COMET III. 1892 (HOLMES).

The history of this unique comet, which was discovered by Mr. Edwin Holmes on the 6th of November, 1892, consists entirely, so far as regards its first apparition, of two sudden outbursts with gradual fading afterwards. The former of these must have occurred immediately preceding its discovery. In its normal condition the comet was doubtless too faint to be visible at all, unless with the most powerful telescopes, and it was only the outbursts that rendered it visible. As it faded it expanded, and the second outburst, no doubt, took place in the same spot as the first.

By the time the second outburst took place, the comet had expanded into a very feeble extension which became like a tail to this outburst.

1892, 11 mo. 12. 9.45. (38) & (4). Observed the comet in consequence of having to-day received an Edinburgh circular announcing its discovery. I cannot certainly say the comet is not round. (See fig. 33 for position.)

11 mo. 14. 14.20. (80). Fig. 34 shows the comet. It is a singular object, a great part of it being unusually uniform in brightness, fading very rapidly at the edge, especially in the *np* quarter. There is a concentration of light in the middle in the form of a long band; near the extremities of which are two brighter spots, d and e, the *p* one being much the brighter. They may both be stars, though they give somewhat the impression of being nuclei. The *p* one has a stellar appearance. The *f* one is so faint, *i. e.* so little brighter than the band, that I cannot tell whether it is stellar or not, nor can I locate it exactly with reference to the star f. The edge of the comet is at c, g, and $\frac{1}{4}$ (b, h). h is a bright star $\frac{3}{14}$ diameter of field, or 10′, due *s* of d. It is also due *s* of b; c is rather nearer d than b is. I cannot say that the comet's outline is not a perfect circle described about the middle of the bright band; but the indefiniteness of the whole *sf* edge, as compared with the *np*, makes it impossible to say. On 1894, 2 mo. 1. 9.50, with powers 38, 50, and 80, I saw nothing in the place of the spots of light in the bar.

14·40. (38). Comet's edge at c: a little beyond g: and $\frac{1}{3}$ (b, h). It is much within k.

11 mo. 16. 10.0. (20, 38, 80). Fig. 35 shows the comet. The bright bar in the middle is not so definite as on the 14th, but it is elongated into a distinct tail, or at least the central part of the tail—for there is a very feeble extension on each side making the whole width of the tail equal to that of the comet. q′ (the speck drawn midway between s′ and p′) is evidently a star. There is an indefinite concentration of light, r′, at the *p* end of the bar; it is $\frac{1}{8}$ as far off q′ as s′ is, and *p* the line q′s′; I take it to be the nucleus. It is but little brighter than the neighbouring part of the bar, in which I suspect other concentrations, but they may be stars. The *sf* end of the bar is indefinite, as it melts gradually into the tail. The *p* and *np* edge of the comet is much the most definite. There is no material difference in the position of the margin of the head with (20), (38) and (80); but the tail's outline is much less plain with (80) than with the other powers. The head reaches to p′, $\frac{5}{11}$ (r′ t′), and rather beyond s′ and n′. The tail reaches at least as far as m′. The bar and the axis of the tail for most of its length are parallel with n′ m′ l′; but I am not sure whether it does not bend towards m′ towards the end. I cannot say the head (exclusive of the bar) is not round, though the figure does not show it so.

11.40. (38) & (20). Nebula in Andromeda white, but comet pale blue. The nucleus of the nebula is much brighter than the comet's, and the nebula is wider than the comet; but a much larger area of the comet is bright than of the nebula.

11 mo. 17. 9.45. (38). Very little change in the comet. The nucleus, though still indefinite, is much plainer, not being near any star as it was last night.

11 mo. 24. 11.35. n. e. Comet not distinguishable from a star.

11 mo. 26. 13.35. (4). Comet mainly a disc whose diameter = 14′; but it seems to extend indefinitely further *f* and *nf*, without a distinct tail.

11 mo. 29. 10.25. (38). Comet not easily seen in the moonlight, though the atmospheric absorption is only normal. It is very diffuse and indefinite; longest from *p* to *f*. It is rather more definite towards *n* than on other sides. Very little concentration; there is nothing like a nucleus, nor the core seen on the 16th.

(20). Comet rather plainer, but much as with (38).

15.0. (38). The moonlight having gone, comet is much better seen, and is conspicuous. Its edge is much more indefinite than on the 16th; it is most definite nearest the nucleus, namely, at position angle 290°. The core shown in fig. 35 still exists, but is very indefinite, and broader, forming a broad tail, but the tail is narrower than the head.

15.10. (20). Comet much as with (38).

15.30. With the miniature spectroscope on the telescope. I can make nothing out of the spectrum.

12 mo. 11. 8.10. (4). Comet very large, much elongated to *sf*, thus forming a faint, though very plain, broad tail in that direction. It is impossible to locate the central point of the head, it is so diffuse, especially longitudinally. Not very clear.

8.25. Comet not easily visible to naked eye.

10.20. (4). Fig. 36 shows the comet. Its tail is parallel with c′ β Andromedæ. Comet is much smaller than the great nebula in Andromeda, which is roughly drawn in figure.

12 mo. 12. 11.43. (38). Comet very diffuse and indistinct.

11.45. (20). It is much plainer, but still very diffuse, entirely without the definite outline it had before. The brightest part is towards the *np* part of the head, as before; but it is impossible to specify the exact place. There is still something like the core of fig. 35, but extremely diffuse.

Off Galicia. 12 mo. 19. 8.52. (4). Comet's tail points nearly towards β Andromedæ; and extends more than half way from its brightest part to that star. There are two or three brightish stars near or in it.

Lisbon. 12 mo. 23. 10.25. (4). Fig. 37 roughly shows the position of the comet, or what I take to be it.

(4) out of focus. I judge the comet's brightness to be about equal to a, but I cannot put (4) nearly enough out of focus to make a good comparison, as that would include other stars with a.

Puerto Orotava, Tenerife. 1 mo. 6. 9.20. (4). Fig. 38 shows the comet as far as I can see it; but it is in such a rich region that the only part I can make out is the *s* side, which is rather definite. I am not sure that all the concentrations of light in it are not stars; but c looks rather hazy.

1 mo. 8. 9.28. (4). I see a hazy patch as shown in fig. 39, which I believe to be the comet.

1 mo. 10. 11.40. (4). Comet seen as hazy patch, though it is possible part or whole of this patch is either nebulous wisps or faint stars. (See fig. 40.)

Icod de los Vinos. 1 mo. 12. 9.40. (4). I can see something about the position of the brightest portion of the hazy patch seen on the 10th; but it is not now nearly so bright, so that must have been partly, I presume mainly, Comet Holmes.

Puerto Orotava. 1 mo. 13. 9.50. (4). Fig. 41 shows the comet. l is a star.

There is a very faint spot about the position of the brightest part of the comet as seen on the 10th, but it bears quite an insignificant proportion to the light of the comet as then described.

I did not make any careful observation of the comet on 1 mo. 14 or 15, though I believe I looked for it on those nights without seeing anything particular. On the 16th, the date of the second outburst, I did not make any exact observation, but I saw the new nucleus, which I took for a star, about 9.55. (See fig. 42.)

On the 17th I again took the nucleus for a star, n. I was only certain of the nebulosity at some distance from this, though I suspected its extension as far as n.

1 mo. 20. 9.30. (4). It is obvious the comet is increasing remarkably in brightness, which I was somewhat suspicious of on the 17th. It consists of a slightly nebulous stellar nucleus, with a very faint tail. See fig. 43.

1 mo. 21. about 9.30. With a small telescope, aperture about 1 inch, power about 12, comet is a definite nucleus with round nebulosity, gradually and uniformly fading away from it. No moonlight. See fig. 44.

(4). The nucleus is rather indefinite.

10.50. (4) out of focus. The comet's head decidedly brighter than r or p, so it must be brighter than on 17th.

1 mo. 22. 11.42. (4). No moonlight. The haziness round the nucleus very decided; brightest to *n f*, forming a short bushy tail.

Santa Cruz de Tenerife. 1 mo. 24. 8.55. With telescope, aperture $2\frac{1}{4}$ inches, there is no definite nucleus, but the light is very much concentrated in one part. See fig. 45.

Tangier. 2 mo. 4. 7.52. Fig. 46 shows the comet, not quite right side up. I am not sure that the tail extends as far as it is drawn, or whether there may not be a faint star where I have drawn the end, so causing the appearance. It certainly extends to B.

2 mo. 5. 9.27. (4). Being not so clear as last night, comet is not so distinct, which is probably the reason. I cannot see any lengthened tail.

Off Gibraltar. 2 mo. 7. 8.12. (4). Fig. 46 shows the comet. The nucleus is in a line with $\frac{1}{2}$ (DE) and F; so is the axis of the tail, which is very indefinite. I think there is a star in the axis. I believe there is a very faint star about where the extremity of the tail was on the 4th.

Granada, Spain. 2 mo. 9. 8.30. (4). Comet very indefinite. Sky very clear. See fig. 47.

Sunderland. 3 mo. 6. 7.45. (38). Comet *very* faint. See fig. 48. There are one or two very faint stars in its middle, but I do not think any of them is a nucleus. The circle marks the part that seems the brightest. a is one of a very coarse triple star. About 12′ *n* of a there is a small hazy resolvable patch, but I doubt its containing any true nebulosity; probably it is entirely a very small cluster.

TABLE III.

Place. 1.	Date. 2.	Time. 3.	Power. 4.	Extension from nucleus. 5.	Length. 6.	Breadth. 7.	Position-angle of axis. 8.	Notes and Hindrances. 9.
	1892.	h. m.						
Sunderland	11 mo. 12	9.40	38	About 6′	Abt. 12′	Abt. 12′		
,,	,, 14	14.20	80	5′	9¾′	9⅓′	130°	Measurements are made from middle point of bright bar in centre of comet.
,,	,, 16	10.0	20, 38, 80	22′	24½′	11½′	140°	
,,	,, 26	13.35	4	..	..	14′		
,,	,, 29	10.25	38	..	18′	14′	90°	Moonlight.
,,	,, ,,	,,	20	..	22′	17′	..	,,
,,	,, ,,	15.0	38	5′	29′	16′	Abt. 110°	No moonlight now.
,,	12 mo. 11	8.10	4	..	45′	21′	..	Not very clear.
,,	,, ,,	10.20	4	56′	68′	30′	83°	
,,	,, 12	11.45	20	..	55′	19′		
Off Galicia	,, 19	8.52	4	Abt. 60′	..	..	Abt. 80°	
Lisbon	,, 23	10.25	4	..	Abt. 43′	Abt. 26′	Abt. 70°*	Very rough observation.
	1893.							
Puerto Orotava, Tenerife.	1 mo. 6*	9.20	4	50′*	55′[a]	13′	77°*	[a] Probably *sp* part was stars.
,, ,,	,, 8*†	9.28	,,	15′*	15½′	8′	72°*	
,, ,,	,, 10†	11.40	,,	16′[b], 27′*	26′	16½′	93°*	[b] Measured from a slight concentration far from the position of the nucleus.
,, ,,	,, 13*	9.50	,,	25′*	30′	12′	82°*	
,, ,,	,, 17†	10.25	,,	33′*	17′	15′	91°*	
,, ,,	,, ,,	,,	,,	..	33′?	..	..	Suspected to this length.
,, ,,	,, 20	9.30	,,	36′	36′	10′	87°	
		About						[on the 20th.
,, ,,	,, 21	9 30	,,	30′	30′	..	Abt. 80′	Not quite parallel with the direction
,, ,,	,, ,,	,,	,,	..	52′?	..	..	Believed to be seen to this distance.
,, ,,	,, 22	9.50	,,	..	Short	..	Abt. 45°	Very rough observation.
La Laguna, Tenerife	,, 23	9.29	,,	..	..	..	40°?	Suspected moonlight.
Santa Cruz de Tenerife	,, 24	8.55	2¼-inch telescope	6′	7′	4′	50°	Moonlight.
Tangier	2 mo. 4	7.52	4	31′	32′	9′	42°	
Off Gibraltar	,, 7	8.12	,,	22′	24′	9½′	33°	
Granada	,, 9	8.30	,,	40′	46′	22′	40°	
Sunderland	3 mo. 6	7.45	38	3¾′	7½′	3′	95°	Sky not quite clear.
,,	,, 9	9.50	,,	8′	16′	8′	95°	[been a nebulosity.
,,	,, 16	8.50	,,	7′	12′	7′	87°	Apparent length 14′, but 2′ may have

(20). The nebulosity I take to be the comet is not so well seen, though larger.

(4). There is a very faint nebulosity reaching most of the way from BD + 34° 500 to 17 Persei, but probably it is mainly a stream of stars, and perhaps none of it the comet. Sky not quite clear.

3 mo. 9. 9.50. (38). Fig. 49 shows the comet. There are several very faint objects near the middle of the comet, but I cannot say whether any are part of it and not stars. There is no nebulosity now in the place where it is drawn in fig. 48.

10.0. (4). I cannot see the comet.

10.20. (38). The little cluster mentioned on 3 mo. 6 is visible.

3 mo. 16. 8.50. (38). Comet *very* faint, and almost shapeless (see fig. 50). There are numerous very faint stars in it.

9.5. (4). Comet invisible—at any rate the part about the cross in fig. 50. I can just see a hazy spot near there, which is c and the nebulosity about it, but I cannot trace it to b.

(38). It is impossible to make any measurement of its light, but I should judge the total light equal to an $11\frac{1}{2}$ Magnitude Star, H.P. scale.

4 mo. 3. 8.45. (38), (20), (4). Cannot see the comet. It should be about 1° *s p* the star in Proctor's Atlas at R.A. 58°, Decl. + 37°. Sky rather light, probably with the zodiacal light, which, together with the lower altitude, would probably render the comet invisible, if of the same brightness as on the 16th.

In figs. 51 and 52, which are traced from the B.D. maps, the cross denotes the position of the comet, at the times I observed it on the days mentioned, according to observed positions at Greenwich, &c. The small circle denotes the position of the nucleus according to my drawings, the straight line the observed direction of the tail, the curves showing its outline.

DIMENSIONS.

Table III. gives my observations of the dimensions of this comet as published in the 'Journal of the British Astronomical Association,' further particulars being added. It is similar to Table I. for Comet Barnard (p. 56), with the exception that there is an additional column, namely column 5, which gives the longest radius of the comet, measured from the nucleus.

In the cases marked * there was no nucleus, or concentration of light, visible; but the comet was merely an extremely faint and tolerably uniform patch of light. Measures marked * in columns 5 and 8 are from the calculated positions of the nucleus as given by other observers. In the cases marked † this position was outside the nebulous patch observed by me as the comet.

The fluctuations in the dimensions of the comet were, no doubt, chiefly due to the variations in transparency of the atmosphere, and to the degree of vacancy of the part of the sky in which the comet was situated.

TABLE IV.

Place. 1.	Date. 2.	Time. 3.	Power. 4.	Object compared. 5.	Magnitude. 6.	Authority. 7.	Comet's mag. 8.	Remarks. 9.
	1892.	h. m.						
Sunderland....	11 mo. 12	9.45	n. e.	μ.	3·92	H. P.	4·83	Decidedly $<\mu$ or ν; about = nebula. Clouds prevent good comparison.
				ν.	4·42	„		
				Nebula in Andromeda.	4·83	T. W. B.		
			4	a′=B.D.+39° 5174.	6·67	E. C. P.	..	>a′.
	13	9.55	n. e.	Nebula in Andromeda.	4·83	T. W. B.	4·99	Slightly < nebula.
			4	„ „	4·83	„	4·99	Thin cloud.
	14	6.25	n. e.; 4	„ „	4·83	„	5·11	3 or 4 steps < neb. Step assumed = ·08 mag. Considerably uncertain through cloud.
	14	13.45	n. e.	„ „	4·83	„	5·53	Nebula $\bar{4}\,\rho\,\bar{3}$ (32 comet) $\bar{2}$ 23.
				ρ Andromedæ.	5·27	H. P.		
				32 „	5·57	T. W. B.		
				23 „ (including comes).	5·68	H. P.		
		15.22	4	Nebula in Andromeda.	..	....	..	=central part of nebula.
	16	6.50	n. e.	„ „	4·83	T. W. B.	5·47	Nebula $\bar{3}\cdot\bar{5}\,\rho\,\bar{3}\cdot\bar{5}\,32\,\bar{1}$ comet $\bar{3}\cdot\bar{5}$ 23. Rather foggy, but it has not much effect at this altitude.
				ρ Andromedæ.	5·27	H. P.		
				32 „	5·57	T. W. B.		
				23 „ (including comes).	5·68	H. P.		
		6.55	4 o. f.	32 „	5·57	T. W. B.	5·64	$32\,\bar{2}$ comet $\bar{1}$ 23. Very much out of focus.
				23 „ (including comes).	5·68	H. P.		
		11.40	20.38	Nebula in Andromeda.	..	....	..	Nucleus of nebula much brighter than comet's.
	24	11.35	n. e.	32 Andromedæ.	5·57	T. W. B.	6·11	Rather < 32 Andromeda.
	29	10.25	20	Nebula in Andromeda.	4·83	„	..	Nebula far > comet.

Place. 1.	Date. 2.	Time. 3.	Power. 4.	Object compared. 5.	Magnitude. 6.	Authority. 7.	Comet's mag. 8.	Remarks. 9.
	1892.	h. m.						
	12 mo. 11	8.25	n. e.	w′.	6·84	T. W. B.	6·96	w′ $\bar{1}\cdot\bar{5}$ comet.
			4 o. f.	w′.	6·84	,,	7·02	w′ $\bar{1}\cdot\bar{5}$ comet $\bar{1}\cdot\bar{5}$ d′.
				d′.	7·20	,,		
Lisbon	23	10.25	4 o. f.	a=B.D.+33° 167.	8·4	,,	9·30	About = a. Not a good comparison.
	1893.						8·87	=e. Very rough.
Puerto Orotava, Tenerife.	1 mo. 10	11.40	4	e ,, +33° 193.	8·87	,,	*7·56*	*nucleus* = p.
	17	10.25	4 o. f.	p ,, +33° 246.	7·56	,,	*6·90*	q $\bar{3}$ *comet's head* $\bar{2}$ s $\bar{8}$ p $\bar{2}$ r.
	20	9.35	4 o. f.	q ,, +32° 258.	6·51	,,		
				s ,, +34° 270.	7·27	H. A. vol. xxiv.		
				p ,, +33° 246.	7·56	T. W. B.		
				r ,, +33° 252.	7·57	E. C. P.		
	21	8.10	4 o. f.	q ,, +32° 258.	6·51	T. W. B.	*6·96*	q $\bar{1}$ t $\bar{5}$ *comet's head* $\bar{2}\cdot\bar{5}$ s $2\cdot5$ u $\bar{6}$ r. Very slight moonlight.
				t ,, +33° 259.	6·67	E. C. P.		
				s ,, +34° 270.	7·27	H. A. vol. xxiv.		
				u ,, +34° 272.	7·30	E. C. P.		
				r ,, +33° 252.	7·57	,,		
		10.50	4 o. f.	p ,, +33° 246.	7·56	T. W. B.	*About 7·0*	r = p. The *comet's head* decidedly brighter.
				r ,, +33° 352.	7·57	E. C. P.		
	22	9.50	4 o. f.	t ,, +33° 259.	6·67	,,	7·06	(tv) $\bar{8}$ comet $\bar{3}$ s $\bar{4}$ w. Moonlight and hazy.
				x=H.P. 240.	6·67	H. P.		
				s=B.D.+34° 270.	7·27	H. A. vol. xxiv.		
				w ,, +34° 272.	7·30	E. C. P.		
La Laguna	23	9.32	4 o. f.	s ,, +34° 270.	7·27	H. A. vol. xxiv.	7·30	s $3\cdot\bar{5}$ (comet u).
				u ,, +34° 272.	7·30	E. C. P.		
Santa Cruz de Tenerife.	24	8.55	4	.....	..	.. ..	..	Comet about same brightness as on 23rd, but did not observe exactly.
Atlantic Ocean	26	..	4	.....	..	....	..	Much as on 24th, but moonlight prevents exact observation.
Tangier	2 mo. 4	7.52	4 o. f.	r=B.D.+33° 252.	7·57	E. C. P.	*7·91*	r $\bar{6}$ *comet's head* $\bar{1}$ r.
				F ,, +33° 328.	7·97	,,		
Gibraltar	10	9.21	4 o. f.	D ,, +33° 330.	7·65	,,	*7·65*	*head* = D.
Sunderland	3 mo. 16	9. 5	38	.....	..	....	11·5	Equals a. $11\frac{1}{2}$ Mag. Star, H. P. scale.

BRIGHTNESS.

Table IV. gives the observed brightness of the whole comet, measured in terms of the stellar magnitude to which the total light of the comet was equal; but in the cases printed in italics the observation refers to the nucleus or head only, as stated in the remarks.

Columns 1 to 4 are the same as in Table III., except that in column 4 the letters o. f. denote "out of focus"; column 5 gives the objects I have compared the comet with, the letters being the designations given to them in the plates. Column 6 gives their magnitudes according to the authority in column 7.

In column 7, H. P. denotes that the magnitude is taken from the Harvard Photometry; H. A., from the Harvard Annals; E. C. P. that the magnitude was photometrically observed at Harvard College Observatory and supplied by Professor E. C. Pickering; T. W. B. that the magnitude was computed from observations made by myself.

Column 8 gives the magnitude of the comet (or its head or nucleus, if so stated in column 9), as calculated from observations given in the last column.

Column 9 gives remarks, together with comparisons made with stars, &c. The signs >, < are used to denote "brighter than," "fainter than."

DRAWINGS.

The following remarks refer to the drawings of Comet Holmes, pages 85–95 :—

Fig. 34. Comet much more distinct than shown, having a more definite circular outline, and the band being rather more definite.

Fig. 35. Head fades rather more gradually to the edges than shown, and its outline, apart from the bar, should be more definitely circular. The bar is not distinct enough beyond the head.

Fig. 36. Comet drawn too rectangular and too definite.

Fig. 38. Comet drawn too dark, except on left side.

Fig. 40. Too definite a concentration shown in the centre.

Fig. 41. Lower right-hand edge made too definite.

Fig. 44. Drawn too definite, and rather too large.

Fig. 46. There should not be any extra shading shown about B.

Fig. 47. Comet more indefinite than shown.

h = n′ in Figs. 35 & 51.

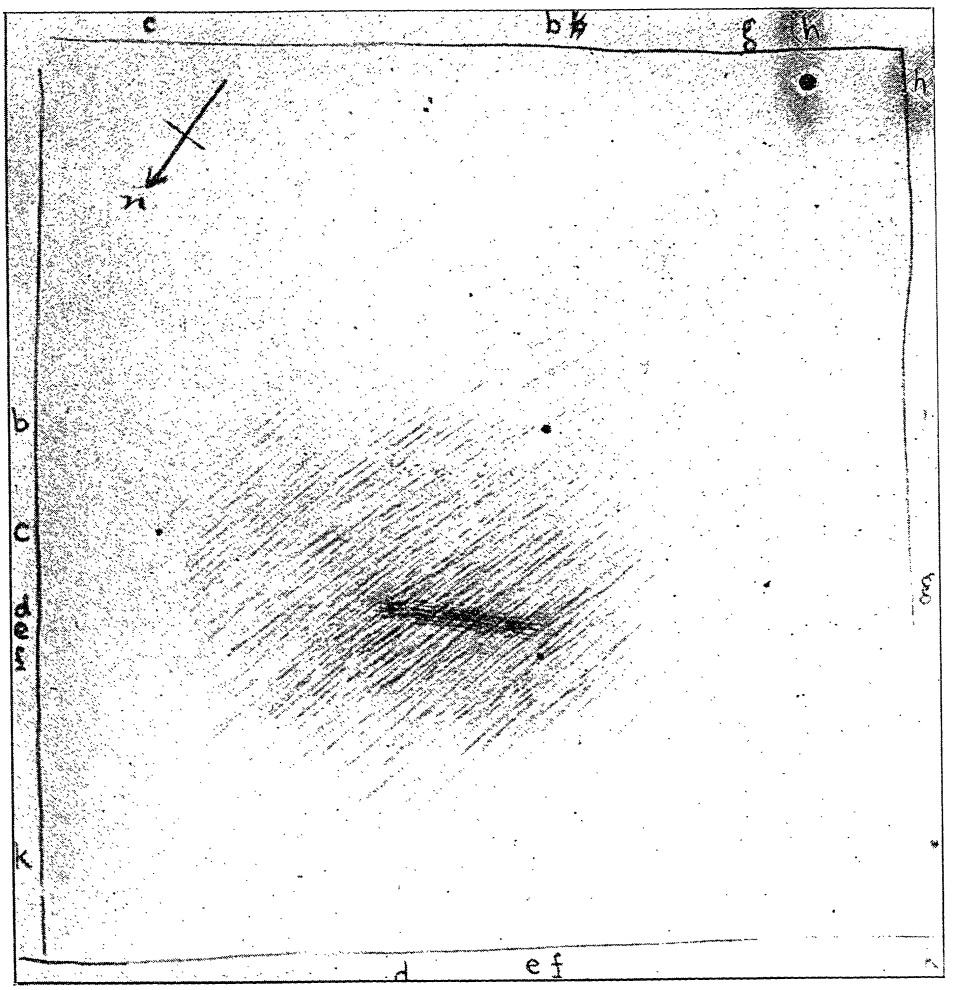

Fig. 34. (See p. 84.)
1892, 11 mo. 14, $14^h\ 20^m$, power 80.

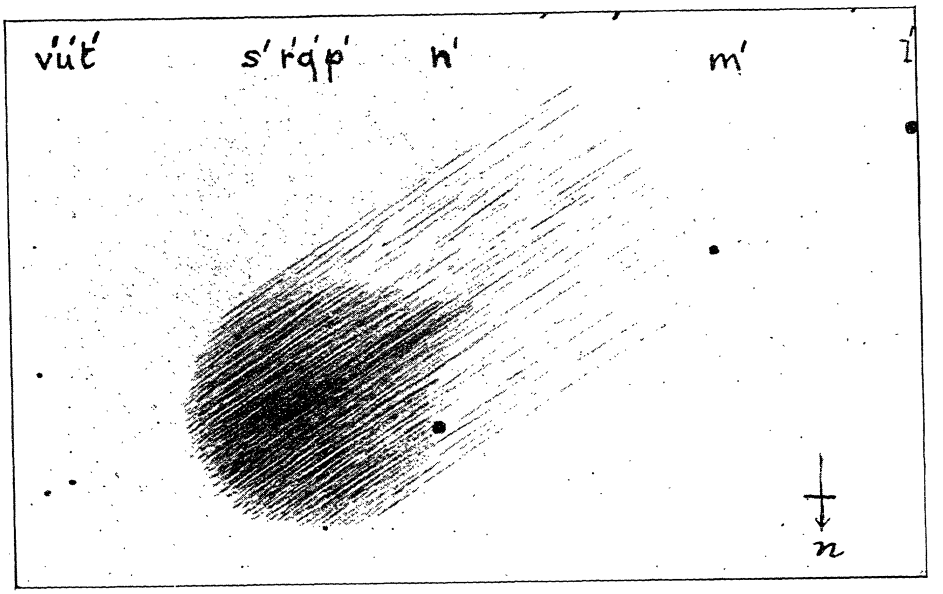

Fig. 35. (See p. 84)

1892, 11 mo. 16, $10^h\ 0^m$, powers 20, 38, 80.

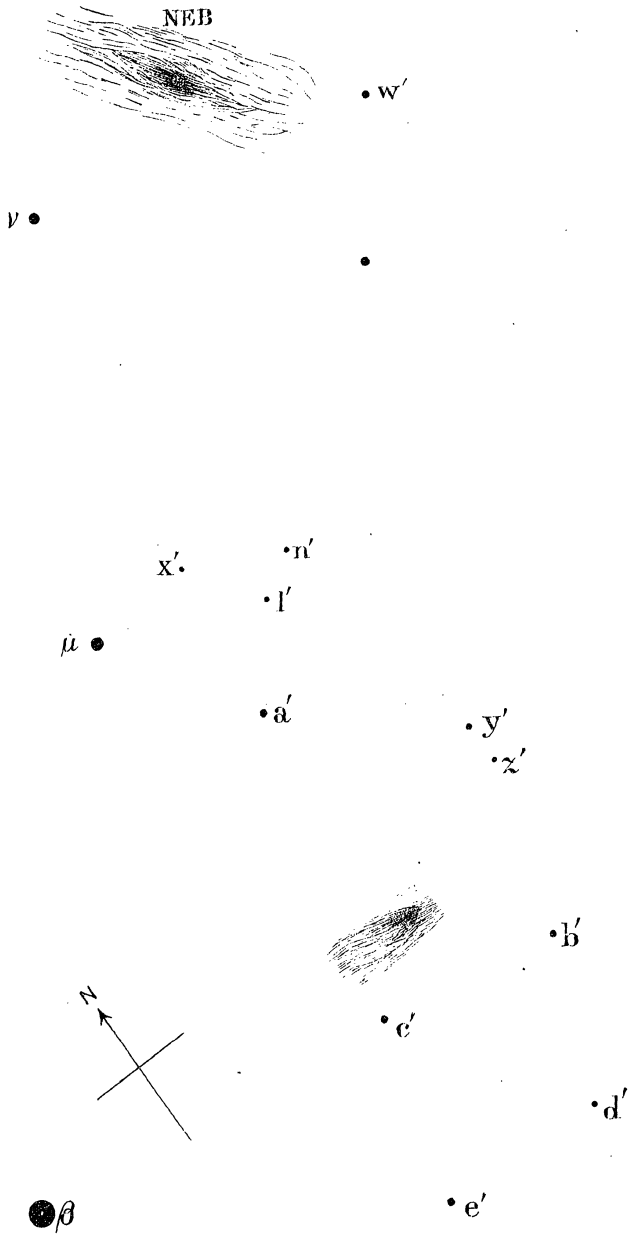

Fig. 36. *(See p. 78)*
1892, 12 mo. 11, 10h 20m, power 4.

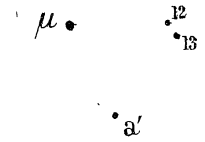

Fig. 33. *(See p. 77)*
1892 11 mo. 12, 13, power 4.

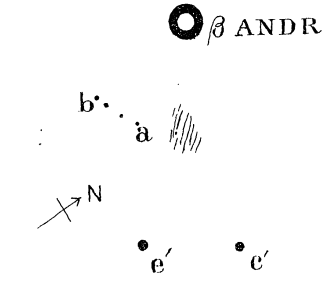

Fig. 37. *(See p. 78)*
1892, 12 mo. 23, 10h 25m, power 4.

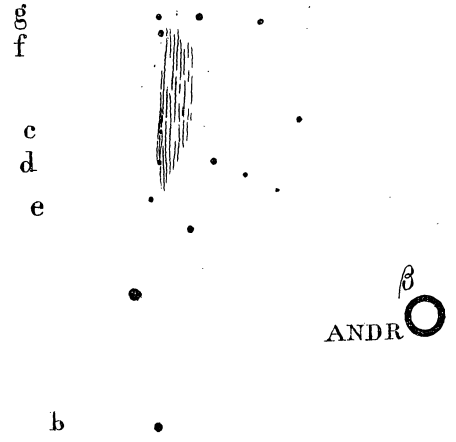

Fig. 38. *(See p. 78)*
1893, 1 mo. 6, 9h 20m, power 4.

Fig. 39. *(See p. 78)*
1893, 1 mo. 8, 9h 28m, power 4.

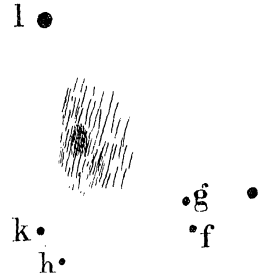

Fig. 40. *(See p. 79)*
1893, 1 mo. 10, 11h 40m, power 4.

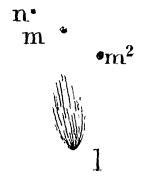

Fig. 41. *(See p. 79)*
1893, 1mo. 13, 9h 50m; power 4.

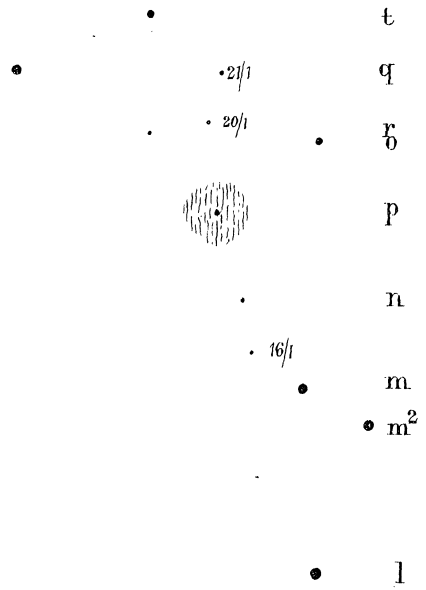

Fig. 42. *(See p. 79)*
1893, 1mo. 17, 10h 25m; power 4.
Positions on 1mo. 16, 20 & 21 also added.

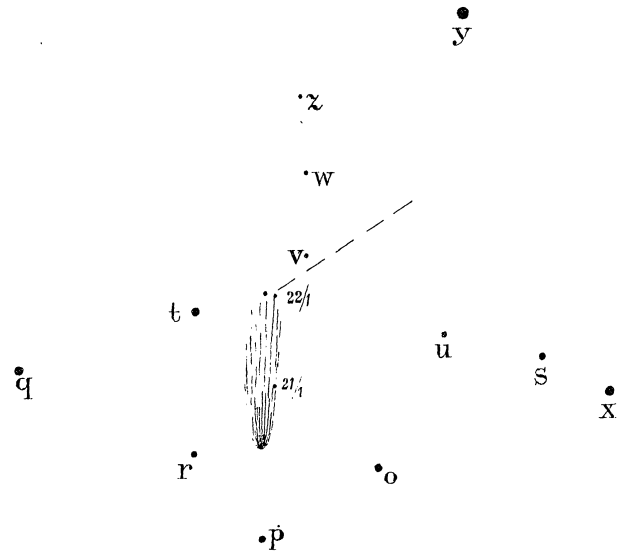

Fig. 43. *(See p. 79)*
1893, 1mo. 20, 9h 30m; 1mo. 21, 8h 50, & 1mo. 22, 9h 50m
power 4.

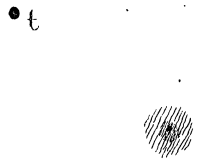

Fig. 44. *(See p. 79)*
1893, 1mo. 21, 9h 30m; power 12.

Fig. 45. *(See p. 79)*
1893, 1mo. 24, 8h 55m, with telescope aperture 2¼ ins.

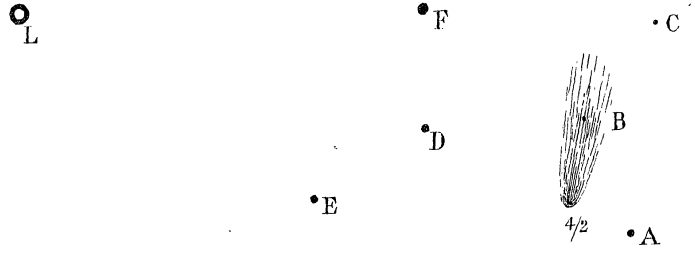

Fig. 46. *(See p. 79)*
1893, 2mo. 4 & 7, power 4.

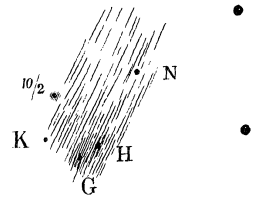

Fig. 47. *(See p. 79)*
1893 2mo 9, 8h 30m, power 4.

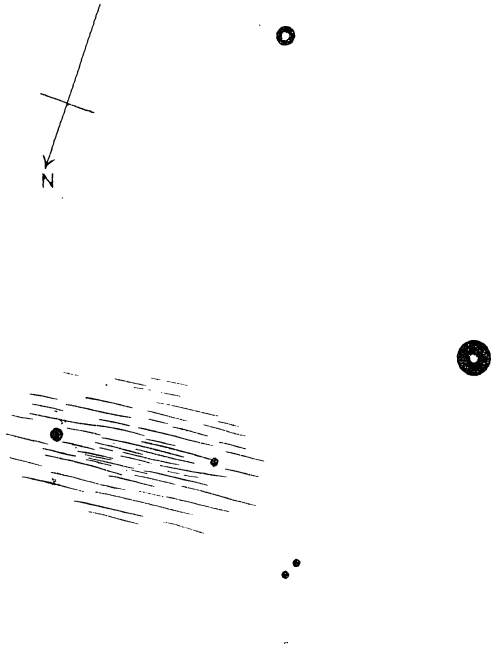

Fig. 49. *(See p. 81)*
1893, 3mo. 9, 9h 50m, power 38.

a is BD +34°.500.
z is BD +34°.504.

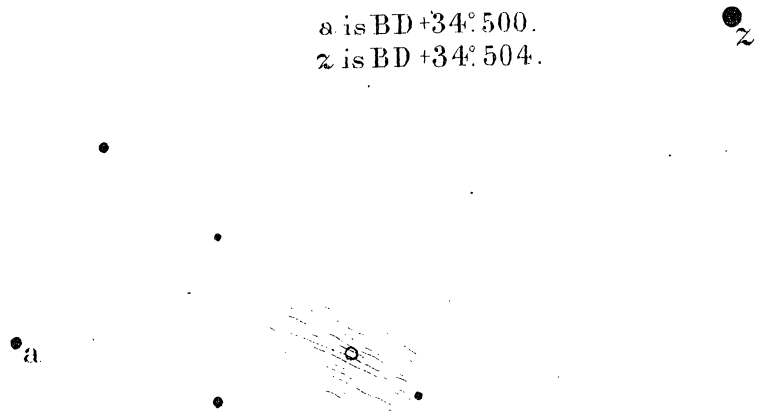

Fig. 48. *(See p. 79)*
1893 3mo 6. 7h 45m, power 38.

Fig. 50. *(See p. 81)*
1893, 3mo. 16, 8h 50m, power 38.

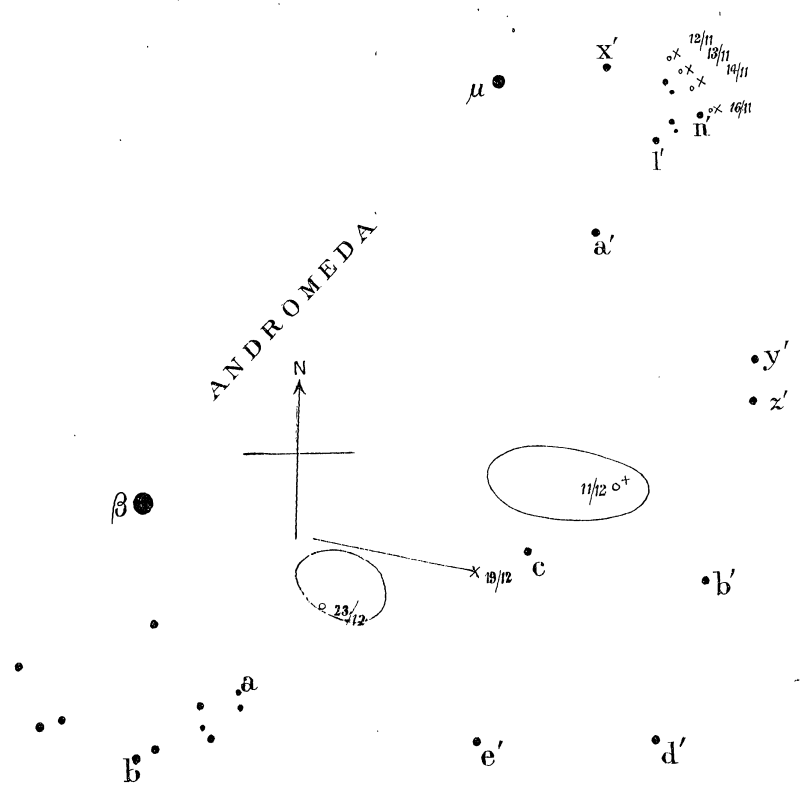

Fig. 51. *Traced from B.D. Maps. (See p. 81)*
Comet Holmes. 1892 11 mo. 12 to 12 mo 23.

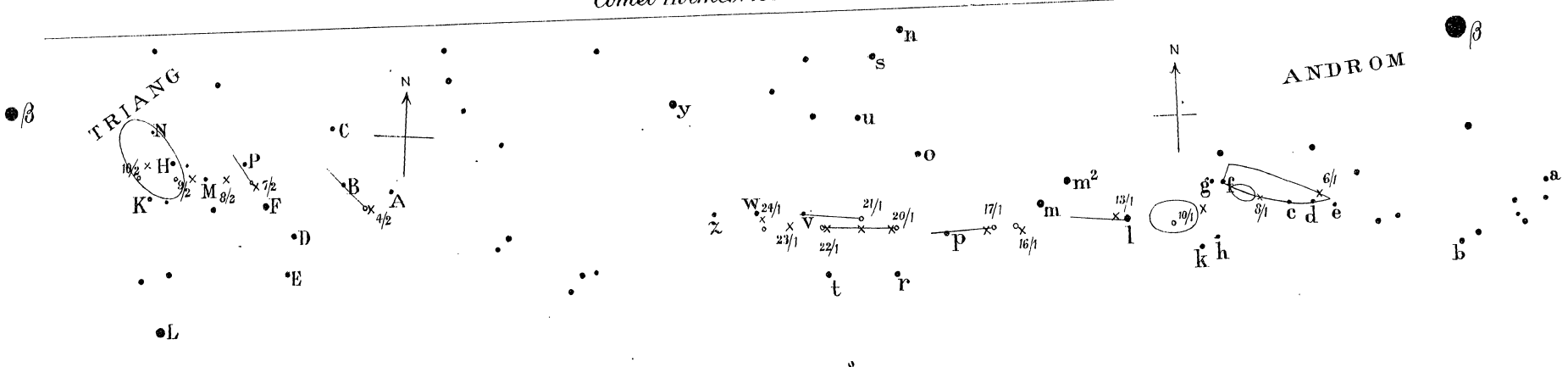

Fig. 52. *Traced from B.D. Maps. (See p. 81)*
Comet Holmes. 1893 1 mo. 6 to 2 mo 10.