42.80 −6 6.9
0 8 4.85 +2 45 7.2
+2.12 +14.6
apPl. = 0 8 6.97 +2 45 21.8
22.2

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Dec. 7/1889.

Comet d, 1889 (Brooks July 6)

Comp. Stars = +2 18 (8.9 B)

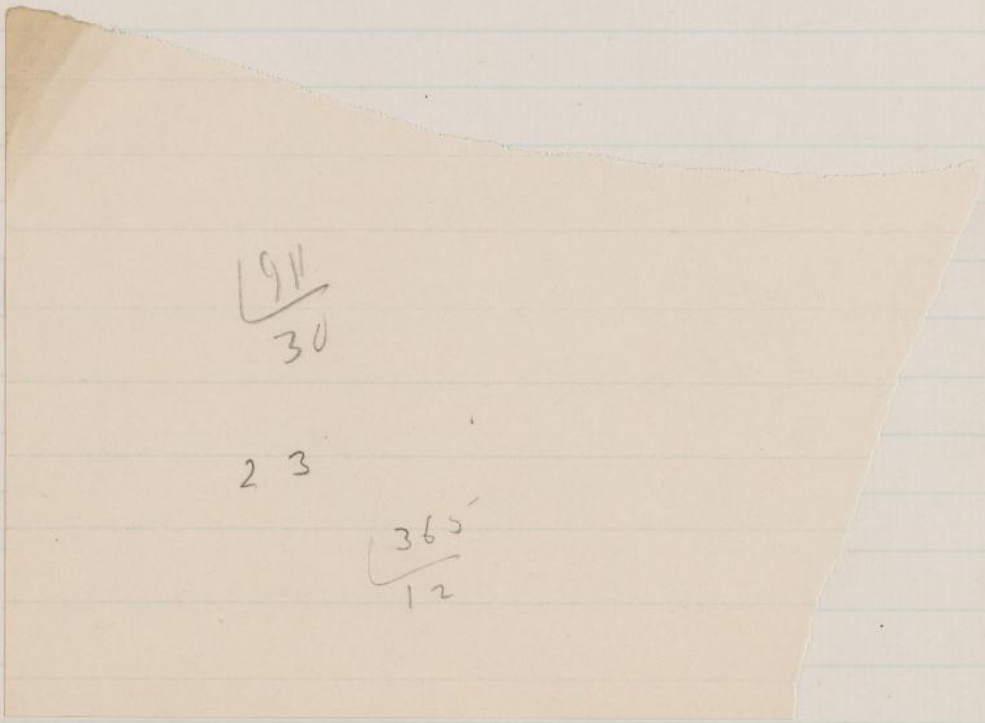
B.D. VI +2° 18 = 0 7 3.15 +2 39 53.1 (1855)
+0 52.26 +7 40.7
0 7 55.42 +2 44 14.2
1 58 55.30 +2 45 33.8

Log m/s = 8.12608 +0.12608 log n = 1.30217
log sin t = 8.53888 +8.5386 log cos t = 9.99917
log tan t = 8.68304 +8.68303 log 34 = 1.53148
+0.00222 = 7.34449 +7.3477 681.4 = 2.83339
3.07102 7.34480 681.0 = 2.83315
+3.07302 = 0.48759
34 = 1.53148
+104.49 = 2.01907

0 7 3.16 +2 39 53.1
+1 44.49 +11 21.8
0 8 47.65 +2 51 14.7
−0 42.80 −6 6.9
0 8 4.85 +2 45 7.8
+2.12 +14.6
apR. = 0 8 6.97 +2 45 22.4
22.2

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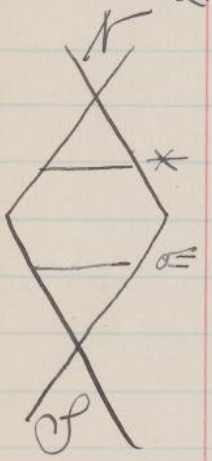
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Comet f Swift, Nov. 17, Dec. 13, 1889



	α		*					
1								
2	34	55.5	34	30.3				
	35	19.0	34	54.5				
	70	14.5″	69	24.8″	0	49.17″	0	24.85″
	36	21.2	35	56.0				
	36	45.8	36	20.0				
	73	7.0″	72	16.0″	0	51.0″	0	25.50″
	41	41.5	41	10.0				
	41	59.8	41	40.2				
	83	41.3″	82	50.2″	0	51.1″	0	25.55″
	43	10.2	42	47.5				
	43	38.0	43	8.8				
	86	48.2″	85	56.3″	0	51.9″	0	25.95″
	50	18.0	49	51.0				
	50	42.5	50	16.0				
	111″	0.5″	100	7.0″	0	53.5″	0	26.75″
								3.60
							+ 0	25.72″

Means Tests = 1

	423	111.5″	
	42	29.2″	17
	—	39.5	
1	41	49.7″	17
17	30	13.3	
8	11	36.4″	17
	1	20.5	
8	10	15.9″	17
4	44	31.0	
12	54	46.9 = Gr. M. T.	

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Δ α cos δ Δ δ

23.5″ 24.2″ 47.7″

24.6″ 24.0″ 48.6″

18.3″ 30.2″ 48.5″

27.8″ 21.3″ 49.1″

24.5″ 25.0″ 49.5″

43.4″

48.68″

Log 48.68 = 1.68735″ 1.68735

" 7.5 = 0.87506 0.87506

" cos δ = 9.97409′ 9.97453

344.0′ = 2.536500″ = 2.53694″

886.0′

542.0″ = −9 2.0″ 344.3′ 886.0

541.9′ = −9 1.9′

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Dec. 13, 1889

Comet of 1889, II (Swift Nov. 17)

Comp. Star = Dm. +19° 5174 (8.0) K

$11/2\ 23^h 1022 =$ $23^h\ 47\ 24.82''$ $+19\ 14\ 6.5''$ (1825)

$+1\ 37.44^{7L}$ $+10\ 41.0^{0.6}$

$23\ 49\ 2.26^{9L}$ $+19\ 24\ 47.5^{1L}$

$357\ 15\ 30^{34,35L}$

Log 11/15 = 0.12611 L

" sin t = -8.67973 ⊙

" tan 2 = 9.54706

-0.0225 = -8.35290

3.07071 L

3.0482' = 0.48404

1.80618 L

195.08° = 2.29022 L

Log r = 1.30220 L

" cos d = 9.99950 1 L

, 64 = 1.80618 L

1282.0' = 3.10788 9 L

$23\ 47\ 24.82''$ $+19\ 14\ 6.5''$

$+3\ 15.08'$ $+21\ 22.0'$

$*\ 1889.0$ $23\ 50\ 39.90$ $+19\ 35\ 28.5$ L

$+1.98$ $+20.0$

1889.0 ~~Ap. Pl.~~ α = $23\ 50\ 41.88$ $+19\ 35\ 48.5$

$+0\ 25.72$ $-9\ 1.7$

Ap. Pl = $23\ 51\ 7.60'$ $+19\ 26\ 46.8'$

Cor for prop. mot = $-0.22''$ $-3.6''$

Final = $23\ 51\ 7.38''$ $+19\ 26\ 43.2$

$\Delta\alpha$ $\Delta\delta$

(∴ $\alpha - *$ = $+0\ 25.50$ $-9\ 5.3$)

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1889phae.proj..508.

Dec. 13 1889

Comet of 1889 (Swift Nov 17)

$f = 1.855'$ $\Delta\gamma = 0\ 17.9'$ $\Delta\theta = 0\ 27.7'$

$\Delta\gamma = 0\ 17.9'$ $\alpha = 23\ 50.7'$ $\alpha = 23\ 50.7'$

$\Delta\theta = 0\ 27.7'$ $0\ 8.6^c$ $0\ 18.4^c$

$\log g = +1.0850'$

" $h = +1.3100'$ $\gamma = +19°35'28''$

" $i = +0.0282'$

$\log 1/15 = +8.8239'$

" $\sin g = 1.0850'$

" $\sin \frac{1}{2}\Delta\theta = +8.5735'$

" $\tan \frac{1}{2}\alpha = 9.5514'$

$0.011' = 8.0338^c$

$\log 1/15 = +8.8239'$

" $\sin h = +1.3100'$

" $\sin \frac{1}{2}\Delta\theta = +8.9040'$

" $\sec \frac{1}{2}\alpha = 0.0279$

$+0.116' = 9.0628^c$

$+0.011'$

$1.855'$

$+1.982' = \text{corr}^n$ R.A.

$\log g = +1.0850'$

" $\cos \frac{1}{2}\Delta\theta = +9.9997'$

$12.15' = 1.0847^c$

$\log h = +1.3100'$

" $\cos \frac{1}{2}\Delta\theta = +9.9986'$

" $\sin \frac{1}{2}\alpha = 9.5254'$

$6.82' = 0.8340^c$

$\log i = 0.0282'$

" $\cos \frac{1}{2}\alpha = 9.9741'$

$1.00' = 0.0023^c$

$6.82'$

$12.15'$

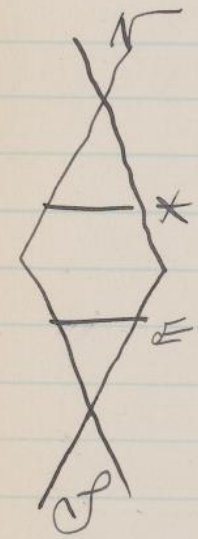
$19.97' = \text{corr}^n$ in Dec.

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1889phae.proj..508.

Dec. 13, 1889.

Comet d 1889 (Brooks July 6)



	α	*	α − *
3h	3 28.0	2 28.9	
	3 44.0	2 42.5	
	7 12.0	5 11.4	2 0.6 1 0.30
	5 29.5	4 3a/	
	5 46.3	4 44.0	
	11 15.8	9 14.1	2 1.7 1 0.85
	7 19.0	6 20.6	
	7 37.0	6 34.0	
	14 56.0	12 54.6	2 1.4 1 0.70
	9 19.6	8 20.3	
	9 36.4	8 33.8	
	18 56.0	16 54.1	2 1.9 1 0.95
	12 56.5	11 57.7	
	13 13.9	12 11.0	
	26 10.4	24 8.7	2 1.7 1 0.85
			3.65
			+1 0.73

Mean Dects =

3h 7 6 150.2
7 51.0
*395

3 7 11.5
17 30 13.3

9 36 58.2
1 34.5

9 35 23.7
4 44 31.0

14 19 54.7 = Gr. M. T.

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16.0 13.6 29.6

16.8 13.9 30.7

18.0 13.4 31.4

16.8 13.5 30.3

17.4 13.3 30.7

0.0 2.7

17.00 30.54

Log. 30.54 = 1.48487

" 7.5 = 0.87506

" 2.5 = 9.99891

227.0 = 2.35884

886.0

659.0 = 10 59.0

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1889phae.proj..508.

Dec. 13, 1889

Comet d 1889 (Brooks July 6)

Comp. Star = Dm. +3° 33

W I	0^h	20	7 =	0^h	11	0.58
					+1	38.37
	0^h	12	38.95			
	3	9.	.45.15			

	+3	42	16.2			182
	+10	41.0				
	+3	52	57.2			

Log m/5 = 0.12611

" sin d = +8.74168

" tan L = +8.83165

+0.00050 = 7.69944

3.07077

3.07572 = 0.48795

64 = 1.80618

196.85 = 2.29413

Log m = 1.30220

" cos d = 9.99934

" 64 = 1.80618

128.15 = 3.10772

	0^h	11	0.58	+	3	42 16.2
		+3	16.85		+21	21.5
	0	14	17.43	+	4	3 37.7
		+1	0.73		−10	58.4
	0	15	18.16	+3	52	38.72
			+2.12			+14.4
	0	15	20.28	+3	52	53.1

46

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Dec. 13 1889

Comet d 1889 (Brooks July 6)

$f = +1.855''$ $\Delta\gamma = 0^h\ 17.9''$ $H = 0\ 27.7''$

$f\gamma = 0^h\ 17.9''$ $\Delta\alpha = 0\ 15.3''$ $+ = 0\ 15.3''$

$H = 0\ 27.7''$ $0\ 33.2''$ $0\ 43.0''$

$\log g = +1.0850''$

" $h = +1.3100''$ $\gamma = +3\ 52\ 39''$

" $i = +0.0282''$

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

" $\sin g = +1.0850''$

" $\sin H+\alpha = +9.1594''$

" $\tan \Sigma = 8.8311$

$+0.008'' = 7.8994''$

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

" $h = +1.3100''$

" $\sin H+\alpha = +9.2707''$

" $\sec \Sigma = 0.0010''$

$+0.254'' = 9.4056''$

$+0.008''$

$+1.855''$

$+2.117'' =$ cor. in R.A.

$\log . g = +1.0850''$

" $\cos \gamma+\alpha = +9.9954''$

$+12.03'' = 1.0804''$

$\log . h = +1.3100''$

" $\cos H+\alpha = +9.9923''$

" $\sin \Sigma = 8.8301''$

$+1.36'' \quad +0.1324''$

$\log i = +0.0282''$

" $\cos \Sigma = 9.9990''$

$+1.06'', = 0,0272''$

$+1.36$

$+12.03''$

$+14.45''$ = cor. in Dec.

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Doudly's new Comet

Dec. 16 1889

	∈		∗		∈ − ∗			
1	41	17.3	40	36.4				
	41	51.8	41	35.2				
	83	9.1	82	11.6	0	57.5	0	28.75
	43	11.0	42	29.7				
	43	44.4	43	29.9				
	86	55.4	85	59.6	0	55.8	0	27.90
	44	54.4	44	12.4				
	45	26.9	45	13.3				
	90	21.3	89	25.7	0	55.6	0	27.80
	46	42.2	45	59.3				
	47	15.4	47	0.8				
	93	57.6	93	01	0	57.5	0	28.75
	48	35.1	47	51.8				
	49	8.1	48	54.3				
	97	43.2	96	46.1	0	57.1	0	28.55
	50	51.4	50	6.9				
	51	24.0	51	10.2				
	102	15.4	101	17.1	0	58.3	0	29.15
	53	10.0	52	25.5				
	53	43.0	53	29.8				
	106	53.0	105	55.3	0	57.7	0	28.85
								3.75
	657	255.0					+0	28.54
		4	47	13.9				

Mean 7 sets = 1h

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Δδ = Δ*

34.5"	58.8"	243"
33.4"	60.2"	26.8"
32.5"	60.9"	28.4"
33.2"	61.5"	28.3"
33.0"	62.5"	29.5"
32.6"	~~63.3~~	30.7"
33.0"	64.3	31.3"

1h 47 13.9
+29.6
1 47 ~~43.5~~ 44.3
17 42 3.0
8 54 ~~40.5~~ 41.3
1 19.64
8 43 ~~20.9~~ 21.9
4 44 31.0
~~12~~ 48 51.9 = Gr. m. T
12 47 52.9

Log 28.47 1.45439
" 7.5 = 0.87506
" cos δ = 9.85234
152.0' = 2.18179
− 2 32.0'
36 52
34 20'

1.45439
0.87506
9.85270
152.1' = 2.18215
− 2 32.1'

33.0 / 7|232.2 / 33.17 ✓
64.3 / 7|451.5 / 64.4 ✓
31.3 / 199.3 / 28.47'

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Dec. 16 1889

Doolittle Nautonics

Comp. Star = Dm. +44° 28 57 (8.0 K)

W_2 $18^h 296$ = 18^h 9 33.45 +44 35 49.7 (1825)
+0 56.06 +0 26.6
18 10 29.51 +44 36 16.3
272 37 27.45

log $W/15$ = 0.12611
11 sin α = −9.99955
11 tan δ = 9.99402
−1.31723 = −0.11967
+3.07077
+1.75354 = 0.24390
1.80618
112.22 = 2.05008

log m = 1.30220
11 cos α = +8.66052 ⊙
11. 64 = +1.80618
58.8 = 1.76910

	18 9 33.45	+44 35 49.7
	+1 52.22	+0 58.8
*1889.0	18 11 25.67	+44 36 48.5
	−0.83	+3.7
	18 11 24.84	+44 36 52.2
	+0 28.54	−2 32.1
ap. Pl. =	18 11 53.38	+44 34 20.1

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Dec. 16, 1889

Borelly's New Comet.

$f = +1.872'$
$\mathfrak{G} = 0\ 17.6'$
$H = 0\ 16.4'$
$\log g = +1.0890'$
$\log h = +1.3104'$
$\log i = +9.8030'$

$\mathfrak{G} = 0\ 17.6'$ $\quad H = 0\ 16.4'$
$\Delta = 18\ 11.4'$ $\quad \Delta = 18\ 11.4'$
$18\ 29.0'$ $\quad 18\ 27.8'$

$\Sigma = +44\ 36\ 48''$

$\log f/15 = +8.8239$
$\log g = +1.0890$
$\log \sin \Delta = +1.0890'$
$\log \sin \mathfrak{G}+\Delta = -9.9965'$
$\log \tan \Sigma = +9.9941'$
$-0.801' = -9.9035$

$\log f/15 = +8.8239$
$\log h = +1.3104'$
$\log \sin H+\Delta = -9.9968'$
$\log \sec \Sigma = +0.1476'$
$-1.900' = -0.2787$
$-0.801'$
-2.701
$+1.872'$
$-0.829'' =$ cor. in R.A.

$\log g = +1.0890'$
$\log \cos \mathfrak{G}+\Delta = +9.1011'$
$+1.55' = +0.1901$

$\log h = +1.3104'$
$\log \cos H+\Delta = +9.0828'$
$\log \sin \Sigma = +9.8465'$
$1.74' = +0.2397$

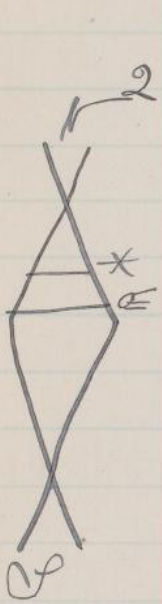
$\log i = +9.8030'$
$\log \cos \Sigma = +9.8524'$
$+0.45' = +9.6554$
$+1.55'$
$+1.74'$
$+3.74'' =$ cor. in Dec.

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Dec 16/1889

Comet d 1889 Brooks (July 6)



	C		X					
2	33	21.2	36	6.5				
	33	59.4	36	29.5				
	67	20.6	72	36.0	5	15.4	2	37.70
	37	19.6	40	5.5				
	37	58.0	40	28.0				
	75	17.6	80	33.5	5	15.9	2	37.95
	42	3.0	44	48.0				
	42	40.4	45	10.5				
	84	43.4	89	58.5	5	15.1	2	37.55
	46	18.5	49	4.0				
	46	56.1	49	26.0				
	93	14.6	98	30.0	5	15.4	2	37.70
	50	32.0	53	17.0				
	51	9.1	53	39.0				
	101	41.1	106	56.0	5	14.9	2	37.45
						3.35		
							- 2	37.67

	420	13	7.3
2	42	13.	7
		- 29.	6
2	41	44.	1
17	42	3.	0
8	59	41.	1
	1	28.	5
8	58	12.	6
4	44	31.	0
13	42	43.	6 = G.M.T.

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1889phae.proj..508.

38.2″ 23.0″ 15.2″

38.4″ 22.5″ 15.9″

37.4″ 22.5″ 14.9″

37.6″ 22.0″ 15.6″

37.1″ 22.0″ 15.1″

3.7 1.7

37.74 15.34″

Log 15.34 = 1.18583″

" 7.5 = 0.87506″

" cos 2 = 9.99870″

2.05959″

− 114.7″

− 1 54.7′

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1889phae.proj..508.

Dec. 16 1889

Comet d 1889 Brooks July 6

Comp. Star = Dm. +4° 57 (93 B)

B.B VI +4° 57 = 0 19 58.84 +4° 15 6.6 (1855)

+0 52.38 +5 39.7

0 20 51.22 +4 20 46.3

5 12 48.30

Log 11/15 = 0.12608

" sin φ = 8.95839

" tan δ = 8.88076

+0.00092 = 7.96523

+3.0710

3,0802 = 0.48858

1.53148

104.72 = 2.02006

Log r = 1.30217

" cos Δ = 9.99820

" 34 = 1.53148

679.0 = 2.83185

0 19 58.84 +4° 15 6.6

+1 44.72 11 19.0

* 1889.0 = 0 21 43.56 +4° 26 25.6

+2.11 +14.4

ap. Pl. * = 0 21 45.67 +4° 26 40.0

−2 37.67 −1 54.7

ap. Pl. ⊕ = 0 19 8.00 +4 24 45.3

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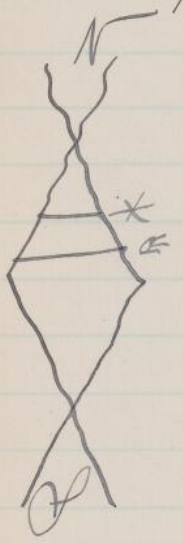
1889phae.proj..508.

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1889phae.proj..508.

Dec. 19 1889

Brooks July 6, d 1889



	α	*			
4	3 52.2	2 34.0			
	4 37.8	2 46.8			
	8 30.0	5 20.8	3	9.2	1 34.60
	6 32.3	5 14.5			
	7 17.7	5 26.5			
	13 50.0	10 41.0	3	9.0	1 34.50
	9 20.5	8 2.4			
	10 6.0	8 15.0			
	19 26.5	16 17.4	3	9.1	1 34.55
	12 15.2	10 56.5			
	13 0.0	11 8.5			
	25 15.2	22 5.0	3	10.2	1 35.10
	14 48.6	13 29.3			
	15 32.4	13 41.0			
	30 21.0	27 10.3	3	10.7	1 35.35
					4.10
					+1 34.82

Mean Sats 4h 9.5 14.2.7
9. 44.3
− 18.0
4 9 26.3
17 53 52.6
10 15 33.7
1 40.8
10 13 52.9
4 44 81.0
14 58 23.9 G.M.T.

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1889phae.proj..508.

45.6 12.8 32.8

45.4 12.0 33.4

45.5 12.6 32.9

44.8 12.0 32.8

43.8 11.7 32.1
25.1 11.1 4.0
45.02 12.2 32.80

Log 32.80 = 1.51587
" 7.5 = 0.87506
" cos L = 9.99845
245.0 = 2.38928
− 45.0

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1889phae.proj..508.

Dec. 19 1889

Comet d 1889 Brooks July 6

Comp. Stat. — Dm. +4° 55 9.0 Unlet.

Albany Jones No 80 = 0h 20m 48.23s ↓ +4° 56′ 50.6″ ↓ 1875.0

+0 21.56 ˂ +2 19.8 ˂

0 21 9.79 ˂ +4 59 10.4 ˂

5° 17′ 26.85″ 27.00 ˂

Log n/5 = 0.12606 ˂ Log n = 1.30215 ˂

" sin d = +8.96478 ˂ " cos d = 9.99815 ˂

" tan ℓ = +8.94064 " 14 = 1.14613 ˂

0.0108 ˂ = +8.03148 ˂ 279.5 ˂ = 2.44643 ˅ ˂

3.0712 ˂

3.0820 ˂ = 0.48883 ˂

1.14613 ˂

43.15 ˂ = 1.63496 ˅ ˂

0 20. 48,23 ˀ +4 56 50.6 ˀ

+0 43.15 ˂ +4 39.5 ˂

* 1889.0 = 0 21 31,38 ˅ ˂ +5 1 30.1 ˅ ˂

ap. Pl. cor. = +2.11 +14.3

0 21 33.49 ˅ +5 1 44.4 ˅

+1 34.82 −4 5.0

ap. Pl. E = 0 23 8.31 ˂ +4 57 39.4 ˅

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1889phae.proj..508.

Parallax Computation
Comet d. Dec 19

H.A	Dec.		
$+3^h\ 46$	+5.0		
	δ. 0.354 = 9.5490	5.45	= 0.7364
	+9.5631		+0.7505

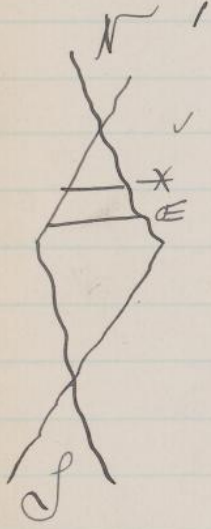
Parallax Computation

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1889phae.proj..508.

Dec. 21 1889

Comet 1889 (Barnard Dec. 12)



	∈		*		∈ − *			
1	53	22.0	54	59.4				
	54	22.4	55	20.3				
✓	107	44.4	110	19.7	2	35.3	1	17.65
	56	33.2	58	9.5				
	57	32.0	58	29.0				
	114	5.2	116	38.5	2	33.3	1	16.65
	59	17.7	60	56.2				
	60	17.4	61	13.5				
	119	35.1	122	9.7	2	34.6	1	17.30
2h	2	6.3	3	45.0				
	3	5.1	4	1.2				
	5	11.4	7	46.2	2	34.8	1	17.40
	4	53.8	6	34.2				
	5	53.8	6	48.0				
	10	47.6	13	22.2	2	34.6	1	17.30
	7	26.5	9	7.2				
	8	26.5	9	19.6				
	15	53.0	18	26.8	2	33.8	1	16.90
								1.20
							− 1	17.20

7h 30 196.7

Mean 6 sets 2 1 6.4 R.R. 7 57 49.8

− 12.3 4 44 31.0

2 0 54.1

18 1 45.8

7 59 8.3

1 18.5

7 57 49.8

1242 20.8 = Gr. m. T.

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1889phae.proj..508.

60.8 4 1c 20.9 1c 39.1 5 1c

58.8 1c 19.5 1c 39.3 1c

59.7 1c 17.3 1c 42.4 1c

58.8 1c 16.2 1c 42.6 1c $4287 = 1,632\,15$ (93, 76, 1)

0.87506

$\underline{9.88927}$

60.0 1c 13.8 1c 46.2 1c $249.8 = 2.396\,48$ (17, 5, 9)

$-\ 4\quad 9.2$ (5, 17)

60.0 1c 12.4 1c 47.6 1c

6 | 357.7 ✓ 6 | 100.1 ✓

59.62 ✓ 16.68 ✓

17.26

42.87 1c (9/3)

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1889phae.proj.508.

Dec. 21/1889

Comet g 1889 Borrelly (Dec. 12)

Comp. Star = Dm. +39° 3402 (7.3 K)

W_2 18^h 5/3-14-15 = 18^h 16 52.26 +39 10 28.5
+1 3.47 +0 47.8
18 17 55.73 +39 11 16.3
274 28 55.95
56.70

Log $m/5$ = 0.12611
" sin Δ = -9.99867
" tan Δ = 9.91128
-1.0866 = -0.03606
+3.0707
+1.9841 = 0.29756
1.80618
126.98 = 2.10374

Log m = 1.30220
" cos Δ = 8.89293
1 64 = 1.80618
100.3 = 2.00131/4

	18^h 16 52.26	+39 10 28.5
	+2 6.98	+1 40.3
* 1889.0	18 18 59.24	+39 12 8.8
	-0.50	+2.9
	18 18 58.74	+39 12 11.7
	-1 17.20	-4 9.2
Ap. Pl. =	18 17 41.54	+39 8 2.5/2

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1889phae.proj..508

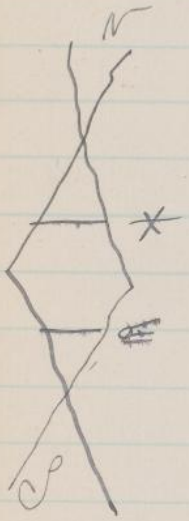
74

Dec. 21 1889

Comet Brooks 1889d

	⊕	×
3	22 26.5	23 54.4
	23 3.8	24 10.5
	45 30.3	48 4.9

2 34.6 / 17.30



25 5.5	26 32.5	
25 44.0	26 49.6	
50 49.5	53 23.1	

2 33.6 / 16.80

27 33.5	29 1.8	
28 12.5	29 17.5	
55 46.0	58 19.3	

2 33.3 / 16.65

30 3.7	31 32.2	
30 43.0	31 47.5	
60 46.7	62 19.7	

2 33.0 / 16.50

32 31.9	34 0.2	
33 11.5	34 16.0	
65 43.4	68 16.2	

2 32.8 / 16.40

3.65

− / 16.73

Means of sets 3 & 2

275 21 5.9
27 51.6
12.3

3rd 27 39.3
18 / 45.8

9 25 53.5
/ 32.7

9 24 20.8
4 44 31.0

14 8 51.8

Gr. M. 9

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1889phae.proj..508.

37.3″ 16.1″ 53.4″

38.5″ 16.1″ 54.6″

39.0″ 15.7″ 54.7″

39.3″ 15.3″ 54.6″

39.6″ 15.8″ 55.4″

2.7

3.7

38.74 0 54.34″

Log 54.54 = 1.736721″

" 7.5 = 0.875061″

" cos 2 = 9.999854″

407.2′ = 2.609982″

886.0′

478.8′ = −7 58.8′′

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1889phae.proj..508.

Dec. 21, 1889

Brooks July 6, 1889 d

Comp. Star = Dm. +5° 66 (9.0 K)

W I $0^h 42^2 = 0^h\ 23\ 45.91''\ \ +5\ 5\ 32.2''$

$+1\ 44.62^s\ \ +10\ 38.4'$

$0^h\ 25\ 27.53''\ \ +5\ 16\ 10.6''$

$6\ 21\ 52.95$

7.95

9.00

Log u/15 = 0.12611

" 2nd = 9.04476

" tan 2 = 8.96497

+0.0137 = 8.13784

+3.0707

3.08473 = 0.48917

1.80618

197.40 = 2.29535

Log n = 1.30220

" cos d = 9.99733

" 64 = 1.80618

1275.6 = 3.10571

$0^h\ 23\ 45.91''\ \ +5°\ 5\ 32.2''$

$+3\ 17.40\ \ +21\ 15.6'$

$0^h\ 27\ 3.150''\ \ +5°\ 26\ 47.8''$

$+2.11\ \ +14.3$

* 1889.0

ap. Pl. * = $0\ 27\ 5.26''\ \ +5°\ 27\ 2.1''$

$-1\ 16.73''\ \ -7\ 58.8$

ap. Pl. = $0\ 25\ 48.53''\ \ +5\ 19\ 3.3''$

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1889phae.proj..508.

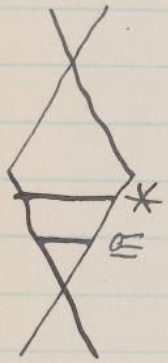
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1889phae.proj..508.

78 Southfield

Dec. 21, 1889

Comet f 1889 Swift (Nov. 17)



	⊏	*			
2	32 53.8	33 41.5			
	33 25.5	34 34.0			
	66 19.3'	68 15.5'	1 56.2"	0 58.10"	
	35 46.5	36 33.1			
	36 19.3	37 26.0			
	72 5.8'	73 59.1'	1 53.3"	0 56.65"	
	39 6.0	39 52.5			
	39 39.0	40 45.9			
	78 45.0'	80 38.4'	1 53.4"	0 56.70"	
	42 37.0	43 24.0			
	43 9.5	44 17.5			
	85 46.5'	87 41.5'	1 55.0"	0 57.50"	
Rej. one reading wrong.	45 45.8	46 32.9			
	46 31.0	47 26.3			
	92 16.8	93 59.2'	1 42.4"		
				28.95'	
				−0 57.24"	

Mean date 2^h 30.1 11 6.6 ,7
38 52.1 J.R.
−12.3

2 37 39.8 ,7
18 1 45.8 ,7
8 35 54.0 ,7
1 24.5 ,7
8 34 29.5
4 44 31.0
13 19 0.5 = Gr. m. t.

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1889phae.proj..508.

AE

31.7″ 32.5″ 20.8″

32.8″ 52.9″ 20.1″

33.0″ 53.4″ 20.4″

32.5″ 53.5″ 21.0″

2.3

20.58″

log 20.58 = 1.313455″

" 7.5 = 0.87506

" cos 2 = 9.96813

-143.4″ = 2.15664″

- 2 23.4″

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1889phae.proj..508.

Dec. 21 1889

Comet 1889 I Swift Nov. 17

Comp. Star = DM. +21° 35 (8.5 L)

Lalande 448 = 0^h 13 18.26 (18.05) +21 10 59.0 (50.9) (1800)

+2 17.95 +68 49 1.0 14 51.2

0 15 36.21 +69 3 52.2

3 54 3.15 (4.65) +21 25 50.2 (49.9)

Log 11/15 = 0.12614

" sin t = 8.83307 (27 76) 9.59385

" cos L = 0.41728

0.357

+0.2379 = +9.37649 8.55306

+3.0705 c. 49223

+3.3084 = 0.51962 3

3.1062 89 = 1.94989

29479 = 2.46951

276.45 = 2.44162

Log n = 1.30223

" cos t = 9.99899

" 89 = 1.94989

1780.8 = 3.25061

0^h 13 18.26 +21 10 59.0

+4 36.45 +29 40.8

*1889.0 = 0^h 17 54.71 +21 40 39.8

+2.09 +20.0

ap. Pl. + 0 17 56.80 +21 40 59.8

−0 57.24 −2 23.4

ap. Pl. α = 0 16 59.56 +21 38 36.4

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1889phae.proj..508.

Dec. 2/1889

Swift Nov. 17 & 1889

$f = +1.939''$ $\Delta\lambda = 0\ 19.1''$ $H = 23\ 57.7''$

$\log g = 0\ 19.1''$ $+ = \underline{0\ 17.9''}$ $+ = \underline{0\ 17.9''}$

$H = 23\ 57.7''$ $0\ 37.0''$ $0\ 15.6''$

$\log g = +1.1045''$

" $h = +1.3106''$

" $i = -8.9415''$ $\lambda = +21\ 40\ 40''$

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

" $g = +1.1045''$

" $\sin \frac{1}{2}H = +9.2061''$

" $\tan \lambda = \underline{9.5994''}$

$+0.054'' = +8.7339''$

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

" $h = +1.3106''$

" $\sin H+\lambda = +8.8324''$

" $\sec \lambda = \underline{0.0319''}$

$+0.100'' = +8.9988''$

$+0.054''$

$+1.939''$

$+2.093'' =$ corr. in R.A.

$\log g = 1.1045''$

" $\cos \frac{1}{2}H = +9.9943''$

$12.56'' = 1.0988''$

$\log h = 1.3106''$

" $\cos H+\lambda = +9.9998''$

" $\sin \lambda = \underline{9.5675''}$

$+7.55'' \quad +0.8779''$

$\log i = -8.9415''$

" $\cos \lambda = +9.9681''$

$-0.08'' = -8.9096''$

$+20.10''$

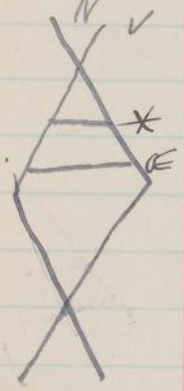
$+20.02'' =$ corr. in Dec.

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1889phae.proj..508.

82 Obs. 2/3 wt. Dec. 23 1889

Comet g Brooks Dec. 12, 1889



	E	*
2	17 37.5 ✓	16 25.4 ✓
	18 18.8 ✓	16 48.7 ✓
	35 56.3	33 14.1

2 42.2 / 21.10

~~19 11.9 20 22.5~~
~~19 30.5 21 2.0~~

20	22.5 ✓	19 11.9 ✓
21	2.0 ✓	19 30.5 ✓
41	~~44.5~~	38 42.4

2 42.1 / 21.05

22	59.3 ✓	21 48.9 ✓
23	36.0 ✓	22 4.0 ✓
46	35.3	43 52.9

2 42.4 / 21.20

25	32.0 ✓	24 24.0 ✓
26	8.4 ✓	24 35.5 ✓
51	40.4	48 59.5

2 40.9 / 20.45

29	3.0 ✓	27 52.5 ✓
29	43.0 ✓	28 9.0 ✓
58	46.0	56 1.5

2 44.5 / 22.25
1.05

4	23 1	20 2.5	8 13 40.6
2	23	26.2	1 20.9
		−6.7	
2	23	19.5	8 12 19.7
18	9	38.9	4 44 31.0
8	13	40.6	12 56 50.7 = G.M.T.

Mean Dec. 2 23 26.2 N.A.

+1 21.21

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1889phae.proj..508.

41.3″ 23.3″ 18.0″

39.5° 18.6° 20.9°

36.7° 15.1° 21.6°

36.4° 11.5° 24.9°

40.0° 16.5° 23.5°
5)193.9 ✓ 5)85.0 ✓ 8.9
~~38.78~~ 17.00 ✓ 21.78′
38.7 F ✓

log. 21.78 = 1.33806″
+ 7.5 = 0.87506′
+ log cos Z = 9.90326′
−130.7′ = 2.11638″
− 2 10.7′

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1889phae.proj..508.

84

Dec. 23 1889

Conct'g 1889 Doolly Dec. 12

Comp. Star = Dm. +36 3104 (7.3 K)

W 2 18^h 299-500 = 18 16 21.68 +36 49 14.0 1825
+1 6.27 +0 45.8
18 17 27.95 +36 49 59.8
274 21 59.25

Log W/5 = 0.12611
l. 2 sin 2 = -9.99874
l. tan L = 9.87448
-0.9985 -9.99933
+3.0707
+2.0722 = 0.31643
64 = 1.80618
132.62 = 2.12261

Log v = 1.30220
l. cos δ = 8.88158
l. 64 = 1.80618
97.7 = 1.98996

	18 16 21.68	+36 49 14.0
	+2 12.62	+1 37.7
*1889.0 =	18 18 34.30	+36 50 51.7
	-0.37	+2.2
ap. * =	18 18 33.93	+36 50 53.9
	+1 21.21	-2 10.7
ap. Pl. o =	18 19 55.14	+36 48 43.2

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1889phae.proj..508.

Dec. 23 1889

Comet 1889 Borelly Dec. 12

$f = +1.974'$ $\Delta G = 0^h\ 17.9'$ $H = 23\ 50.3'$

$G = 0\ 17.9'$ $\alpha = -18\ 18.6'$ $\alpha = 18\ 18.6'$

$H = 23\ 50.3'$ $18\ 36.5'$ $42\ 8.9''$

$\log g = +1.1120'$ 24

$\log h = +1.3105'$ $18\ 8.9''$

$\log i = -9.5760'$ $\Delta = +36\ 50\ 52'$

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

$\log g = +1.1120''$

$\log g = +1.1120''$

$\log \sin \frac{1}{2}H+\alpha = -9.9944'$

$\log \tan \alpha = +9.8747'$

$-0.638' = -9.8050''$

$\log \cos \frac{1}{2}G+\alpha = +9.2003'$

$+2.05' = +0.3123''$

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

$\log h = +1.3105'$

$\log \sin H+\alpha = -9.9997'$

$\log \sec \alpha = +0.0968'$

$-1.702' = -0.2309''$

$\log h = +1.3105'$

$\log \cos \frac{1}{2}H+\alpha = +8.5889'$

$\log \sin \Delta = +9.7779'$

$+0.48' = +9.6773''$

$-0.638'$

$-2.340''$

$+1.974'$

$-0.366'' =$ cor. in R.A.

$\log i = -9.5760'$

$\log \cos \Delta = +9.9032'$

$-0.30' = -9.4792''$

$+2.53'$

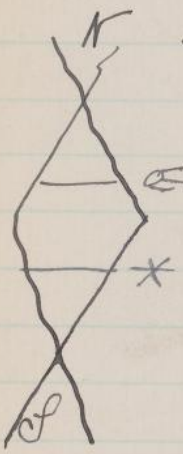
$+2.23' =$ cor. in Dec.

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1889phae.proj..508.

Dec. 23/1889

Comet d 1889 Brooks July 6



	α		×		
3	8 21.6		9 28.1		
	9 16.2		10 6.4		
	17 37.8		19 34.5	1	56.7
	10 46.4		11 37.9		
	11 25.0		12 1.1		
	22 11.4		23 39.0	1	27.6 0 43.80
	12 50.2		13 41.5		
	13 29.6		14 4.9		
	26 19.8		27 46.4	1	26.6 0 43.30
	15 35.9		16 27.5		
	16 15.0		16 50.5		
	31 50.9		33 18.0	1	27.1 0 43.55
	17 48.4		18 39.5		
	18 27.8		19 2.5		
	36 16.2		37 42.0	1	25.8 0 42.90

1.55
− 0 43.39

Mean Sat 3h 11 5 98.3
14 34.8
− 6.7
3 14 28.1
18 9 38.9
9 4 49.2
4 44 29.2
9 3 20.0 C. M. T.
4 44 31.0
13 47 51.0

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1889phae.proj..508.

38.6 23.2 61.8

39.4 23.4 62.8

39.1 23.0 62.1

39.4 23.0 62.4

0.5 1.1

39.12 62.28

log 62.28 = 1.79435
log 7.5 = 0.87506
log cos ∠ = 9.99995

464.9 = 2.66736
860.0
421.1 = + 7 1.1

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Dec. 23 1889

Comet d 1889 Brooks July 6

Comp. Stas = Dec. +5° 74 (9.4 B)

B.B.VI +5° 74 = 0^h 27 29.50 +5° 22 26.0 (1855)

+0 52.46 +5 38.5

0 28 21.96 +5 28 4.5

7° 5 29.40

Log m/5 = 0.12608

" 2 sin ½ = 9.09151

" tan ½ = 9.99802

0.0158 = 8.19859

3.0710 = 0.48951

2.2353 = 0.50991

3.0868 34 = 1.53148

10.00 2.04039

104.95 = 2.02099

Log m = 1.30217

" cos ½ = 9.99666

" 34 = 1.53148

676.6 = 2.83031

0^h 27 29.50 +5 22 26.0

+1 44.95 +11 16.6

*1889.0 = 0^h 29 14.45 +5 33 42.6

+ 2.11 + 14.3

ap. Pl. * = 0^h 29 16.56 +5 33 56.9

−0 43.39 +7 1.1

ap. Pl. ☰ = 0^h 28 33.17 +5 40 58.0

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1889phae.proj..508.

Dec. 23, 1889

Comet d 1889 Brooks July 6

$f = 1.974'$
$\Omega = 0\ 17.9'$
$\pi = 23\ 50.3'$
$\log q = +1.1120'$
$\log h = +1.3105'$
$i = -9.5760'$

$\Omega = 0\ 17.9'$ $\quad \pi = 23\ 50.3'$
$\alpha = 0\ 29.2'$ $\quad \alpha = 0\ 29.2'$
$0\ 47.1'$ $\quad 0\ 19.5'$

$\lambda = +5^{\circ}\ 33\ 43'$

$\log 1/15 = +8.8239'$
$\log q = +1.1120'$
$\log \sin(\Omega+\alpha) = +9.3098'$
$\log \tan \lambda = +8.9885'$
$+0.017' = 8.2342''$

$\log 1/15 = +8.8239'$
$\log h = +1.3105'$
$\log \sin \pi+\alpha = +8.2292'$
$\log \sec \delta = +0.0020'$
$+0.116' = +9.0656''$
$+0.017'$
$+1.974'$
$+2.107'' =$ cor. in R.A.

$\log q = +1.1120''$
$\log \cos \Omega+\alpha = +9.9908'$
$+12.67' = 1.1028''$

$\log h = +1.3105'$
$\log \cos \pi+\alpha = +9.9984'$
$\log \sin \lambda = +8.9864'$
$+1.97' = +0.2953''$

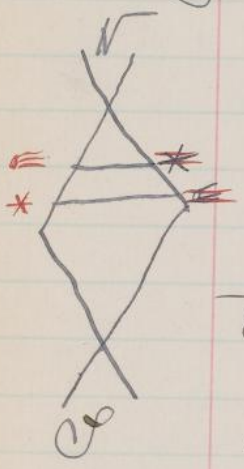
$\log i = -9.5760'$
$\log \cos \lambda = +9.9980'$
$-0.38' = -9.5740''$
$+14.64'$
$+14.26'' =$ cor. in Dec.

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1889phae.proj..508.

Dec. 23. 1889.

Comet of 1889, Swift Nov. 17.



3	40	45.5	41	37.0				
	41	19.2	42	15.3				
	82	4.7	83	52.3	1	47.6	0	53.80
	43	3.1	43	54.2				
	43	37.4	44	32.6				
	86	40.5	88	26.8	1	46.3	0	53.15
	45	19.3	46	9.1				
	45	52.4	46	47.7				
	91	11.7	92	56.8	1	45.1	0	52.55
	47	31.1	48	21.4				
	48	5.7	48	59.8				
	95	36.8	97	21.2	1	44.4	0	52.20
	49	34.5	50	24.9				
	50	8.0	51	3.4				
	99	42.5	101	28.3	1	45.8	0	52.90
								4.60
							− 0	52.92

Mean Sats = 3^h 453 136.8
45 31.6
− 6.7

3^h 45 24.9
18 9 38.4
9 35 46.0
− 1 34.3
9 34 11.7
4 44 31.0
14 18 42.7 = G. M. T.

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1889phae.proj..508.

$\Delta\alpha$	$\Delta\delta$	
33.7	38.3	4.6
34.3	38.4	4.1
33.1	38.6	5.5
34.6	38.4	3.8
33.5	38.5	5.0

3.0

4.60

Log 4.60 = 0.66276 — 0.66276

11 cos Δ = 9.99665 — 9.9966K

11 7.5 = 0.87506 — 0.87506

+ 32.0 = 1.50447 — 1.50KK6

+ 0 32.0 — +0° 31.9

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1889phae.proj..508.

Dec. 23/1889

Comet f 1889, Swift Nov 17

Comp. Star – Dm. +21° 55 (88 K)

W_2 $0^h 57^m$ = 0^h 21 20.07″ +21 48 35.4″ (1825)
+1 39.87″ +10 39.0″
0 22 59.88″ +21 59 14.4″
94
5 45 0.0
44 59.10″

log 11/15 = 0.12611″
" sin 2 = 9.00082°
" tan 2 = 9.60613
0.8541″ = +8.73306″
+3.07707″ *
+3.1248″ = 0.49482″
1.80618″
199.99 = 2.30100″

log r = 1.30220″
" cos 2 = 9.99781″
" 64 = 1.80618″
1277.0″ = 3.10619″

	0^h 21 20.07″	+21 48 35.4″
	+3 19.99″	+21 17.0″
* 1889.0 =	0^h 24 40.06″	+22 9 52.4″
	+2.12	+20.1
ap. Pl. * =	0^h 24 42.18″	+22 10 12.5″
	− 0 32.92″	+ 0 32.0
ap. Pl. 0 =	0^h 23 49.26″	~~+22 9 40.5″~~
		+22 10 44.5 ✓ ✓

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1999phae.proj..508.

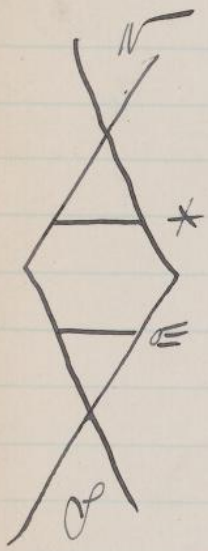
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1889phae.proj..508.

94 Seeing rather bad Obs. fair.

Comet d 1889 (Brooks July 6)

Dec. 26. 1889.



	∈		*				
3h	32m	46.2	37m	24.6			
	39	10.2	37	41.6			
	71	57.0	75	6.2	2	50.8 / 7.2	1 25.40
	41	14.9	39	53.7			
	41	39.5	40	10.5			
	82	54.4	80	4.2	2	50.2	1 25.10
	43	43.1	42	21.5			
	44	4.1	42	34.5			
	87	51.2	85	0.0	2	51.2	1 25.60
	46	40.0	47	17.4			
	49	4.5	47	34.6			
	97	44.5	94	52.0	2	52.5	1 26.25
	56	52.2	55	29.7			
	57	17.9	55	47.5			
	114	10.7	111	17.2	2	53.5	1 26.75
						410	
						+1	25.82

3h	45m	217.8	
	46	3.8	
	+4	30.3	
3	50	34.1	
18	21	28.6	
9	29	5.5	
	1	33.2	
9	30 27	38.7	3.2,3.
4	44	31.0	
14	15 2	9.7 / 3.3	= Gr. m. T.

9	27	32.3	= C. m. T.
4	44	36.0	
		3.3	= Gr. m. T.
14	12		

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1889phae.proj..508.

Δδ

24.6 17.0 41.6

24.6 16.8 41.4

25.0 17.0 42.0

24.5 17.2 41.7

25.1 17.8 42.9

3.8 9.6

24.76 41.92

Log. 41.92 = 1.62242

" 7.5 = 0.87506

" cos L = 9.99728

312.4 = 2.49476

312.4

AA60

573.6

5 12.4

−9' 33".6

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1889phae.proj..508.

96 ~~Seeing rather bad. Obs. pretty fair.~~ Comet d 1889 (Brooks July 6)

Dec. 26. 1889.

Comp. Star = BB. VI. +6° 7ℓ (9.5)

(1855.0) $0^h\ 29^m\ 34^s.70$ $+6°\ 12'\ 29''.8$ (1855.0)

$+0\ \ 52.55$ $+5\ \ 38.0$

$0\ \ 30\ \ 27.25$ $+6\ \ 18\ \ 7.8$

$7°\ \ 36\ \ 48.785$

log r/Δ = +0.12608
" sin ℓ = 9.12220
" tan L = 9.04313
+0.0196 = +8.29141
+3.0710
+3.0906 = 0.49004
34 = 1.53148
105.08 = 2.02152

log r = +1.30217
" cos ℓ = +9.99615
" .34 = +1.53148
675.8 = +2.82980

$0\ \ 29\ \ 34.70$ $+6\ \ 12\ \ 29.8$
$+1\ \ 45.08$ $+11\ \ 15.8$
*1889.0 = $0\ \ 31\ \ 19.78$ $+6\ \ 23\ \ 45.6$
$+1\ \ 25.82$ ~~$-5\ \ 12.4$~~
ap. Pl. * = $0\ \ 32\ \ 45.60$ ~~$+6\ \ 18\ \ 33.2$~~
$+2.10$ ~~$+14.2$~~
ap. Pl. ☉ = $0\ \ 32\ \ 47.70$ ~~$+6\ \ 18\ \ 47.4$~~

$+6\ \ 23\ \ 45.6$
$-9\ \ 33.6$
$+6\ \ 14\ \ 12.0$
$+14.2$
$+6\ \ 14\ \ 26.2$

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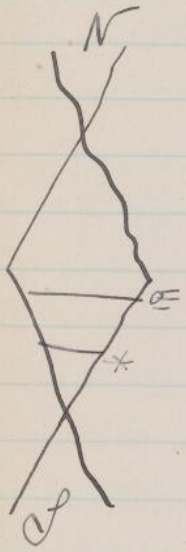
1889phae.proj..508.

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1889phae.proj..508.

98 Obs. 2/3 wt. Comet d 1889 (Brooks July 6)

Dec. 27. 1889.



3h	K2	16.6 ✓	39	30.6 ✓				
	K2	9.2 ✓	40	1.K ✓				
	K	15.K ✓	79	32.0 ✓	−	K3.K ✓✓	2	−1.9 ✓
							2	21.9
	K6	16.− ✓	K3	32.K ✓				
	K7	1.K ✓	KK	3.2 ✓				
	93	19.9 ✓	K7	35.6 ✓	−	KK.3 ✓✓	2	−2.1 ✓
							2	22.1−
	−0	2K.7 ✓	K7	38.0 ✓				
	−1	6.− ✓	KK	9.3 ✓				
	101	31.2 ✓	9−	K7.3 ✓	−	K3.9 ✓✓	2	−1.9− ✓
							2	21.9−
	−K	33.K ✓	−1	K6.7 ✓				
	−−	15.7 ✓	−2	17.K ✓				
	109	K9.1 ✓	10K	K.− ✓	−	KK.6 ✓✓	2	−2.3 ✓
							2	22.3
	−K	−K.− ✓	−6	11.6 ✓				
	−9	39.6 ✓	−6	K0.K ✓				
	11K	34.1 ✓	112	−2.0 ✓	−	K6.1 ✓✓	2	−3.0− ✓
							2	23.0−
								11.35
							+ 2	22.27
							+ 2	−2.27 ✓

	506	154.1	7
3h	50	51.4 ✓	✓
	+0	34.8	✓
3	51	26.2	✓
18	25	25.1	✓
9	26	1.1	✓
	1	32.8	✓
9	24	28.3	✓
4	44	31.0	✓
14	8	59.3	= Gr. Mn. T.

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1969phae.proj..508.

42.6 30.8 11.8

42.9 30.8 12.1

41.8 31.3 10.5

42.3 31.1 11.2

41.1 28.8 12.3

0.7 7.9

42.14 11.58

log. 11.58 = 1.06371

" 7.5 = 0.87506

" cos Σ = 9.99728

86.3 = 1.93605

+ 1 26.3

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1889phae.proj..508.

Comet d 1889. (Brooks July 6.)

Dec. 27. 1889.

Comp. Star same as on the 26th,
viz: BD. VI. +6° 7A (9.5)

* 16 55.0 = 0h 29m 34.70s +6 12 29.A"

	0	31	19.78	+6	23	45.6
		+2	22.27		+1	26.3
at	0	33	42.05	+6	25	11.9
			+2.10			+14.2
apPl. a=	0	33	44.15	+6	25	26.1
Log. m/s	0	34	14.15			
" sin t						
" l						

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1889phae.proj.508.

Comet d 1889 (Brooks. July 6.)

Dec. 27. 1889.

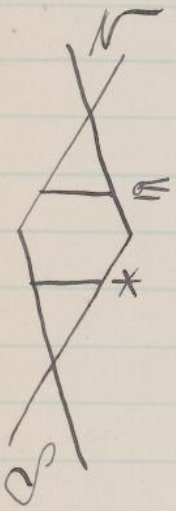
* 1255.0	0	29	38.70	v	+6	12	29.4	v (9.5)

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1889phae.proj..508.

Jan 14, 1890

Comet d, 1889 Brooks July 6



	E	*		
3	31 22.8	35 14.0		
	32 2.0	35 56.6		
	63 24.8"	71 10.6"	7 45.8"	3 52.90"
	38 23.3	42 13.0		
	39 1.2	42 55.9		
	77 24.5"	85 8.9"	7 44.4"	3 52.20"
	45 4.0	48 53.0		
	45 41.0	49 36.2		
	90 45.0"	98 29.2"	7 44.2"	3 52.10"
	51 30.4	55 18.0		
	52 6.8	56 1.8		
	103 37.2"	111 19.8"	7 42.6"	3 51.30"
	58 20.9	62 7.5		
	58 56.0	62 51.5		
	117 16.9"	124 59.0"	7 42.1"	3 51.05"
				4.55"
				−3 51.91"

Mean of 3^h 45.0 148.4'
45 14.8 N.R.
+1 34.6
3 46 49.4
19 36 23.2
8 1026.2
−1 20.3
8 9 5.9
4 44 31.0
12 53 36.9 = Gr. M. T. of obs.

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1889phae.proj..508.

39.2"	42.6"	81.8"
37.9"	42.9"	80.8"
37.0"	43.2"	80.2"
36.4"	43.8"	80.2"
35.1"	44.0"	79.1"
0.6		2.1
37.12"		80.42"

Log 80.42 = 1.905360"
ℓ 7.5 = 0.875060"
ℓ cos L = 9.993741"
594.5" = 2.774161"
886.0"
291.5" = + 4' 51.5"

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1889phae.proj..508.

Jan. 14 1889

Comet d, 1889, July 6

Comp. Stat. = Dun. +9° 138 (17.0 K)

W I $1^h 39$ = 1^h 2 19.28″ +9 21 30.6″ (1825)
+1 41.69 +10 27.9
1 4 0.97 +9 31 58.5
16 0 14.55
15.60

Log. u/5 = 0.12611
" sin α = 9.44045
" tan ξ = 9.22513
+0.0619 = +8.79169
+3.0707
3.1326 = 0.49590
65 = 1.81291
203.61 = 2.30881

Log. u = 1.30220
" cos α = 9.98283
" 65 = 1.81291
1253.0 = 3.09794

1 2 19.28 +9 21 30.6
+3 23.61 +20 53.0
1 5 42.89 +9 42 23.6
− 1.06 − 5.7
ap. Pl. x = 1 5 41.83 +9 42 18.9
−3 51.91 +4 51.5
ap. Pl. ∈ = 1 1 49.92 +9 47 9.4

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1889phae.proj..508.

Jan. 14 1889

Comet d 1889 July 6

Ap. P.L. Reduction

$\lambda = -0.885$ $\quad$ $G = 11\ 37.9$ $\quad$ $H = 22\ 27.1$

$\lambda G = 11\ 37.9$ $\quad$ $1\ 5.7$ $\quad$ $1\ 5.7$

$H = 22\ 27.1$ $\quad$ $12\ 43.6$ $\quad$ $23\ 32.8$

$\log g = +0.7622$

$\log h = +1.3043$

$\log i = -0.5377$

$\delta = +9^\circ\ 42\ 24''$

$\log g = +0.7622$

$\log \cos \delta G \cos \delta = -9.9921$

$5.68'' = -0.7543$

$\log h = +1.3043$

$\log \cos \delta H \cos \delta = +9.9967$

$\log \sin \lambda = +9.2269$

$= +0.5279$

$i = -0.5377$

$\log \sin \delta = +9.9937$

$-0.161'' = -7.2078$

$-0.012''$

$-0.885''$

$-1.058 =$ corr in R.A.

$-3.40'' = -0.5314$

$-5.68''$

$-9.08''$

$+3.37''$

$-5.71 =$ corr. in Dec.

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1889phae.proj..508.

Jan. 14 1889

Comet d, 1889 July 6

Comp. Star = Dm. +9° 138 (7.0 K)

W I 1^h 39 = 1^h 2 19.28″ +9 21 30.6″ (1825)

+1 41.69 +10 27.9

1 4 0.97 +9 31 58.5

16 0 14.55

15.60

Log. u/15 = 0.12611

" sin α = 9.44045

" tan Σ = 9.22513

+0.0619 = +8.79169

+3.0707 = 0.49590

3.1326 = 1.81291

65 = 2.30881

203.61 = 2.30881

Log. n = 1.30220

" cos α = 9.98283

" 65 = 1.81291

1253.0 = 3.09794

1 2 19.28 +9 21 30.6

+3 23.61 +20 53.0

1 5 42.89 +9 42 23.6

+1889.0 − 1.06 − 5.7

ap. Pl. x = 1 5 41.83 +9 42 18.9

−3 51.91 +4 51.5

ap. Pl. α = 1 1 49.92 +9 47 9.4

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1889phae.proj..508.

Jan. 14 1889
Comet d 1889 July 6
Ap. Pl. Reduction

$\lambda = -0.885$ ″
$\lg = 11\ 37.9$ ″
$H = 22\ 27.1$ ″
$\log g = +0.7622$ ″
$\log h = +1.3043$ ″
$\log i = -0.5377$ ″

$G = 11\ 37.9$ ″
$1\ 5.7$ ″
$12\ 43.6$ ″

$H = 22\ 27.1$ ″
$1\ 5.7$ ″
$23\ 32.8$ ″

$\alpha = +9^{\circ}\ 42\ 24$ ″

Log ″/15 = +8.
″ sin g = 0.
″ sin G+L =
″ tan L =
−0.012″ =

Log ″/
″ sin
″ sin
″ sin

−0.161″ = −9.2078″
−0.012″
−0.885″
−1.058″ = corr in R.A.

= +0.7622″
G+L = −9.9921″
= −0.7543″

= +1.3043″
H = +9.9967″
L = +9.2269″
= +0.5277″

= −0.5377″
″ cos L = +9.9937″
−3.40″ = −0.5314″
−5.68″
−9.08″
+3.37″
−5.71″ = corr. in Dec.

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1889phae.proj..508.

Jan. 14 1890

Comet d 1889 July 6

Ap. Pl. Reduction

$\lambda = -0.885''$ $\quad \lambda = 11\ 37.9''$ $\quad H = 22\ 27.1''$

$\lambda = 11\ 37.9''$ $\quad 1\ 5.1''$ $\quad 1\ 5.1''$

$H = 22\ 27.1''$ $\quad 12\ 43.6''$ $\quad 23\ 32.8''$

$\log g = +0.7622''$

" $h = +1.3043''$ $\quad \delta = +9^\circ\ 42\ 24''$

" $i = -0.5377''$

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

" $g = 0.7622''$

" $\sin \frac{1}{2}H = -9.2767''$

" $\tan \lambda = +9.2331''$

$-0.012'' = -8.0959''$

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

" $h = +1.3043''$

" $\sin H = -9.0733''$

" $\sec \lambda = +0.0063''$

$-0.161'' = -9.2078''$

$-0.012''$

$-0.885''$

$-1.058''$ = corr in R.A.

$\log g = +0.7622''$

" $\cos \frac{1}{2}H = -9.9921''$

$-5.68'' = -0.7543''$

$\log h = +1.3043''$

" $\cos H = +9.9967''$

" $\sin \lambda = +9.2269''$

$+3.37'' = +0.5279''$

$\log i = -0.5377''$

" $\cos \lambda = +9.9937''$

$-3.40'' = -0.5314''$

$-5.68''$

$-9.08''$

$+3.37''$

$-5.71''$ = corr in Dec.

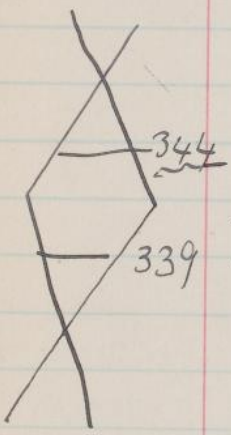
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1889phae.proj..508.

Jan. 14, 1889

Dec. +53° 344 & 339

	344		339				
4	~~46~~ 7	~~27~~ 15.5	46	21.0			
	48	38.5	47	44.0			
	95	54.0	94	5.0	1	49.0	0 54,50



344	50	6.5	49	12.5			
	51	29.5	50	35.5			
339	101	36.0	99	48.0	1	48.0	0 54.00
							+ 0 54.25

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1889phae.proj..508.

83.0" 83.0" 166.0"

83.0" 83.0" 166.0"
332.0
166.0"

log 166.0 / 332.0 = 2.220 11 − 2.518 78
11 7.5 = 0.8750 6"
N cos 2 = 9.9996 46
1456.5 = 3.16330
732.2" = 2.86463"
886.0"
153.8 = +2 33.8"

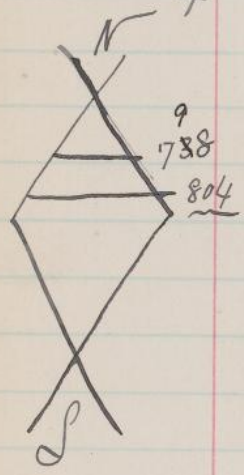
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1889phae.proj..508.

Jan. 14 1889

DM. +51° 804 & 738

		804		738	
4	16	45.6	15	58.9
	17	45.0	16	31.0
	20	17.0	19	31.0
	21	19.5	20	5.0



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1889phae.proj..508.

60.0′ 32.1′ 27.9′

62.5′ 34.0′ $\frac{28.5'}{0.4}$′

28.20′

$\log 28.20 = 1.450250$

$\log 7.5 = 0.875061$

$\log \cos 2 = 9.789700$

$130.3' = 2.113811^c$

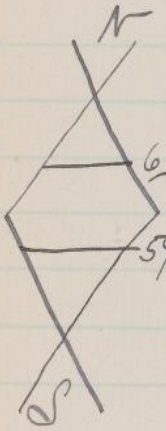
$-2\ 10.3'$

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1889phae.proj..508.

Jan. 14 1890

Dec. +51° 604 & 599



	604		599	
5h	49	28.8	47	54.0
	50	24.8	48	36.5
	52	34.5	50	59.5
	53	30.0	51	42.5

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1889phae.proj..508.

56.0″ 42.5″ 98.5″

555″ 43.0″ 98.5″
98.50″

log. 98.5° = 1.99344″
" 1.5 = 0.17506″
" cos 2 = 9.99520
461.0″ = 2.66370″
886.0
425.0″ = +7 5.0″

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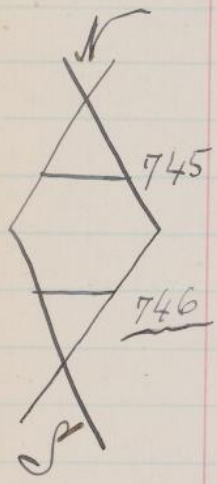
1889phae.proj..508.

Mer. Circle Sloan.

Jan. 14 1890

Dm. +52° 746 & 745.

		746		745	
6	5	54.7	5	43.1	
	6	41.0	6	29.0	
	7	31.0	7	19.4	
	8	18.0	8	5.0	
	8	53.0	8	41.5	
	9	40.0	9	27.0	



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1899phae.proj..508.

46.3 7 45.9 7 92.2 7

47.0 7 45.5 6 7 92.6 7

47.0 7 45.5 7 92.5 7

13

~~92.65~~

92.K3

Log 92.~~65~~ K3 = 1.96~~685~~ 21

11 7.5 = 0.87506

11 cos 2 = 9.78652

42~~5~~.0 K 2.62~~843~~ 7 3 9

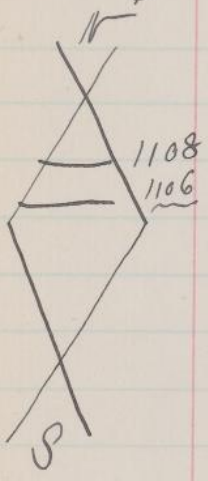
886.0

462.0 = −7 47.0

1889phae.proj..508.

Jan. 14 1890

Dm. +49 1106 & 1108



	1106		1108	
23	19.4	23	40.8
24	39.0	24	6.9
25	4.4	25	26.0
26	23.6	25	52.0

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1999phae.proj..508.

79.6 26.1 53.5

79.2 26.0 53.2

0.7

53,35

Log 53.35 = 1.72713 1.72713

" 7.5 = 0.87506 0.87506

" cos 2 = 9.98948 9.80957

= 2.58977 2.41176

388.2

- 628.2

258.1

- 418.1

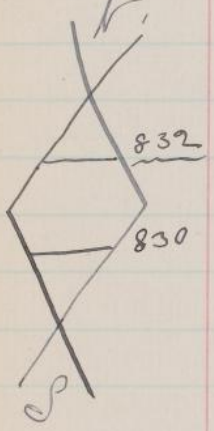
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1889phae.proj..508.

Jan. 14 1890

Dm. +52 832 & 833

	832	833
.6	~~48 8~~	
	49 9.6	48 18.0
	49 29.1	49 41.0
	51 0.8	50 8.8
	51 20.0	51 32.5



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1999phae.proj..500.

19.5° 83.0° 102.5°

19.2° 83.7° 102.9°
1.4
102.70'

Log 102.70 = 2.011517°
" 7.6 = 0.875066°
" cos 2 = 9.788230
473.0' = 2.674866°
886.0
413.0' = +6 53.0'

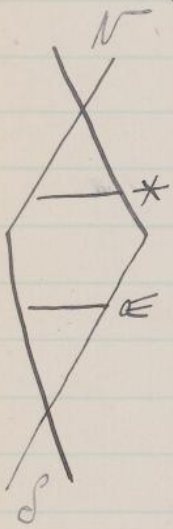
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1889phae.proj..508.

Obs. 2/3 weight

Jan. 16, 1890

Comet d. 1889 Brooks July 6



	E	*			
3	41 32.7 ✓	39 54.5 ✓			
	42 10.5 ✓	40 39.2 ✓			
	83 43.2 ✓	80 33.7 ✓	3	9.5 ✓	1 34.75 ✓
	44 37.2 ✓	42 59.0 ✓			
	45 16.0 ✓	43 43.5 ✓			
	89 53.2 ✓	86 42.5 ✓	3	10.7 ✓	1 35.35 ✓
	51 34.0 ✓	49 55.0 ✓			
	52 13.5 ✓	50 39.0 ✓			
	103 47.5 ✓	100 34.0 ✓	3	13.5 ✓	1 36.75 ✓
	55 0.0 ✓	53 22.5 ✓			
	55 40.6 ✓	54 5.6 ✓			
	110 40.6 ✓	107 28.1 ✓	3	12.5 ✓	1 36.25 ✓
	61 25.7 ✓	59 48.7 ✓			
	62 7.6 ✓	60 31.7 ✓			
	123 33.3 ✓	120 20.4 ✓	3	12.9 ✓	1 36.45 ✓
4	~~76~~ 15.5 ✓	~~74~~ 37.2 ✓			
	~~76~~ 57.3 ✓	~~75~~ 19.2 ✓			
	~~33~~ 12.8 ✓	~~29~~ 56.4 ✓	3	16.4 ✓	1 38.20 ✓
	153	149			37.75 ✓
	~~41~~ 230.6				+ 1 36.29 ✓
	661 230.6 ✓				
3	55 24.2				

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1999phae.proj..508.

37.8 44.7 82.5

38.8 44.5 83.3

39.5 44.0 83.5

40.6 43.1 83.7

41.9 43.0 84.9

41.8 42.0 83.8

0.4

40.07

21.7

83.62

3 55 24.2

+1 41.7

3 57 5.9

19 44 22.3

8 12 46.6

-1 20.7

8 11 25.9 C. m. T.

4 44 31.0

12 55 52.9 = Gr. m. T.

6 0

9.9 Gr. m. T.

2.7

log 83.62 = 1.92231 617.2

log cos δ = 9.99303 886.0

log 7.5 = 0.87506 268.8

617.2 = 2.79040 -4 28.8

886.0

617.2

268.8

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1889phae.proj..508.

Jan. 16 1890

Comet of 1889 Brooks (July 6)

Comp. Star = Dm. +10° 133 (9.1 K)

W I 1^h 2 = 1^h 0 5.90 +9 53 34.6 (1825)

+1 41.72 +20 56.4

1^h 1 47.62 10 14 31.0

15 26 54.30 -4 28.8

+10 10 2.2

-5.7

+10° 9 56.5

Log m/15 = 0.12611

" sin t = 9.42548

" tan d = 9.24931

+0.0632 = 8.80090

3.0707 = 0.49608

3.1339 = 1.81291

203.70 = 2.30899

Log m = 1.30220

" cos d = 9.98402

" 65 = 1.81291

1256.4 = 3.09913

+0.12611

+9.42548

+9.24931

+8.80090

+0.0631

+3.0707

+3.1338

+0.49607

+1.81291

+2.30898 = 203.70

90

×1889.0

ap. Pl. = 1 5 4.8

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1909phae.proj..508.

Jan. 16. 1890.

Comet d 1889 (Brooks July 26.)

f =	−0.2524	" 36.3	" 19.3
g =	" 36.3	1 51.1	1 51.1
h =	" 19.3	12 41.4	23 12.4
$\log g$ =	+0.7496	$(g+L)$	$(h+L)$
" h =	+1.3033		
" ε =	−0.5691		

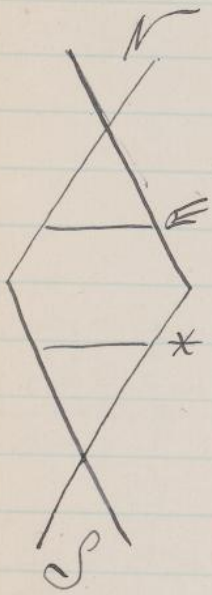
$\log \frac{1}{15}$	= +8.8239	$\log g$	= +0.7496
" g	= +0.7496	" $\cos(g+L)$	= " 9.9929
" $\sin(g+L)$	= " 9.2544	−5.52	= " 0.7423
" $\sin \delta$	= +9.2544		
−0.012	= " 8.0821	" h	= +1.3033
		" $\cos(h+L)$	= +9.9947
" $\frac{1}{15}$	= +8.8239	" $\sin \delta$	= +9.2547
" h	= +1.3033	+3.51	= +0.5525
" $\sin(h+L)$	= " 9.1495		
" $\sec \delta$	= +0.0049	" ε	= −0.5691
−0.210	= " 9.3216	" $\cos \delta$	= +9.9931
−0.012		−3.65	= " 0.5622
−0.8524		−5.52	
−1,080		−9.17	
		+3.51	
		−5.66	

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1889phae.proj..508.

Jan. 17, 1890

Comet d 1889 Brooks (July 6)



	E	*
4h	5 20.0	6 44.9
	6 0.8	7 14.5
	11 20.8	13 59.4 — 2 38.6
4h	7 50.0	9 14.5
	8 29.7	9 34.0
	16 19.7	18 48.5 — 2 28.8 — 1 14.40
	12 10.0	13 34.5
	12 50.0	13 54.4
	25 0.0	27 28.9 — 2 28.9 — 1 14.45
	14 44.6	16 8.5
	15 24.5	16 28.5
	30 9.1	32 37.0 — 2 27.9 — 1 13.95
	17 16.1	18 39.5
	17 55.2	18 59.5
	35 11.3	37 39.0 — 2 27.7 — 1 13.85
	20 7.9	21 31.5
	20 47.8	21 52.0
	40 55.7	43 23.5 — 2 27.8 — 1 13.90
		5.55

Mean sols

	146 95.8	8 28 18.3	−1 14.11
4h	14 45.6	−1 23.3	
	+1 45.5	8 26 55.0	
4	16 31.1	4 44 31.0	
19	48 12.8	13 11 26.0 = Gr. M. T. of obs.	
98	28 18.3		

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1889phae.proj..508.

$\Delta\alpha$

~~40.8 29.6 70.4~~ Rej. One reading wrong.

39.7 19.5 59.2

40.0 19.9 59.9

39.9 20.0 59.9

39.1 20.0 59.1

39.9 20.5 60.4

3.6 3.5

39.72 59.70

Log. 59.70 = 1.77597 440.6

" 7.5 = 0.87506 886.0

" cos δ = 9.99305 445.4

440.6 = 2.64408 +7 25.4

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1889phae.proj..508.

Jan. 17, 18-90.

Comet d 1889 Brooks (July 6)

Comp Stars — Dec. +10° 147 (8.6 K)

W_I 1h 176 = 1h 4 36.67 +9 53 3.9
+1 41.89 +7 47.0
1 6 18.51 +10 2 44.9
16 34 37.65 3 29.9

Log w/15 = +0.12611
" sin d = +9.45531
" tan δ = +9.24833
0.0678 = +8.82946
3.0707
3,138 = 0.49669
65 = 1.81291
204.00
203.99 = 2.30962

Log w = 1.30220
" cos d = 9.98156
" . 65 = 1.81291
1249.3 = 3.09667

1 4 36.62 +9 53 3.9
+3 24.00 +20 49.3
1 8 0.62 +10 13 53.2
− 1.08 − 5.6
ap. Pl. α = 1 7 59.54 +10 13 47.6
−1 14.11 +7 25.4
ap. Pl. δ = 1 6 45.43 +10 21 13.0

×1889.0

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1889phae.proj..508.

Jun 17 1898

Conict d 1889 (July 6.) Brooks.

$\mathfrak{U} = 11\ 36.1$ ⁷ $\quad \mathfrak{U} = 22\ 15.5$

$f = -0.843$ ⁷ $\quad \alpha = 1^h\ 8.0\ 6.6$ ' $\quad \alpha = 1\ 8.0\ 6.6$ '

$\mathfrak{U} = 11\ 36.1$ ⁷ $\quad 12\ 42.7$ ' $\quad 23\ 22.1$ ᵉ

$\mathfrak{U} = 22\ 15.5$ ⁷ $\quad 44.1$ $\quad 23.4$

$\log q = +0.7413$ ⁽⁷⁾ $\quad \Delta = +10^\circ\ 20'$

$\log h = +1.3028$ ⁽⁷⁾

$\log i = -0.5837$ ⁽⁷⁾

$\log 1/15 = +8.8239$ ⁽⁷⁾

$\log q = +0.7413$ ⁽⁷⁾

$\log \sin \mathfrak{U}+\alpha = -9.2767$

$\log \tan \Delta = +9.2609$

-0.0182 ⁷ $= -8.0637$ ⁽¹⁾

8.1033 ⁷

$\log 1/15 = +8.8239$ ⁽⁷⁾

$\log h = +1.3028$ ⁷

$\log \sin H+L = -9.2164$

$\log \sec \Delta = +0.0071$

-0.0224 ⁷ $= -9.3502$ ⁽¹⁾

-0.0182 ⁷ $\quad 9.3351$ ⁷

-0.843 ⁷

-1.0778 ⁷ = cor. in R.a.

$.72$

$\log q = +0.7413$ ⁽⁷⁾

$\log \cos \mathfrak{U}+\alpha = -9.9927$

-5.42 ⁷ $= -0.7337$

32 ⁷

$\log h = +1.3028$ ⁷

$\log \cos H+L = +9.9946$

$\log \sin \Delta = +9.2538$

$+3.52$ ⁷ $= +0.5506$ ⁷

468

$\log i = -0.5837$ ⁷

$\log \cos \Delta = +9.9929$

-3.77 ⁷ $= -0.5766$ ⁷

67

-5.42 ⁷

$-9.1.78$ ⁷

$+3.552$ ⁷

6

-5.64 = cor. in R.a

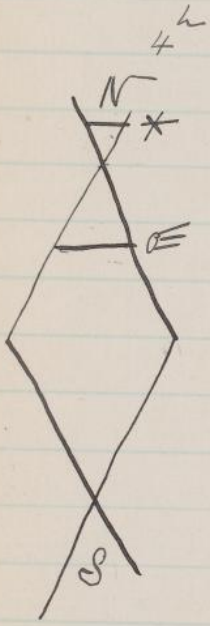
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1889phae.proj..508.

No. 2/3 wt.

Jan. 18, 1890

Comets d 1889 / Brooks (July 6)



	E		*					
	29	14.0	29	23.6				
	29	49.9	29	35.1				
	59	3.9	58	58.8	0	5.2	0	2.55
	30	31.3	30	41.5				
	31	6.5	30	52.4				
	61	37.8	61	33.9	0	3.9	0	1.95
	31	42.3	31	52.7				
	32	19.4	32	4.5				
	64	1.7	63	57.2	0	4.5	0	2.25
	33	18.8	33	28.8				
	33	55.5	33	40.4				
	67	14.3	67	8.8	0	5.5	0	2.75
	34	27.8	34	38.5				
	35	4.4	34	49.2				
	69	32.2	69	27.7	0	4.5	0	2.25
	35	37.7	35	48.5				
	36	14.3	35	58.8				
	71	52.0	71	47.3	0	4.7	0	2.35
				36.3				2.150
	37	25.4	37	25.4			+0	2.35
	37	58.5	37	47.5				
Rej. One transit wrong.	75	23.9	75	23.8	0	0.1		
	39	1	141.9					
Mean beats 4h	32	46.8						

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1889phae.proj..508.

35.9	11.5	47.4
35.2	10.9	46.1
37.1	11.8	48.9
36.7	12.0	48.7
36.6	10.7	47.3
36.6	10.3	46.9

4 32 46.8
+1 49.5
4 34 36.3
19 52 9.4
8 42 26.9
1 25.6
8 41 1.3
4 44 41.0
13 25 42.3 = G.M.T.

2.1
3.3
36.52
47.55

log 47.55 = 1.67715
" 7.5 = 0.87506
" cos 2 = 9.99247
350.5 = 2.54468
− 5 50.5

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1889phae.proj..508.

Jan. 18 1890

Comet d 1889 Brooks (July 6)

Comp. Star = Dm. +10°150 (9.4 B)

B.S. 2. VII +10°150 = 1h 6 33.77 +10 27 22.1 (1855)

+0 55.10 +5 36.4

1 7 27.65 +10 32 58.5

16 51 54.75

16 52 11.55

Log m/15 = 0.12608

" sin t = 9.46258

" tan d = 9.27006

0.07222 + 8.85872

3.07110

3.14332 = 0.49738

35' = 1.54407

11 0.02 = 2.04145

Log m = 1.30217

" cos d = 9.98089

" 35 = 1.54407

671.6 = 2.82713

1 6 33.77 +10 27 22.1

+1 50.02 +11 11.6

1 8 23.79 +10 38 33.7

90

*1889.0

ap. Pl. cor = −1.09 −5.6

1 8 22.70 +10° 38 28.1

+0 2.36 −5 50.5

ap. Pl. α = 1 8 25.06 +10° 32 37.6

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1889phae.proj..508.

0 46 23.4 | 0 46 00.0

13)18(14
13
50
52
50

0 20.5 47 00.0

924 20 Gem 142

13)194.8(14.98
13
64

8)112.9(14.11
8
32
32
9
8
10

13)28(2
26
20

1889phae.proj..508.

22 √6 23.9 22 √6 000

105.0
18.9
123.9
9√6.0
1079.9

142
77
219

6217
1411
7628

25
2
50

22

24
3

21
2.5
105
42
52.5

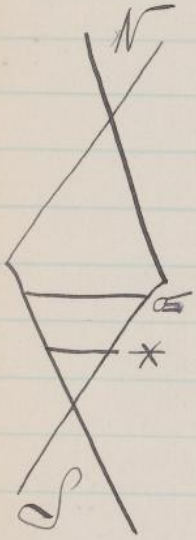
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1889phae.proj..508.

130 Obs. 2/3 wt.

Jan. 20, 1890.

Comet d 1889 Brooks (July 6)



	α		*					
5	33	4.1	31	47.0				
	33	41.9	32	5.4				
	66	46.0	63	52.4	2	53.6	1	26.80
	38	14.2	36	56.2				
	38	53.5	37	15.0				
	77	7.7	74	11.2	2	56.5	1	28.25
	43	35.9	42	18.0				
	44	15.5	42	37.8				
	87	51.4	84	55.8	2	55.6	1	27.80
Rej.	~~46~~	~~45.3~~	44	56.5				
	46	55.9	45	16.2				
	93	41.2	90	12.7	~~2~~ 3	~~28.5~~	1	
	48	54.5	47	35.5				
	49	35.0	47	56.0				
	98	29.5	95	31.5	2	58.0	1	29.00
	52	11.9	50	53.5				
	52	54.0	51	15.0				
	105	5.9	102	8.5	2	57.4	1	28.70
	54	57.6	53	38.2				
	55	39.1	53	59.1				
	110	36.7	107	37.9	2	58.8	1	29.40
								1.95
	543	177.2					+ 1	28.32
Means	5	45	29.8					

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1889phae.proj..508.

~~Δδ~~ ~~Δα~~

37.8 18.4 19.4 5 45 29.8
+1 56.2
5 47 26.0
20 0 2.5
39.3 18.8 20.5 9 47 23.5
1 36.2
9 45 47.3
39.6 19.8 19.8 4 44 31.0
14 30 18.3 = G.M.T.

~~+0.6~~ ~~19.7~~

40.5 20.5 20.0

Log 20.05 = 1.30211
" 7.5 = 0.87506
" 202.2 = 9.99212
+147.7 = 2.16929
+2 27.7

42.1 21.5 20.6

41.5
6/240.8
0.12
21.5
6/120.5
20.04
20.0
0.3
20.05

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1889phae.proj..508.

Jan. 2 0 18 90.

Comet d 1889 Brooks (July 6)

Comp. Star = Dm. +10° 153 (8.8 K).

W. $1^h 11.9$ = $1^h\ 6\ 57.28$ $+10°\ 32\ 26.3$
$+1\ 42.12$ $+10\ 24.3$
$1\ 8\ 39.40$ $+10\ 42\ 50.6$
$17\ 9\ 51.00$

Log. m/15 = 0.12611
" sin t = 9.46998
" tan 2 = 9.27693
0.0746 = 8.87302
3.0707
3.1453 = 0.49766
65 = 1.81291
204.44 2.31057

Log m = 1.30220
" cos t = 9.98021
4 65 = 1.81291
0 1245.4 = 3.09532

	$1\ 6\ 57.28$	$+10\ 32\ 26.3$
	$+3\ 24.44$	$+20\ 45.4$
$*\ 1889.0$ =	$1\ 10\ 21.72$	$+10\ 53\ 11.7$
ap. Pl. con. =	-1.10	-5.6
ap. Pl. *	$1\ 10\ 20.62$	$+10\ 53\ 6.1$
	$+1\ 28.32$	$+2\ 27.7$
ap. Pl. ∞ =	$1\ 10\ 48.94$	$+10\ 55\ 33.8$

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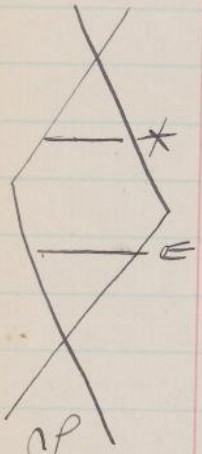
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1889phae.proj..508.

Jan. 2, 1890

Comet d 1889, Brooks, (July 6)



	=	*			
3 52	43.0	53	44.5		
53	16.5	54	20.5		
105	59.5	108	5.0	2 5.5″	1 2.75″
55	8.0	56	8.5		
55	41.0	56	45.9		
110	49.0	112	54.4	2 5.4″	1 2.70″
57	37.0	58	38.0		
58	10.9	59	15.0		
115	47.9	117	53.0	2 5.1″	1 2.55″
0	11.2	1	12.0		
0	45.2	1	49.0		
0	56.4	3	1.0	2 4.6″	1 2.30″
4	45.5	5	46.4		
5	19.8	6	23.0		
10	5.3	12	9.4	2 4.1″	1 2.05″
					2.35
					− 1 2.47″

Mean Sat 3h 580 218.1″
58 21.8″
+1 59.7
4h 0 21.5″
20 3 59.0″
17 56 22.5″
1 18.0″
7 55 4.5 = G. M. T.
4 44 31.0
12 39 35.5 = G. M. T.

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1999phae.proj..508.

$\Delta\delta$	Δx	
33.5″	36.0″	69.5″
33.0″	37.4″	70.4″
33.9″	37.0″	70.9″
34.0″	37.0″	71.0″
34.3″	36.6″	70.9″
3.7		2.7
33.74		70.54″

Log 70.54 = 1.84844″
" 7.5 = 0.87506″
" cos 2 = 9.99165
519.0″ = 2.77515″
880.0″
367.0″ = 6′ 7.0″

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1889phae.proj..508.

June 21. 1890.
Comet d 1889 (Brooks)

Mulet. *	90°			=	1	14	25.61	+11 12 15.8
							− 1.07	− 5.4
ap. Pl. *	=				1	14	24.54″	+11 12 10.4′
						−1	2.47′	−6 7.0′
ap. Pl. ☌	=			=	1	13	22.07″	+11 6 3.4′

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1889phae.proj.508.

Jan. 21, 1890.

App. Place Reduction.

Comet d 1889

$\delta_g = -0.784'$ $\quad G = 11\ 42.9'$ $\quad H = 21\ 59.9'$

$\delta_G = 11\ 42.9'$ $\quad L = 1\ 14.4'$ $\quad L = 1\ 14.4'$

$H = 21\ 59.9'$ $\quad 12\ 57.3'$ $\quad 23\ 14.3'$

$\log g = +0.7087'$

$\log h = +1.3006$; $\quad L = +11\ 12\ 16''$

$\log i = -0.6371'$

$\log 1/15 = 8.8239'$

$\log g = +0.7087'$

$\sin G+L = 9.3937'$

$\tan L = 9.2968'$

$-0.017'' = -8.2251'$

$\log 1/15 = +8.8239'$

$\log h = +1.3006'$

$\sin H+L = 9.2965'$

$\sec L = +0.0084''$

$-0.269' \quad = -9.4294'$

$-0.017''$

$-0.784'$

$-1.070'' =$ cor. in R.A.

$\log g = +0.7087'$

$\cos G+L = 9.9862'$

$-4.95' = -0.6949'$

$\log h = +1.3006'$

$\cos H+L = +9.9918'$

$\sin L = +9.2885'$

$+3.80' = +0.5804'$

$\log i = -0.6371'$

$\cos L = 9.9916'$

$-4.25' = -0.6287''$

$-4.95'$

$-9.20'$

$+3.80'$

$-5.40' =$ cor. in Decn.

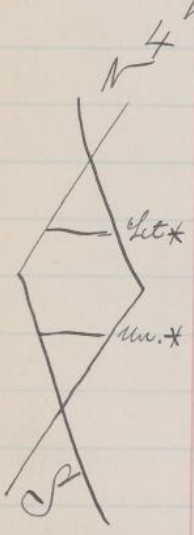
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1889phae.proj..508.

Jan. 21, 1890

Transits to join unlettered star to

Dm. +11° 171 (8.5 K)



Um.*	Let.*				
11 58.4	13 0.5				
12 22.1	13 25.5				
24 20.5	26 26.0	2	5.5	1	2.75
13 57.7	15 0.2				
14 21.7	15 24.6				
28 19.4	30 24.8	2	5.4	1	2.70
16 1.6	17 4.0				
16 25.9	17 28.6				
32 27.5	34 32.6	2	5.1	1	2.55
18 5.0	19 7.7				
18 29.5	19 32.2				
36 34.5	38 39.9	2	5.4	1	2.70
20 7.4	21 10.0				
20 32.0	21 34.5				
40 39.4	42 44.5	2	5.1	1	2.55
22 20.3	23 23.2				
22 44.7	23 47.5				
45 5.0	47 10.7	2	5.7	1	2.85
24 13.5	25 16.4				
24 38.1	25 40.6				
48 51.6	50 57.0	2	5.4	1	2.70
					4.80
				− 1	2.69

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23.7	25.0	48.7
24.0	24.4	48.4
24.3	24.6	48.9
24.5	24.5	49.0
24.6	24.5	49.1
24.4	24.3	48.7
24.6	24.2	48.8

5.6

48.80

Log 48.80 = 1.68842

" 7.5 = 0.87506

" cos d = 9.99142

358.8 = 2.55490

886.0

527.2

− 8 47.2

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1889phae.proj..508.

Jan. 21, 1890

Comet of 1889. Brooks (July 6).

Comp. Mar. = Dm. +11°171 (8.5 K).

W I $1^h 20^s$ = 1^h 12 3.27^s +11° 0 26.4$''$ (1825)

+1 42.38^s +10 19.8$''$

1 13 45.65^s +11 10 46.2$''$

18 26 24.75

25165

Log m/15 = 0.12611

" sin t = 4.50012

" tan ξ = 4.29586

+0.08336 = +8.92209

3.07078

3.14/5 43.4 = 0.49890

65 = 1.81291

205.03^4 = 2.31181 ⊙

Log m = 1.30220

" cos δ = 9.99711

" 65 = 1.81291

123.6.6 = 3.09222

1^h 12 3.27^s +11 0 26.4$''$

+3 25.03^s +20 36.6$''$

+1889.0 = 1 15 28.30^s +11 21 3.0$''$

−1 2.69^s −8 47.2$''$

Mn. +1889.0 = 1 14 25.61^s +11 12 15.8$''$

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1889phae.proj..508.

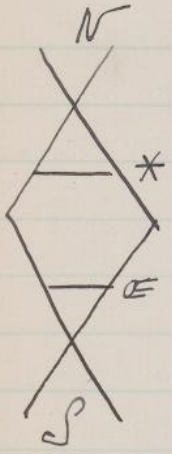
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1889phae.proj..508.

Jan. 22, 1890

Comet d 1889 Brooks (July 6)

	E		*			
4	0	8.6 ✓	0	30.6 ✓		
Rej: true reading wrong.	0	57.2 ✓	1	~~18.4~~		
	1	~~5.8~~	1	49.0	0 43.2	0 ~~24.60~~
	2	57.0 ✓	3	19.4 ✓		
	3	40.0 ✓	4	6.9		
	6	37.0	7	26.3	0 49.3	0 24.65
	10	27.5 ✓	10	48.3 ✓		
	~~11~~	~~48.3~~ 29.5 ✓	~~11~~	~~27~~ ✓		
	21	37.0	22	25.5	0 48.5	0 24.25
	14	0.8 ✓	14	22.4 ✓		
	14	43.3 ✓	15	11.1 ✓		
	28	44.1	29	33.5	0 49.4	0 24.70
	22	58.9 ✓	22	19.0 ✓		
	22	42.0 ✓	23	7.5		
	44	40.9	45	26.5	0 45.6	0 22.80
						0.40
						−0 24.10



Mean 4 sets = 4h	99	159.0 ✓	
	12	~~54.9~~ 2.6 ✓	V.R
	+2	3.5	
	~~4~~	~~58.4~~ 5.9 ✓	
4	14	58.4 ✓	
20	7	55.6	
	~~7~~ 6	~~50.3~~ 2.8 ✓	
8	~~7~~	~~2.8~~	
	~~1~~	19.8 ✓	
	−1	~~43.8~~ 30.8 ✓	
8	5	~~43.8~~	
~~4~~	~~44~~	~~31.0~~	
12	50	14.0 = G.M.T.	

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1889phae.proj..508.

~~Lo~~ ~~A~~ ~~E~~

43.0' 47.5' 90.5'

42.0' 48.9' 90.9'

42.5' 48.7' 91.2'

43.1' 48.5' 91.6'

10.6

42-65

4.2

91.05'

~~Log~~ 91.05 = 1.95928'

" 7.5 = 0.87506'

" cos 2 = 9.99142'

669.5' = 2.82576'

886.0'

216.5' = -3 36.5'

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1889phae.proj..508.

Jan. 22 1890

Comet d 1889, Brooks (July 6)

Comp. Star = Dm. +11° 171 (8.5 K)

W_I $1^h 20^s.8$ = 1^h 12 3.27 +11 0 26.4

For reduction to 1890.0 see p. 140.

1890.0 =	1^h	15	28.30	+11 21	3.0
			-1.07		-5.4
ap. Pl. * =	1	15	27.23	+11 20	57.6
		-0	24.10		-3 36.5
ap. Pl. ∈ =	1	15	3.13	+11 17	21.1

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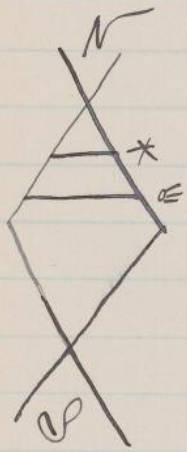
1889phae.proj..508.

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1889phae.proj..508.

Jan. 24 1890

Comet d 1889 Brooks (July 6)



	∈	*			
4	31 8.0	31 57.9			
	31 46.7	32 15.4			
	62 54.7	64 13.3	/	18.6	0 39.30
	33 46.9	34 35.8			
	34 26.0	34 54.0			
	68 12.9	69 29.8	/	16.9	0 38.45
	36 0.0	36 49.0			
	36 38.8	37 6.2			
	72 38.8	73 55.2	/	16.4	0 38.20
	39 50.8	40 39.1			
	40 27.8	40 56.2			
	80 18.6	81 35.3	/	16.7	0 38.35
	45 2.3	45 50.0			
	46 39.5	46 6.8			
	90 41.8	91 56.8	/	15.0	0 37.50
	48 8.5	48 56.0			
	48 45.4	49 12.8			
	96 53.9	98 8.8	/	14.9	0 37.45
	51 12.8	51 59.8			
	51 48.7	52 16.5			
	103 1.5	104 16.3	/	14.8	0 37.40
	56 48.5	57 35.0			
	57 24.5	57 51.5			
	114 13.0	115 26.5	/	13.5	0 36.75
					63.40
					− 0 37.92

685 235.2

Mean 8 sets 4 43 3.4

+2 11.8

4 45 15.2

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1889phae.proj..508.

38.7	17.5	21.2
		~~56.2~~
39.1	18.2	20.9
		~~57.3~~
38.8	17.2	21.6
		~~56.0~~
37.0	17.1	19.9
		~~54.1~~
37.2	16.8	20.4
		~~54.6~~
36.9	16.8	20.1
		~~53.7~~
35.9	16.7	19.2
		~~52.6~~
36.0	16.5	19.5
		~~52.5~~
39.6		~~36.4~~
		~~54.55~~
37.45		2.8
		20.35

4 43 3.4 = mean of 4 times
+2 11.8
4 45 15.2
20 15 48.7
8 29 26.5
1 23.4
8 28 3.1
4 44 31.0
13 12 34.1 = G. M. T. of obs.

~~Log 54.55 = 1.73679~~
~~" 7.5 = 0.87506~~
~~" cos 2 = 9.99087~~
~~400.6 = 2.60272~~
~~- 6 40.6~~

Log 20.35 = 1.30856
" 7.5 = 0.87506
" cos 2 = 9.99087
149.4 = 2.17449
- 2 29.4

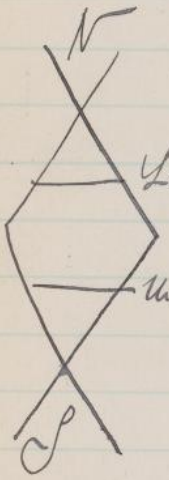
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Jan. 24, 1890

Comet d 1889 (Brooks July 6)

	Unlet *		Let *					
4	60	46.8	59	46.7				
	61	11.4	60	19.9				
	121	58.2	120	5.9	1	52.3	0	56.15



	2	51.5	1	51.5				
	3	16.2	2	34.0				
	6	7.7	4	25.5	1	42.2	0	56.10
	4	56.7	3	56.5				
	5	21.5	4	29.0				
	10	18.2	8	25.5	1	52.7	0	56.35
	7	8.8	6	9.1				
	7	34.0	6	41.5				
	14	42.8	12	50.6	1	52.2	0	56.10
	10	33.0	9	34.0				
	10	58.5	10	5.5				
	21	31.5	19	39.5	1	52.0	0	56.00
	12	53.6	11	54.4				
	13	19.4	12	26.1				
	26	13.0	24	20.5	1	52.5	0	56.25
	15	3.9	14	4.9				
	15	29.6	14	36.3				
	30	33.5	28	41.2	1	52.3	0	56.15
							1.1 0	
							+ 0	56.16

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1889phae.proj..508.

24.6	32.5	57.1
24.7	3 / 42.5	57.2
24.8	32.5	57.3
25.2	32.4	57.6
25.5	31.5	57.0
25.8	31.7	57.5
25.7	31.4	57.1

Log 57.26 = 1.75785
" cos 7.5 = 9.99067
" 7.5 = 0.87506
420.3 = 2.62375
886.0
465.7 = -7 457

57.1 / 1.8
57.26

1889phae.proj..508.

Jan. 24 1890

Comet d 1889 (Brooks (July 6)

Comp. Star = 10.0 mag: not in Dm.

Mn. Comp. ✶ = (1890.0)	1	19	6.94	+11	42	23.9
		−0	37.92		−2	29.4
✶ 1890.0 =	1	18	29.02	+11	39	54.5
Red. to ap. Pl. =			−1.10			−5.54
ap. Pl. ✶ =	1	18	27.92	+11°	39	49.0

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1889phae.proj..508.

Jan. 24 1889

Reduction to app. Place

Comet d 1889 Brooks

$f = -0.764'$ $\quad G = 11\ 50.0'$ $\quad H = 21\ 48.1'$

$\lambda = 11\ 50.0'$ $\quad \lambda = 1\ 18.5'$ $\quad \lambda = 1\ 18.5'$

$H = 21\ 48.1'$ $\quad G+H = 13\ 8.5'$ $\quad H+H = 23\ 6.6'$

$\log g = +0.6966'$

$\log h = +1.2988'$

$\log i = -0.6718'$ $\quad \delta = 11\ 35\ 54'$

$\log 1/15 = +8.8239'$

$\log g = +0.6966'$

$\log \sin G+H = -9.4690'$

$\log \tan \lambda = +9.3121'$

$-0.020'' = -8.30 \times 6'$

$\log 1/15 = +8.8239'$

$\log h = +1.2988'$

$\log \sin H+H = -9.3634'$

$\log \sec \lambda = +0.0098'$

$-0.313' = -9.495 \times'$

$-0.020'$

$-0.764'$

$-1.097' =$ corr. in R.A.

$\log g = +0.6966'$

$\log \cos G+H = -9.9803'$

$-4.75' = -0.6769'$

$\log h = +1.2988'$

$\log \cos H+H = +9.9857'$

$\log \sin \lambda = +9.3032'$

$+3.91' = +0.5977'$

$\log i = -0.6718'$

$\log \cos \lambda = +9.9990'$

$-4.60' = -0.6628'$

$-4.75'$

$-9.35'$

$+3.89'$

$-5.46' =$ corr. in Dec.

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1889phae.proj..508.

Jan. 24 1890

Inlet. Comp. * joined to lettered *

Lettered Star = Dm. +11 176 (9.0 K)

W I $1^h 25^v = 1^h 14^m 45.31^v$ $+11\ 29\ 38.6^v$ (1825)

$+1\ 42.60$ $10\ 17.5$

$1\ 16\ 27.91$ $+11\ 39\ 55.5$

$19\ 6\ 58.65$

Log 4/15 = 0.12611

" sin t = 9.51519

" tan $\frac{1}{2}$ = 9.31485

+0.0904 = +8.95615

3.07078

3.16112 = 0.49984

65 = 1.81291

205.478 2.31275

Log n = 1.30220

" cos d = 9.97536

" 65 = 1.81291

1231.6 = 3.09047

$1\ 14\ 45.31$ $+11\ 29\ 38.0$

$+3\ 25.47$ $+20\ 31.6$

*1890.0 = $1\ 18\ 10.78$ $+11\ 50\ 9.6$

$+0\ 56.16$ $-7\ 45.7$

Mn. *1890.0 = $1\ 19\ 6.94$ $+11\ 42\ 23.9$

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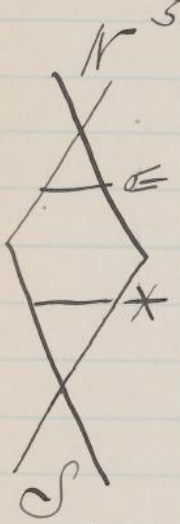
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1889phae.proj..508.

Feb. 11, 1889.

Comet d, 1889, Brooks (July 6)



	E	*			
5h	28 17.9	27 40.8			
	28 48.9	28 4.8			
	57 6.8	55 45.6	1	21.2	40.60
	29 57.0	29 19.0			
	30 27.7	29 43.6			
	60 24.7	59 2.6	1	22.1	41.05
	31 38.3	30 59.3			
	32 7.3	31 23.5			
	63 45.6	62 22.8	1	22.8	41.40
5	4.4				
	37 ~~38.3~~	34 25.3			
	35 33.9	34 50.2			
	70 38.3	69 15.5	1	22.8	41.40
	36 43.2	36 4.0			
	37 11.7	36 27.0			
	73 54.9	72 33.0	1	21.9	40.95
	39 24.4	38 45.2			
	39 53.4	39 9.9			
	79 17.8	77 55.1	1	22.7	41.35
4	35.7				
	4 ~~56.1~~	40 56.1			
	42 4.3	41 21.3			
	83 40.0	82 17.4	1	22.6	41.30
	43 13.4	42 33.2			
	43 40.0	42 58.4			
	86 53.4	85 31.6	1	21.8	40.90

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1889phae.proj..508.

31.0 24.0 55.0

30.7 24.6 55.3

29.0 24.2 53.2

29.5 24.9 54.4

28.5 25.0 53.5

29.0 24.7 53.7

28.6 25.2 53.8

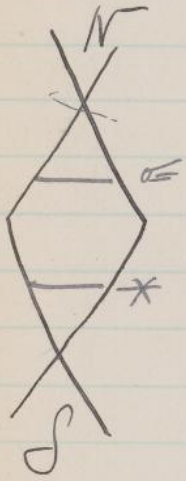
92.9. 29.11 26.6 25.2 51.8

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1889phae.proj..508.

(Continuation of obs on previous pages)

Feb. 11 1890



α	*
44 53.5	44 13.8
45 21.0	44 38.9
90 14.5	88 52.7

1 21.8 0 40.90

46 40.8	45 59.5
47 8.6	46 25.0
93 49.4	92 24.5

1 24.9 0 42.45

1.40

+0 41.14

754 345.4

5h 37 59.3

+3 10.7 (interpolated cor.)

5 41 9.3

21 26 46.7

8h 14 22.6

1 21.0 C

8h 13 1.6 = G. M. T. of obs

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1889phae.proj..508.

Feb. 11, 1890

217.5″ 25.1″ 52.6″

27.8″ 25.5″ 53.3″

36.6″

53.66″

Log. 53.66 = 1.72965″

" 7.5 = 0.87506″

" cos 2 = 9.98534

389.1″ = 2.59005

886.0

496.9″ = + 8′ 16.9″

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1889phae.proj..508.

Feb. 11, 1889

Comet d, 1889 I, Brooks (July 6)

Comp. Star = Dm +14° 302 (8.0 L)

Lalande 3527 =	1h	44	26.26	+14°	21	23.6
	+2	24.90		+13	30.5	
Mid. Pl. =	1	46	51.16	+14	34	54.1
	26	42	47.40			

Log m/s = 0.12614
" sin t = 9.65275
" tan t = 9.41521
+0.1564 = 9.19410
+3.0705
+3.2269 = 0.50879
90 = 1.95424
290.42 = 2.46303

Log m = 1.30223
" cos t = 9.95098
" 90 = 1.95424
1612.3 = 3.20745

	1h	44	26.26	+14	21	23.6
	+4	50.42		+26	52.3	
* 1889.0 =	1	49	16.68	+14	48	15.9
		−1.20			−5.4	
app. Pl. * =	1	49	15.48	+14	48	10.5
		+0	41.14		+8	16.9
app. Pl. ☉ =	1	49	56.62	+14	56	27.4

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1889phae.proj..508.

Feb. 11 1890

Comet d 1889 Brooks (July 6)

Appr. Pl. Reduction

$\delta_0 = -0.629$ $\quad G = 12\ 9.6$ $\quad H = 20\ 35.6$

$\delta = 12\ 9.6$ $\quad l = 1\ 49.3$ $\quad l = 1\ 49.3$

$H = 20\ 35.6$ $\quad 13\ 58.9$ $\quad 22\ 24.9$

$\log g = +0.6125$

$\log h = +1.2871$

$\log i = -0.8157$ $\quad L = +14\ 48\ 16$

$\log 1/15 = +8.8239$

$\log g = +0.6125$

$\log \sin G+l = -9.6953$

$\log \tan L = +9.4221$

$-0.036 = -8.5538$

$\log g = +0.6125$

$\log \cos G+l = -9.9387$

$-3.56 = -0.5512$

$\log 1/15 = +8.8239$

$\log h = +1.2871$

$\log \sin H+l = -9.6054$

$\log \sec L = +0.0147$

$-0.538 = -9.7311$

-0.036

-0.629

$-1.203 =$ cor. in R.A.

$\log h = +1.2871$

$\log \cos H+l = +9.9615$

$\log \sin L = +9.4074$

$+4.53 = +0.6560$

$\log i = -0.8157$

$\log \cos L = +9.9853$

$-6.32 = -0.8010$

-3.56

-9.88

$+4.53$

$-5.35 =$ cor. in Dec.

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1889phae.proj..508.

Feb. 12, 1890.

Comet d, 1889 Brooks July 6

	∈		*	
6	16	59.5	7	17.9
	17	44.3	17	33.4
	14	43.8	14	53.3
	9	49.5	10	1.4
	16	36.2	16	15.5
	20	25.7	20	16.9
	10	56.6	11	8.3
	11	44.4	11	23.8
	22	41.0	22	32.1
	12	41.5	12	53.4
	13	28.8	13	8.6
	26	10.3	26	2.0
	13	53.7	14	6.3
	14	41.5	14	20.4
	28	35.2	28	26.7
	15	9.9	15	22.1
	15	57.5	16	36.4
	31	7.4	30	57.5
	16	21.0	16	34.0
	17	9.1	16	28.5
	33	30.1		2.5

Order wrong.

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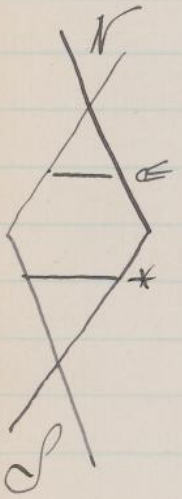
1009phae.proj..508.

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1889phae.proj..508.

Feb. 12 1890.

Comet d, 1889 Brooks July 6



	E	*				
6h	6 59.5	7 17.9				
	7 44.3	7 35.4				
	14 43.8	14 53.3	0	9.5	0	4.75
	10 1.4	9 49.5				
	10 15.5	10 36.2				
	20 16.9	20 25.7	0	8.8	0	4.40
	11 8.3	10 56.6				
	11 23.8	11 44.4				
	22 32.1	22 41.0	0	8.9	0	4.45
	12 53.4	12 41.5				
	13 8.6	13 28.8				
	26 2.0	26 10.3	0	8.3	0	4.15
	13 6.3	13 53.7				
	14 20.4	14 41.5				
	28 26.7	28 35.2	0	8.5	0	4.25
	15 22.1	15 9.9				
	15 36.4	15 57.5				
	30 58.5	31 7.4	0	8.9	0	4.45
	16 34.0	16 21.0				
	16 48.5	17 9.1				
	33 22.5	33 30.1	0	7.6	0	3.80
						2.25
	173 202.5				− 0	4.32
Mean 7 sets = 6	12 35.9	R.A.				

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1889phae.proj..508.

44.8	17.5	62.3
14.1	46.7	60.8
15.5	47.8	63.3
15.2	47.3	62.5
14.1	47.8	61.9
14.3	47.6	61.9
14.5	48.1	62.6

$$\begin{array}{rrr} 6 & 12 & 35.9 \\ & +3 & 14.3 \\ \hline 6 & 15 & 50.2 \\ 21 & 30 & 43.3 \\ \hline 8 & 45 & 6.9 \\ & 1 & 26.0 \\ \hline 8 & 43 & 40.9 = \text{C.m.T.} \end{array}$$

$\log 62.19 = 1.79372$

$\log 11.75 = 0.87506$

$\log \cos \delta = 9.98505$

$450.6 = 2.65383$

886.0

$+435.4 = +7\ 15.4$

7)302.8
43.26

4.5
14.64

15.3
62.19

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1889phae.proj..508.

Feb. 12 1890.

Comet d 1889 Brooks July 6

Comp. Star = DM. +14° 316 Inlet. 9.1

Un. Comp * 1890.0 =	1	51	52.44	✓	+15°	0	2.3	✓
	−	0	4.32	✓		+7	15.4	✓
E 1890.0 =	1	51	48.12		+15	7	17.7	
		−	1.20				−6.3	
ap. Pl. E =	1	51	46.92		+15	7	12.4	

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1999phae.proj..508.

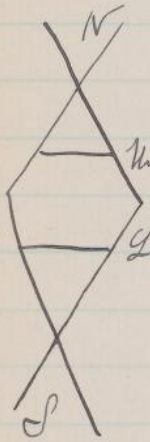
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1889phae.proj..508.

Feb. 12 1890

Transits to join Unlet. Comp Star with

DM. +14 302 (8.0 L)



	Unlet *		Let. *					
6	25	4.1	22	29.0				
	25	17.5	22	40.9				
	50	21.6	45	9.9	5	11.7	2	35.85
	28	23.5	25	48.4				
	28	36.3	26	0.0				
	56	59.8	51	48.4	5	11.4	2	35.70
	31	38.6	29	3.0				
	31	51.2	29	15.3				
	63	29.8	58	18.3	5	11.5	2	35.75
	35	39.2	33	2.7				
	35	51.0	33	15.8				
	71	30.2	66	18.5	5	11.7	2	35.85
	39	3.0	36	26.0				
	39	14.1	36	39.6				
	78	17.1	73	5.6	5	11.5	2	35.75
	42	28.0	39	50.9				
	42	38.9	40	4.7				
	85	6.9	79	55.6	5	11.3	2	35.65
	45	57.4	43	19.5				
	46	7.5	43	33.9				
	92	4.9	86	53.4	5	11.5	2	35.75

5.30

+2 35.76

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1889phae.proj..508.

13.4	11.9	25.3
12.8	11.6	24.4
12.6	12.3	24.9
11.8	13.1	24.9
11.1	13.6	24.7
10.9	13.8	24.7
10.1	14.4	24.5

5.4

24.77

Log 24.77 = 1.39393
" 7.5 = 0.87506
" cos 2 = 9.98534
179.6 = 2.25433

886.0
+706.4 = +11 46.4

1889phae.proj..508.

Feb. 12, 1890.

Comet of 1889 Brooks July 6

Lettered ✕ = Dm. +14 302 (8.0 L)

Lalande 3527 = $1^h\ 44\ 26.26^s$ $+14^\circ\ 21\ 23.6''$ (1800.0)

1890.0 =	1	49	16.68	+14	48	15.9
		+2	35.76		+11	46.4
Un.✕ 1890.0 =	1	51	52.44	+15	0	2.3
			−1.20			−5.3
ap. Pl. Un.✕ =	1	51	51.24	+14	59	57.0

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1009phae.proj.500.

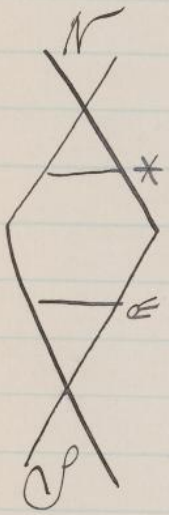
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1889phae.proj--508.

Feb. 15, 1890

Comet d, 1889, Brooks July 6

	≡		*					
6	6	48.9	5	7.4				
	7	24.5	5	57.0				
	14	13.4	11	4.4	3	9.0	1	34.50
	9	33.4	7	50.9				
	10	8.9	8	40.0				
	19	42.3	16	30.9	3	11.4	1	35.70
	12	27.6	10	45.7				
	13	3.4	11	35.0				
	25	31.0	22	20.7	3	10.3	1	35.15
	15	58.4	14	17.8				
	16	34.7	15	5.3				
	32	33.1	29	23.1	3	10.0	1	35.00
	21	35.0	19	53.0				
	22	11.6	20	41.6				
	43	46.6	40	34.6	3	12.0	1	36.00
	25	50.5	24	9.4				
	26	27.6	28	56.9				
	52	18.1	49	6.3	3	11.8	1	35.90
	31	39.6	29	58.0				
	32	17.7	30	45.6				
	63	57.3	60	43.6	3	13.1	1	36.85
								4.10
	248	241.8					+1	35.59
	2 18	0.1						



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1889phae.proj..508.

35.6 49.6 85.2

35.5 49.1 84.6

35.8 49.3 85.1

36.3 47.5 83.8

36.6 48.6 85.2

37.1 47.5 84.6

38.1 47.6 85.7

3.0 7|33.92 6.2

36.43 48.46 84.89

6h 18 0.1

3 25.3

6 21 25.4

21 42 32.9

8 38 52.5

−1 24.5

8 37 28.0 = C.m.T.

4

Log 84.89 = 1.92886

" 7.5 = 0.87506

" cos 2 = 9.98345

612.9 = 2.78737

886.0

273.1 = −4 33.1

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1889phae.proj..508.

Feb. 15 1890

Comet d, 1889 Brooks Study 6

Comp Star = Dm. +15° 294 (9.3 B)

B.B VI +15°294" = 1h 53 44.71" +15° 32 54.7" (1855)

+0 56.86' +5 8.4'

1 54 41.57' +15° 38 3.1"

28 40 23.55'

Log m/15 = 0.12608'

" sin d = 9.68107'

" tan d = 9.44692'

+0.1795' = 9.25407'

3.0710'

+3.2505' = 0.51195'

35 = 1.54407'

113.77' = 2.05602'

Log m = 1.30217'

" cos d = 9.94319'

" 35 = 1.54407'

615.8' = 2.78943'

1 53 44.71" +15 32 54.7"

+1 53.77' +10 15.8"

* 1890.0 = 1 55 38.48' +15 43 10.5'

+1 35.59 −4 83.1

⊜ 1890.0 = 1 57 14.07 +15 38 37.4

−1.20 −5.1

App. Pl. ⊜ = 1 57 12.87 +15 38 32.3

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1889phae.proj..508.

Feb. 15, 1890

Comet d 1889 Brooks July 6

Appr. Place Reduction

$f = -0.578$
$\mathfrak{L} = 12\ 13.9$
$H = 20\ 19.0$
$\log q = +0.5756$
" $h = +1.2846$
" $i = -0.8367$

$\mathfrak{L} = 12\ 13.9$ $H = 20\ 19.0$
$L = 1\ 57.2$ $L = 1\ 57.2$
$14\ 11.1$ $22\ 16.2$

$\Omega = +15\ 37.4$

$\log 1/r = +8.8239$
" $q = +0.5756$
" $\sin \mathfrak{L}+L = -9.7335$
" $\tan L = +9.4472$
$-0.038 = -8.5802$

$\log 1/r = +8.8239$
" $h = +1.2846$
" $\sin H+L = -9.6410$
" $\sec L = +0.0167$
$-0.583 = -9.1716$
-0.038
-0.578
-1.208 = cor. in R.A.

$\log q = +0.5756$
" $\cos \mathfrak{L}+L = -9.9247$
$-3.16 = -0.5003$
-0.5022

$\log h = +1.2846$
" $\cos H+L = +9.9539$
" $\sin L = +9.4328$
$+4.68 = +0.6693$

" $i = -0.8367$
" $\cos L = +9.9836$
$+6.61 = -0.8203$
-3.16
-9.79
$+4.68$
-5.11 = cor. in Dec.

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1889phae.proj..508.

Feb. 29, 1890

Comet d, 1889 Brooks July 6

	α		*					
6	29	56.4	28	32.0				
	30	39.2	29	0.4				
	60	35.6	57	32.4	3	3.2	1	31.60
	32	33.7	31	9.4				
	33	17.3	31	38.6				
α	65	51.0	62	48.0	3	3.0	1	31.50
	35	13.4	33	48.0				
	35	57.3	34	16.9				
	71	10.7	68	4.9	3	5.8	1	32.90
	43	24.7	41	59.9				
	43	59.8	42	19.7				
	87	24.5	84	19.6	3	4.9	1	32.45
	47	47.3	46	22.4				
	48	23.6	46	43.4				
	96	10.9	93	5.8	3	5.1	1	32.55
								1.00
							+ 1	32.20



Mean Data: 6h 38 7.3 A.R.

37.9 132.7

+343.2

6 41 50.5

22 2 15.7

8 39 34.8

1 25.1

8 38 9.7 = C. M. T. of obs.

*

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1889phae.proj..508.

4
32.8 28.4 14.4

43.6 29.2 14.4

43.9 28.9 15.0

35.1 19.8 15.3

36.3 21.0 15.3

201.7 ~~+.7~~ 127.3 4.4
40.34 25.46 14.88

Log 14.88 = 1.172606
" 7.5 = 0.875061
" cos 23 = 9.981791
107.0 = 2.029458
+1 47.0

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1889phae.proj..508.

Feb 20, 1890

Comet d, 1889, Brooks July 6

Comp ✳ = Dec. +16° 24' 9".3 Unlct.

Unlct Comp ✳ 1890.0 =	2	4	51, $\overset{2}{8}$5	+16	28	25.2,
			+1	32.20"			+1	47.0
✳ 1890.0 =	2	6	23.54 5	+16	30	12.2
			− 1.23			−4.9
Ap. Pl. ✳ =	2	6	22.3 2	+16	30	7.3
			2			

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1889phae.proj..508.

Feb. 20 1890

Comet Brooks 1889 d July 6

$f = -0.5417$
$\mathfrak{Y} = 12\ 33.3'$
$\mathfrak{H} = 19\ 58.0'$
$\log q = +0.5505'$
$\log h = +1.2817'$
$\log i = -0.8587'$

$\mathfrak{Y} = 12\ 33.3'$ $\quad \mathfrak{H} = 19\ 58.0'$
$\alpha = 2\ 6.4'$ $\quad \alpha = 2\ 6.4'$
$14\ 39.7'$ $\quad 22\ 4.4'$

$\Delta = +16^\circ\ 30\ 12''$

$\log \frac{1}{15} = +8.8239'$
$\log q = +0.5505'$
$\log \sin(\mathfrak{Y} + \alpha) = -9.8074'$
$\log \tan^2 = +9.4717'$
$-0.045' = -8.6535'$

$\log \frac{1}{15} = +8.8239'$
$\log h = +1.2817'$
$\log \sin(\mathfrak{H} + \alpha) = -9.6842'$
$\log \sec \Delta = +0.0183'$
$-0.643' = -9.8081'$
$-0.541'$
$-0.045'$
$-1.229' =$ cor. in R.a.

$\log q = +0.5505'$
$\log \cos(\mathfrak{H} + \alpha) = -9.8848'$
$-2.72' = -0.4353'$

$\log h = +1.2817'$
$\log \cos(\mathfrak{H} + \alpha) = +9.9422'$
$\log \sin \Delta = +9.4534'$
$+4.76' = +0.6773'$

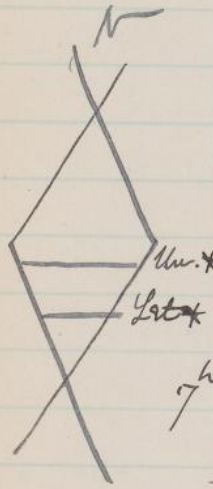
$\log i = -0.8587'$
$\log \cos \Delta = +9.9817'$
$-6.92' = -0.8404'$
$-2.72'$
$-9.64'$
$+4.76'$
$-4.88' =$ cor. in Dec.

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1889phae.proj..508.

Feb. 2, 1890

Transits to join Dm. +16°249 Unlet. to Dm. +16°255 8.9 K



	Unlet.*		Let X					
6	56	9.0	59	14.1				
	56	59.2	59	29.0				
	113	82."	118	43.1"	5	34.9"	2	47.45"
	59	57.0	63	2.5				
	60	47.8	63	17.6				
	120	45.8"	126	20.1"	5	34.3"	2	47.65"
		4						
7h	3	53.0	6	58.5				
	4	44.5	7	14.5				
	8	37.5"	14	13.0"	5	35.5"	2	47.75"
	7	53.7	10	58.5				
	8	45.8	11	14.8				
	16	39.5"	22	13.3"	5	33.8"	2	46.90"
	12	24.0	15	29.5				
	13	14.2	15	44.0				
	25	38.2"	31	13.5"	5	35.3"	2	47.65"

1.90 240"

− 2. 47.38"

4

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1889phae.proj..508.

50.2″ 14.9′ 35.3′

50.8″ 15.1″ 35.1″

51.5″ 16.0″ 35.5′

52.1″ 16.3″ 35.8″

50.2″ 14.5″ 35.1″

30

35.′60″

Log 3560′ = 1.55145″

" 7.5 = 0.87506″

" cos δ = 9.98195

256.1′ = 2.40846″

+4 16.1′

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1889phae.proj..508.

Feb. 20. 1890.

Reduction of place of star used with Comet d.

Let. * = Dm. +16° 2 55 8.9 K.

W 2ʰ 2ᵐ 12ˢ.4 = 2ʰ 4ᵐ 5.92ˢ +16° 5′ 37.3″ 1825
+1 46.21ˢ +9 18.1″
2 5 52.13ˢ +16 14 56.0″
31 28 1.95″
3.00

log u/5 = 0.12611ˢ
" sin d = 9.71767ⁿ
" tan d = +9.46457″
+0.2034ˢ = +9.308355.
+3.0707ⁿ
+3.27741ᵈ = 0.51509ᵈ
65 = 1.81291ᵈ
212.8ᵈ = 2.32800ˢ.0

log u = 1.30220ˢ
" cos d = 9.93092″
" 65 = 1.81291ˢ
1111.8ˢ = 3.04603″

2ʰ 4ᵐ 5.92ˢ.7 +16° 5′ 37.3″
+3 32.81ˢ.7 +18 31.8″
2 7 38.73 +16 24 9.1″
−2 47.88 +4 16.1
2 4 51.85ˢ +16 28 25.2″
2

*1890.0

Mn. *1890.0

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1889phae.proj..508.

Feb. 21. 1890.

Comet d 1889 (Brooks July 6.)



	E	*		
7	13 20.5 ✓	13 29.7 ✓		
	14 1.4 ✓	13 57.0 ✓		
	27 21.9	27 26.7	0 4.8	0 2.40
	17 12.2 ✓	17 22.9 ✓		
	17 57.3 ✓	17 42.9 ✓		
	35 6.5	35 11.8	0 5.3	0 2.65
	14 14.9 ✓	14 25.0 ✓		
	14 57.8 (2) ✓	14 51.5 ✓		
	37 12.7	37 16.5	0 3.8	0 1.90
	20 23.4	20 32.3		
	21 5.3	20 54.9		
	41 28.7	41 31.2	0 2.5	0 1.25
	22 31.4 ✓	22 39.7 ✓		
	23 12.0 ✓	23 6.4 ✓		
	45 43.4	45 46.1	0 2.7	0 1.35
	23 36.9 ✓	23 49.0 ✓		
	24 16.5 ✓	24 13.4 ✓		
	47 55.4	47 58.4	0 3.0	0 1.50

5.05.

− 0 1.84

Mean bets = 7^h 19 34.0 G.M.T.

+3 46.5

7^h 23 20.5

22 6 12.8

9 17 8.2

232 16 8.6

9 17 8.2

1 31.3

9 15 36.9 = C. M. T. of obs.

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1999phae.proj..500.

40.9 27.3 68.2

42.1 26.0 68.1

42.9 26.5 69.4

41.9 26.6 68.5

40.6 26.7 67.3

41.6 28.4 70.0

18.0 6/161.5 ✓ 51.5

41.69 ✓ 26.92 ✓ 68.58

log 68.58 = 1.83620

" 7.5 = 0.87506

" cos 2 = 9.99159

493.0 = 2.69285

886.6

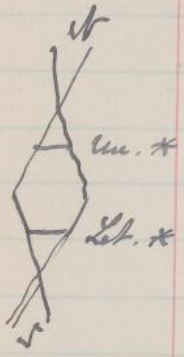
393.0 = +6 33.0

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1889phae.proj..508.

Feb. 21. 1890.

Transits to connect unlettered with lettered star.



	Un. *	Let. *		
7	29 36.K ✓	29 1.6 ✓		
	30 2.7 ✓	29 17.5 ✓		
	59 39.1	58 19.1	/ 20.0	0 40.00
	31 31.5 ✓	30 56.1 ✓		
	31 57.K ✓	31 12.5 ✓		
	63 28.9	62 8.6	/ 20.3	0 40.15
	32 52.0 ✓	32 22.5 ✓		
	33 23.2 ✓	32 39.1 ✓		
	66 21.8	65 1.6	/ 20.2	0 40.10
	3K 29.6 ✓	33 53.5 ✓		
	3K 5K.9 ✓	3K 10.9 ✓		
	69 24.5	68 4.4	/ 20.1	0 40.05
	36 23.5 ✓	35 K7.0 ✓		
	36 KA.K ✓	36 K.9 ✓		
	73 11.9	71 51.9	/ 20.0	0 40.00
	3L 10.K ✓	37 33.7 ✓		
	3L 3K.2 ✓	37 52 ✓		
	76 44.6	75 24.4	/ 20.2	0 40.10
	39 36.7 ✓	3L 59.0 ✓		
	K0 0.1 ✓	39 17.K ✓		
	79 36.8	78 16.4	/ 20.4	0 40.20

0.60
+0 40.09

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1890phae.proj.508.

26.3	15.9	42.2
25.9	16.4	42.3
25.8	16.6	42.4
25.3	17.4	42.7
24.9	17.9	42.8
23.8	18.0	41.8
23.4	18.4	41.8

2.0

42.29

log 42.29 = 1.62624

" 7.5 = 0.87506

" cos 2 — 9.98195

304.3 = 2.48325

886.0

581.7 + 9 41.7

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1889phae.proj..508.

Feb 2 1890

Comet a 1889 Brooks July 6

Lettered * = Dm. +16° 255 (8.9 K)
= same as on Feb. 2c

Lett * 1890.0 =	2	7	38.73	s	+16°	24	9.1	"
		+0	40.09			+9	41.7	'
Wm. * 1890.0 =	2	8	18.82	'	+16	33	50.8	'
∈ − * =		−0	1.84	'		+6	33.0	'
∈ 1890.0 =	2	8	16.98	'	+16	40	23.8	'
		−	1.24	'			−4.8	'
ap. Pl. ∈ =	2	8	15.74	'	+16	40	19.0	'

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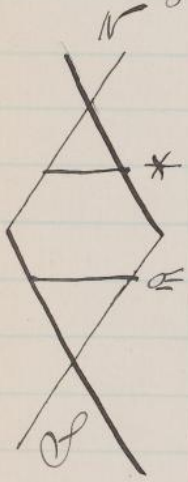
1999phae.proj..508.

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1889phae.proj..508.

Mar. 17 1890

Comet d 1889 (Brooks July 6)



	α	*			
8	11 36.5	12 34.4			
	12 3.3	12 49.0			
	23 39.8	25 23.4	1	43.6	0 51.80
	13 27.4	14 25.2			
	13 56.2	14 39.7			
	27 23.6	29 4.9	1	41.3	0 50.65
	29 6.4	30 6.0			
	29 38.2	30 17.2			
	58 44.6	60 23.2	1	38.6	0 49.30
	32 39.9	33 41.4			
	33 13.2	33 50.4			
	65 53.1	67 31.8	1	38.7	0 49.35
	35 24.0	36 26.4			
	35 58.0	36 34.9			
	71 22.0	73 1.3	1	39.3	0 49.65
					250.75 ✓
					− 0 50.150

Mean Ratio

	244 183.1	
8h	24 42.3	VR
	+5 7.7	
8	29 50.0	
23	40 49.5	
8h	49 0.5	
	1 26.7	
8	47 33.8 = G.M.T.	

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1999phao.proj.508.

26.8	14.6	41.4
28.8	14.5	43.3
31.8	11.2	43.0
33.3	9.0	42.3
34.0	~~8.5~~	42.5

~~[illegible]~~
~~[illegible]~~
~~174.7~~
~~174.7~~ ✓
30.94 ✓

$\sqrt{57.8}$ ✓
11.56 ✓

2.5
42.50

log 42.50 = 1.62839
" 7.5 = 0.87506
" cos 2 = 9.99130

298.4 = 2.47475

886.0
−587.6 = −9 47.6

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1889phae.proj..508.

Mar. 17 1890

Brooks July 6 1889 Comet d

Comp. ☉ = 9m. +20° 48' 9.0 K

W 2 2h 126 = 2h 50 38.83 ↙ +1 50.63 ↙ = 2 52 29.46 ↙ 5.9 ↙ ; +20 20 19.1 ↙ (1825) +7 59.4 ↙ = +20 28 18.5 ↙ 17.8

43 7 21.90 ↙ 23.85

Log m/15 = +0.12611 ↙
" sin d = +9.83478 ↙
" tan L = +9.57208 ↙
+0.3412 ↙ = +9.53297 ↙
+3.0707.8
+3.411290 = 0.53306
65 = 1.81291 ↙
221.778 = 2.34591 2 ↙

Log m = 1.30220 ↙
" cos d = 9.86334 5
" 65 = 1.81291 ↙
951.6' = 2.97845

	2 50 38.83	+20 20 19.1
	+3 41.77	+15 51.6
☉ 1890.0 =	2 54 20.60	+20 36 10.7
	−1.36	−4.0
ap. Pl. ☉ =	2 54 19.24	+20 36 6.7
	−0 50.175	−9 47.6
ap. Pl. ☉ =	2 53 29.069	+20 26 19.1

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1889phae.proj.508

Mar. 17 1890

Appr. Pl. Reduction for Comet d 1889

$f = -0.379$ ' "

$\log g = 13\ 20.4$ ' "

$H = 18\ 10.5$ ' "

$\log g = +0.4168$ ' "

" $h = +1.2732$ ' "

" $i = -0.9101$ ' "

$G = 13\ 20.4$ ' "

$\alpha = 2\ 54.3$ ' "

$16\ 14.7$ ' "

$H = 18\ 10.5$ ' "

$\alpha = 2\ 54.3$ ' "

$21\ 4.8$ ' "

$\alpha = +20\ 36\ 11$ "

$\log 1/5 = +8.8239$ "

" $g = +0.4168$ "

" $\sin G+d = -9.9524$ "

" $\tan L = +9.5751$ "

-0.059 ' $= -8.7682$ "

$\log 1/5 = +8.8239$ "

" $h = +1.2732$ "

" $\sin H+d = -9.8402$ "

" $\sec L = +0.0287$ "

-0.925 ' $= -9.9660$ "

-0.379 "

-0.059 "

-1.363 ' = cor. in R.a.

$\log g = +0.4168$ "

" $\cos G+d = -9.6468$ "

-1.16 ' $= -0.0636$ '

$\log h = +1.2732$ "

" $\cos H+d = +9.8584$ "

" $\sin L = +9.5464$ "

$+4.76$ ' $= +0.6780$ '

$\log i = -0.9101$ "

" $\cos L = +9.9713$ "

-7.61 ' $= -0.8814$ "

-1.16 "

-8.77 "

$+4.76$ "

-4.01 = cor. in Dec.

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1889phae.proj..508.

Mar. 18 1890

Comet d 1889 Brooks July 6

	∝	*	∝ − *	∝ − * / 2
8	24 5 0.5	23 59.4		
	25 38.0	24 28.2		
	50 38.5 ✓	48 27.6	2 10.9	1 5.45
	27 7.4	26 6.4		
	27 46.2	26 3 55		
	54 53.6	52 ~~41~~ 1.9	2 ~~21~~ 1.7	1 ~~5.85~~ 0.85
	29 17.3	28 16.2		
	29 57.4	28 45.0		
	59 14.7	57 1.2	2 13.5	1 6.75
	31 35.0	30 33.0		
	32 12.4	31 1.0		
	63 47.4	61 34.0	2 13.4	1 6.70
	35 26.6	34 23.0		
	36 2.9	34 50.0		
	71 29.5	69 13.0	2 16.5	1 8.25
	37 59.8	36 57.4		
	38 35.4	37 23.0		
	76 35.2	74 20.4	2 14.8	1 7.40
				40.40
				+1 6.73

37 3 21 ~~5.9~~ 6 ✓

8h 31 ~~18.5~~ 23.2 ✓

+5 11.4

8 36 ~~29.1~~ 34.6 ✓

23 44 46.1

8 51 ~~43.8~~ 43.8

8 51 ~~43.8~~ 43.8 ✓

−1 27.1

8 50 ~~16.7~~ 16.7 ✓

C.M.T. of obs

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1000phae.proj.508.

$\Delta\alpha$	$\Delta\delta$	$\alpha - \delta$
37.5"	28.8"	8.7"
38.8"	2 × 9.1"	9.7"
40.1"	28.8"	11.3"
37.4"	28.0"	9.4"
36.3"	27.0"	9.3"
35.6"	25.8"	10.0"

$6\overline{)45.7}$ → 37,62 ✓

$6\overline{)167.3}$ → 27.88 ✓

58.4" → 9.73"

$\log 9.73 = 0.98811$

$\log 7.5 = 0.87506$

$\log \cos \delta = 9.97130$

$-68.3" = 1.83447$

$-1'\ 8.3"$

1889phae.proj..508.

Mar. 18, 1890

Comet d 1889, Brooks July 6

Comp. Star = Dm. +20° 488 9.0 K

W_2 2^h 1260 = 2^h 50 38.83 ✓ +20 20 19.1 ✓ (1825.0)

✱1890.0 =	2 54 20.60		+20 36 10.7
	+1 6.73		−1 8.3
✠1890.0 =	2 55 27.33		+20 35 2.4
	−1.38		−4.0
App. Pl. ✠ =	2 55 25.95		+20 34 58.4

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1899phae.proj..508.

Mar. 18 1890

Opp. Place Reduction for Comet d

$f = -0.375^{7}$
$g = 13\ 25.0^{7}$
$H = 18\ 6.2^{7}$
$\log g = +0.4154^{7}$
$\log h = +1.2732^{7}$
$\log i = -0.9103^{7}$

$G = 13\ 25.0^{7}$
$\delta = 2\ 54\ 3^{7}$
$1.5\ 37.3^{7}$

$H = 18\ 6.2^{7}$
$\delta = 2\ 54\ 3^{7}$
$20\ 15.5^{7}$

$\Delta = +2036\ 11^{7}$

$\log g = +0.4154^{7}$
$\log 1/15 = +8.8239^{7}$
$\log \sin(G+\delta) = -9.9056^{7}$
$\log \tan \delta = +9.5751^{7}$
$-0.052^{7} = -8.7800^{1}$

$\log h = +1.2732^{7}$
$\log 1/15 = +8.8239^{7}$
$\log \sin(H+\delta) = -9.9192^{7}$
$\log \sec \delta = +0.0287^{7}$
0.943^{7}
$-1.112^{7} = -0.0816^{3}$
-0.052^{7}
-0.375^{7}
-1.518^{7} = cor. in R.A.

$\log g = +0.4154^{7}$
$\log \cos(G+\delta) = -9.7737^{7}$
$-1.55^{7} = -0.1891^{7}$

$\log h = +1.2732^{7}$
$\log \cos(H+\delta) = +9.7462^{7}$
$\log \sin \delta = +9.5464^{7}$
$+3.68^{7} = +0.5658^{7}$

$\log i = -0.9103^{7}$
$\log \cos \delta = +9.9713^{7}$
$-7.61^{7} = -0.8816$
-1.55
-9.72^{7}
$+3.68$
-5.48^{7} = cor. in Dec.
4.04^{7}

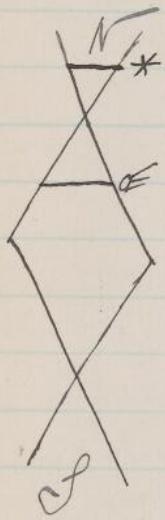
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1889phae.proj..508.

Mar. 21 1890

Comet a 1890 f Brooks Iwm. 19 24.

	∈	∗	∈ − ∗	$\frac{∈ - ∗}{2}$
16	46 4.8	45 35.		
	46 38.6	45 44.1		



∈	∗			
47 39.3	47 3.7			
48 6.4	47 17.8			
95 45.7	94 21.5	1	24.2	0 42.10
49 15.2	48 39.2			
49 42.0	48 53.3			
98 57.2	97 32.5	1	24.7	0 42.35
50 36.2	50 1.4			
51 4.2	50 ~~5.0~~ 1.0			
101 40.4	100 16.4	1	~~34.0~~ 24.0	0 42.00
52 12.0	51 36.2			
52 39.1	51 50.1			
104 51.1	103 26.3	1	24.8	0 42.40
53 37.5	53 1.3			
54 4.5	53 15.5			
107 42.0	106 16.8	1	25.2	0 42.60
55 2.7	54 27.0			
55 28.8	54 40.6			
110 31.5	109 7.6	1	23.9	0 41.95
~~57 5.7~~	~~55 50.3~~			1.40
57 52.7	56 3.8			+ 0 42.23
114 58.4	111 54.1			~~4.3~~

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1999phae.proj..500.

Δ α	Δ δ	
27.1″	14.1″	41.2″
26.8″	14.1″	40.9″
28.0″	13.6″	41.6″
27.1″	13.9″	41.0″
27.0″	14.2″	41.2″
26.1″	13.6″	39.7″

$6\overline{)162.1}$ = 27.02 ✓ $\quad 6\overline{)83.5}$ = 13.92 ✓ $\quad 5.6 \times 40.93$ ✓

16 51 37.3 ✓
+5 21.0 ✓
16 56 58.3 ✓
23 56 35.8 ✓
17 0 22.5 ✓
−2 47.2 ✓
16 57 35.3 = C.M.T. ✓
+4 44 31.
21 42 6. Gr. m. s.

log 40.93 = 1.61204 ✓
" 7.5 = 0.87506 ✓
" cos δ = 9.99724 ✓
305.0 = 2.48434 ✓

−5 5.0 ✓

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1889phae.proj..508.

Mar. 21 1890

Comet a, 1890, (Brooks) (Mar 19)

Comp. Star = Dm. +6° 4779 (8.5 K)

W_I 21h 132 = 21 5 40.22 +6 14 56.8
+1 36.52 +7 52.2
21 7 16.74 +6 22 49.0
316 49 11.10

Log m/15 = +0.12611
" sin α = −9.83525
" tan α = +9.04852
−0.1023 = −9.00988
+3.0707
2.96845 = 0.47252
65 = 1.81291
192.945 = 2.28543 ⊙

Log m = 1.30220
" cos α = +9.86285
" δ = 1.81291
950.5 = 2.97796

*1825.0 = 21 5 40.22 +6 14 56.8
+3 12.94 15 50.5
*1890.0 = 21 8 53.16 +6 30 47.3
−1.26 −12.0
21 8 51.90 +6 30 35.3
+0 42.23 −5 5.0
Ap. pl. = 21 9 34.13 +6 25 30.3

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1999phae.proj..508.

Mar. 21 1890

$f = -0.371''$
$\mathcal{G} = 13\ 29.8''$
$H = 17\ 53.2''$
$\log g = +0.4149''$
$\log h = +1.2732''$
$\log i = -0.9103''$

$\mathcal{G} = 13\ 29.8''$
$+ \quad 21\ 8.9''$
$34\ 38.7''$
24
$10\ 38.7''$

$H = 17\ 53.2''$
$+ \quad 21\ 8.9''$
$39\ 2.1''$
24
$15\ 2.1''$

$\Delta = +6^\circ\ 30\ 47''$

$\log 1/15 = +8.8239''$
$\log g = +0.4149''$
$\log \sin \mathcal{G}+\Delta = +9.5407''$
$\log \tan \Delta = +9.0575''$
$+0.007'' = +7.837^0''$

$\log 1/15 = +8.8239''$
$\log h = +1.2732''$
$\log \sin H+\Delta = -9.8534''$
$\log \sec \Delta = +0.0028''$
$-0.898'' = -9.9533''$
$-0.371''$
$-1.269''$
$+0.007''$
$-1.262'' =$ cor in R.A.

$\log g = +0.4149''$
$\log \cos \mathcal{G}+\Delta = -9.9721''$
$-2.44'' = -0.3870''$

$\log h = +1.2732''$
$\log \cos H+\Delta = -9.8455''$
$\log \sin \Delta = +9.0547''$
$-1.49'' = -0.1734''$

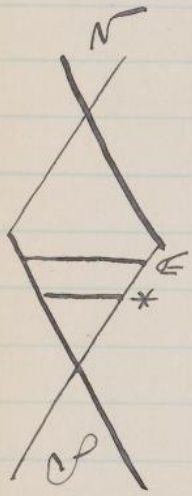
$\log i = -0.9103''$
$\log \cos \Delta = +9.9972''$
$-8.08'' = -0.9075''$
$-2.44''$
$-1.49''$ ✓
$-12.01 =$ cor. in Dec.

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1889phae.proj..508.

Mar. 24, 1890

Comet a 1890 (Brooks-Mar 19)



		E		*		
16	55	32.6	54	10.3		
	56	17.0	54	45.5		
	111	49.6	108	55.8	2 53.8	1 26.90
	58	11.4	56	49.3		
	58	55.8	57	24.5		
	117	7.2	114	13.8	2 53.4	1 26.70
	60	41.3	59	18.4		
	61	25.7	59	53.6		
	122	7.0	119	12.0	2 55.0	1 27.50
17	3	18.0	1	55.4		
	4	2.4	2	30.3		
	7	20.4	4	25.7	2 54.7	1 27.35
	5	48.7	4	26.8		
	6	33.4	5	1.8		
	12	22.1	9	28.6	2 53.5	1 26.75
	10	56.0	9	34.3		
	16	40.5	10	8.4		
	22	36.5	19	42.7	2 53.8	1 26.90
						0.10
	751	142.8	16	59 52.3		+1 27.02
	17	2 46.9		2 47.1		
		+5 30.8	16	57 5.2 = G.M.T. of obs.		
	17	8 17.7		4 44 31		
	0	8 25.4				
	16	59 52.3		21 41 36. Sun's L.		

Mean Astr. R

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44.4″ 35.2″ 9.2″

44.4″ 35.2″ 9.2″

44.4″ 35.2″ 9.2″

44.4″ 34.9″ 9.5″

44.7″ 35.0″ 9.7″

log. 9.53 = 0.97909″
" 7.5 = 0.87506
" cos α = 9.99612″
70.8″ = 1.85027″
+ 1 10.8″

44.5″ 34.1″ 10.4″

6 | 2.8 ~~44.18~~ 44.47 ✓

6) 209.6 ✓ 34.93 ✓

3.2″
9.53″

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Mar. 24 1890

Comet a (Brooks) Mar 19) 1890

Comp. Star = DM. +7° 4649 8.3K

W I 21h 12s =	21h 5 32.84″	+7° 23 24.4″ (1825)
	+1 35.88	+7 51.9
	21 7 8.72″	+7 31 16.3″
	316 47 10.80	

Log m/15 = +0.12611
" sin ∠ = −9.83552
" tan ∠ = +9.12066
−0.1209″ = −9.08229″
+3.0707
2.9498″ = 0.46976″
65 = 1.81291″
191.73″ = 2.28270″

Log m = 1.30220″
" cos ∠ = +9.86261″
" 65 = 1.81291″
950.0″ = 2.97772″

	21 5 32.84″	+7 23 24.4″
	+3 11.73	+15 50.0″
✳1890.0	21 8 44.57″	+7 39 14.4″
	+1 27.02	+1 10.8
⊙1890.0	21 10 11.59″	+7 40 25.2
	−1.21	−12.2
ap. Pl. ⊙ =	21 10 10.38	+7 40 13.0″

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May 24 1890

Approx Place Reduction for Comet a 1890

$f = -0.361^{7}$ $\quad G = 13\ 25.2^{7}$ $\quad H = 17\ 40.3$

$g = 13\ 25.2^{7}$ $\quad \lambda = 21\ 10.2^{7}$ $\quad \lambda = 21\ 10.2^{7}$

$h = 17\ 40.3^{7}$ $\quad 34\ 35.4^{7}$ $\quad 38\ 50.5^{7}$

$\log g = +0.3983^{7}$ $\quad 24$ $\quad 24$

$\log h = +1.2734^{7}$ $\quad 10\ 35.4^{7}$ $\quad 14\ 50.5^{7}$

$\log i = -0.9092^{7}$ $\quad \Delta = +7\ 40\ 25^{7}$

$\log 1/\Delta = +8.8239^{7}$

$\log g = +0.3983^{7}$

$\log \sin G+\lambda = +9.5572^{7}$

$\log \tan \Delta = +9.1295^{7}$

$+0.008^{7} = +7.9089^{7}$

$\log g = +0.3983^{7}$

$\log \cos G+\lambda = -9.9697^{7}$

$-2.33^{7} = -0.3680^{7}$

$\log 1/\Delta = +8.8239^{7}$

$\log h = +1.2734^{7}$

$\log \sin H+\lambda = -9.8307^{7}$

$\log \sec \Delta = +0.0039^{7}$

$-0.855^{7} = -9.9319^{7}$

-0.361^{7}

-1.216^{7}

$+0.008^{7}$

-1.208^{7} = cor in R.A.

$\log h = +1.2734^{7}$

$\log \cos H+\lambda = -9.8668^{7}$

$\log \sin \Delta = +9.1256^{7}$

$-1.84^{7} = -0.2658^{7}$

$\log i = -0.9092^{7}$

$\log \cos \Delta = +9.9961^{7}$

$-8.04^{7} = -0.9053^{7}$

-2.33^{7}

-1.84^{7}

-12.21^{7} = cor. in Dec.

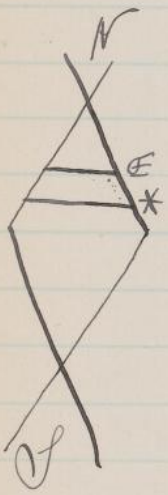
N.B. α & δ of Comet used in above —

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204 Mar. 24 Object supposed to be Comet d.

Comp. with Ephm. shows that it is not Comet d.



		E		*				
9	10	10.0	8	38.3				
	10	29.5	9	24.0				
	20	39.5	18	2.3	2	37.2	1	18.60
	12	26.3	10	54.9				
	12	43.5	11	39.6				
	25	9.8	22	34.3	2	35.5	1	17.75
								0.35
							+1	18.18

See Record B. 54, page 97

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19.5 45.7 26.2

17.2 44.9 $\frac{27.7}{13.9}$

$= 26.95$

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Mar. 24 1890

Comp-⊙ Star = Dm +21° 422 8.8 Unlet

Dm. place = 3h 4 23.2 +21° 20.5 (1855)

Obj. taken for ☉ turns out to be a star.

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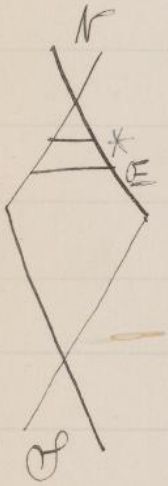
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Mar. 30, 1890

Comet a, 1890 (Brooks Mar 19)

	E	*			
16	33 31.3	32 52.3			
	33 52.4	33 10.9			
	67 23.5	66 3.2	1	20.3	0 40.15
	35 32.2	34 53.0			
	35 53.5	35 12.3			
	71 25.7	70 5.3	1	20.4	0 40.20
	37 47.4	37 7.3			
	38 8.6	37 26.5			
	75 56.0	74 33.8	1	22.2	0 41.10
	39 13.0	38 33.7			
	39 34.0	38 52.8			
	78 47.0	77 26.5	1	20.5	0 40.25
	40 44.1	40 5.0			
	41 5.2	40 24.4			
	81 49.3	80 29.4	1	19.9	0 39.95
	372 201.5				1.65
Means Ests 16	37 32.2				+ 0 40.33



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$\Delta\alpha$ $\Delta\delta$ $\Delta\alpha - \delta$

21.3 18.6 2.7

16 37 32.2
+5 50.3
16 43 22.5
-2 44 4.7
16 40 38.1 G.M.T.

21.3 19.3 2.0

16 11 17.8
-2 39.1
16 8 38.7 = G.M.T.
4 44 31.
20 3 10, Gr. M.T.

21.2 19.2 2.0

$\log .206 = 0.31387$
$\log 7.5 = 0.87506$
$\log \cos \delta = 9.99290$
$\log 152.7 = 1.18183$

21.0
.8
21.20

19.1
36.2
19.05

1.9 = 0 15.2

21.1
.9
21.2

19.4
19.1

1.7
0.3
2.06

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Mar. 30 1890

Comet a, 1890 (Brooks Mar. 19)

Comp. Star. = DM. +10° 4496 (8.0 K)

W ½ 21h 17m	=	21h 7	9.58	+10	4	21.1
		+1	34.48		+7	55.4
		21	8	44.04	+10	12	16.5	1825
		317	11	0.60				

Log 11/5	=	0.12611	
" sin δ	=	-9.83229	
" tan δ	=	-9.25530	
-0.1636	=	-9.21370	
+3.0707			
2.9071	=	0.46346	
65.	=	1.81291	
188.96	=	2.27637	⊙

		21h 7	9.56	+10	4	21.1
		+3	8.96	+15		56.2
*189.0.0.		21	10	18.52	+10	20	17.3
			-1.05				-12.7
ap. Pl. *	=	21	10	17.47	+10	20	4.6
		+0		40.33	-0		15.2
ap. Pl.	=	21	10	57.80	+10	19	49.4

Log n	=	1.30220	
" cos δ	=	+9.86542	
" 65.	=	1.81291	
956.2	=	2.98053	

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1889phae.proj..508.

Mar. 30 1890

Appr. Pl. Computation for Comet a 1890

$f = -0.305'$
$G = 13\ 42.7'$
$H = 17\ 14.5'$
$\log g = +0.3404'$
$\log h = +1.2744'$
$\log i = -0.9033'$

$G = 13\ 42.7'$
$\alpha = 21\ 10.3'$
$34\ 53.0'$
24
$10\ 53.0'$

$H = 17\ 14.5'$
$\alpha = 21\ 10.3'$
$38\ 24.8'$
24
$14\ 24.8'$

$\delta = +10\ 20\ 17''$

$\log 115 = +8.8239'$
$\log \sin G+\alpha = +9.4597'$
$\log g = +0.3404'$
$\log \tan \delta = +9.2611'$
$+0.008' = +7.8851'$

$\log 115 = +8.8239'$
$\log h = +1.2744'$
$\log \sin H+\alpha = +9.7713'$
$\log \sec \delta = 0.0071'$
$-0.753' = -9.8767'$
$-0.305'$
$-1.058'$
$+0.008'$
$-1.050' =$ cor. in R.a.

$\log g = +0.3404'$
$\log \tan G+\alpha = -9.9812'$
$-2.10' = -0.3216'$

$\log h = +1.2744'$
$\log \cos H+\alpha = -9.9069'$
$\log \sin \delta = +9.2540'$
$-2.72' = -0.4353'$

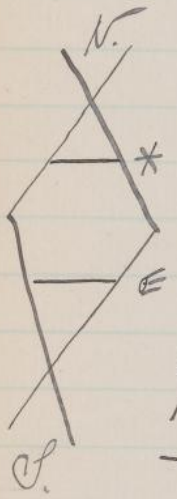
$\log i = -0.9033'$
$\log \cos \delta = +9.9929'$
$-7.87' = -0.8962'$
$-2.10'$
$-2.72'$
$-12.69' =$ cor. in Dec.

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Aug. 15 1890

Comet d 1889 Brooks July 6



	d		*					
	36	30.5″	36	43.1″				
	37	23.9″	37	2.8″				
	73	54.4	73	45.9	0	8.5	0 4.25	
							+ 0 4.25	

9 ~~8~~ 36 57.2

\+

1 35 9.6

~~Nat = d~~

Nat = d. 1889.

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53.4′ 19.7′ 73.1′

Log 73.1 = 1.86392
" 7.5 = 0.87506
" cos δ = 9.96025

500.3 = 2.69923
886.0

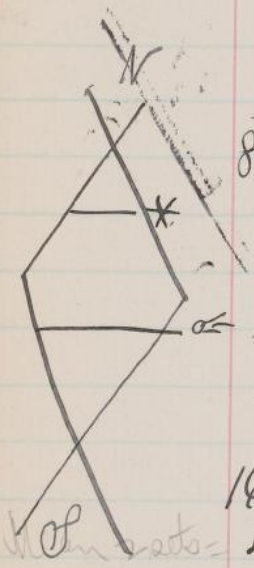
385.7 = − 6′ 25.7″

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Apr. 15, 1890

Object supposed to be Comet of 1889



	α		δ				
	40	49.8	41	34.6			
	41	35.0	41	53.9			
	82	24.8	83	27.9	1	3.1	0 31.55
	42	17.3	42	56.1			
	42	57.1	43	21.1			
	85	14.4	86	17.2	1	28	0 31.40
							− 0 31.48
	167	39.2					
Comets =	41	54.8					

Object turns out not to be the Comet.

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45.2 19.9 65.1

39.8 25.0 64.8

9.9

67.95

Log 64.95 = 1.812 58

N 7.5 = 0.875 08

" cos L 9.960 62

444.9 = 2.648 26

8860

441.1 = −7 21.1

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Apr. 15, 1890

Comp. Star = Dm. +24° 599 (6.8 K)

Dm. +24° 599 = 3^h 48 46.4 +24 4.0

W_2 3^h 1060 = 3^h 46 59.22 ✓ 23 56 45.5 ✓
+1 55.90 +5 57.5
3 48 55.12 +23° 2 44 0
57 13 46.80 32.7
47.70

Log 11/15 = 0.12611
" sin α = +9.92471
" tan δ = +9.64879
+0.5064 = 9.69934
3.0707
+3.5771 = 0.55281
65 = 1.81291
232.42 = 2.36572

Log n = 1.30220
" cos α = 9.92471
" 65 = 1.81291
705.4 = 2.84853

3^h 46 59.22 23 56 45.5
+3 52.18 +11 45.6
* 1890.0 = 3^h 50 51.40 +24 8 31.1
−1.47 −3.0
App. Pl. * = 3 50 49.93 +24 8 28.1
+0 4.25 −6 25.7
3 50 54.18 +24 2 2.4

3 50

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Apr. 15, 1890

Appr. Place Red. for Comet of 1889

$f = -0.205'$
$g = 14\ 27.6'$
$H = 16\ 7.3'$
$\log g = +0.2174'$
$\log h = +1.2809'$
$\log i = -0.8636'$

$G = 14\ 27.6'$
$L = 3\ 50.9'$
$18\ 18.5'$

$H = 16\ 7.3'$
$L = 3\ 50.9'$
$19\ 58.2'$

$\Delta = +24\ 8\ 3'$

$\log 1/15 = +8.8239'$
$\quad g = +0.2174'$
$\quad \sin G+L = -9.9986'$
$\quad \tan \Delta = 9.6513'$
$-0.050' = -8.6912'$

$\log 1/15 = +8.8239'$
$\quad h = +1.2809'$
$\quad \sin H+L = -9.9395'$
$\quad \sec \Delta = +0.0397'$
$-1.213' = -0.0840'$
$-0.050'$
$-0.205'$
$-1.468' = \text{corr}^{n}\ \text{in R.A.}$

$\log g = +0.2174'$
$\quad \cos G+L = +8.9064$
$+0.13' \quad = +9.1238'$

$\log h = +1.2809'$
$\quad \cos H+L = +9.6930'$
$\quad \sin \Delta = +9.6116'$
$+3.85' = +0.5855'$

$\log i = -0.8636'$
$\quad \cos \Delta = -9.9603'$
$-6.67' = -0.8239'$
$-0.13'$
$-6.80'$
$+3.85'$
$-2.95'$

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.nasaphae.proj.508.

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