Comparison Stars for S Ursæ Majoris.

	Harvard.	Rousdon.
<i>a</i>	6.0	6.0
<i>b</i>	7.0	7.0
<i>c</i>	7.0	7.3
<i>f</i>	9.0	8.6
<i>g</i>	9.0	9.0
<i>h</i>	10.0	10.1
<i>k</i>	10.0	9.8
<i>l</i>	10.0	10.1
<i>m</i>	11.0	10.9

Rousdon Observatory, Lyme Regis:
1892 September 19.

The Geminid Meteor Shower, 1892 December 12.

By W. F. Denning.

The night of December 12 appears to have been clear over the country generally, and observations were obtained at many places. It is probable, however, that the Geminid display had then passed its maximum.

Professor A. S. Herschel, at Slough, watched the western sky during three hours of the interval between 10^h 45^m and 14^h 38^m, and registered the paths of twenty-four shooting stars. Five others had been recorded earlier in the same night. The radiant of the Geminids was not very active nor its position sharply defined, most of the tracks of the conformable meteors having been observed at a considerable distance from it. Some conspicuous meteors were recorded which belonged to the numerous minor showers of the epoch, including Ursids, Leonids, Perseids, &c.

Mr. H. Corder, at Bridgwater, counted sixty-six shooting stars during watches covering about 5¼ hours (6^h to 8^h, and 10^h to 13^h 15^m). He found the chief Geminid radiant at 109° + 34° (38 meteors), and there was a secondary display at 117° + 30° (12 meteors).

At Bristol I looked towards the eastern sky during a period equivalent to 1½ hour between 9^h 45^m and 11^h 30^m, and observed twenty shooting stars, of which about fifteen were Geminids. The chief radiant point was at 119° + 29°, 4½° E. of *β Geminorum*, and the centre of the true Geminids appeared to be indistinctly marked at 107° + 34° from six tracks. The two showers are, I believe, quite separate; that from near *β Geminorum* usually gives brighter and longer meteors than the companion radiant N.W. of *α*. I had already seen this pair of contemporary

showers in the first half of December 1885, and on that occasion detected a third at $110^{\circ} + 25^{\circ}$ (11 meteors).

The radiant of the true Geminids as independently determined by several observers this year on Dec. 12 was as under:—

Position. α δ	No. of Meteors.	Observer.	Place.
$112^{\circ} + 38^{\circ}$	6	A. S. Herschel.	Slough.
$109 + 34$	38	H. Corder.	Bridgwater.
$110 + 32$	14	D. Booth.	Leeds.
$107 + 32\frac{1}{2}$	17	E. R. Blakeley.	Dewsbury.
$109 + 30$	5	W. H. Milligan.	Belfast.
$107 + 34$	6	W. F. Denning.	Bristol.

Evidence is not wanting to show that the diverging centre of this shower, like that of the great Perseid display in July–August, moves to the eastwards, but my observations of the earlier and later stages of the December stream are not sufficiently numerous to be conclusive on the point. I have certainly seen Geminids falling from $\alpha 103^{\circ} - 105^{\circ}$ on the first few nights of December, whereas on the 9th the centre has been at $\alpha 107^{\circ}$, and on the 12th at $\alpha 109^{\circ}$. It is rather difficult to register the exact paths of these meteors, as they commonly traverse short, quick courses, and, except in regard to the brighter ones, streaks or trains rarely accompany them in their flights, so that there is nothing to guide the eye in its hurried effort to retain the directions accurately.

As to the neighbouring shower east of β *Geminorum*, this and previous years' observations define the mean place of it at $116^{\circ} + 30^{\circ}$ from the following observations:—

Date.	Position. α δ	No. of Meteors.	Observer.
... December 7–13	$118 + 26$	13	Heis Cr ₂₃ .
1880 December 9	$116 + 31$	5	Backhouse.
1880 December 11	$115 + 31$	19	Backhouse.
1884 December 11	$115 + 30\frac{1}{2}$	...	Sawyer.
1885 December 7–8	$115 + 33$	11	D. 861.
1885 December 9–10	$117 + 32$	10	D. 877.
1892 December 12	$117 + 30$	12	Corder.
1892 December 12	$119 + 29$	8	D.

There is a well-pronounced shower, apparently from the same point in the sky, at the close of the year, for in 1886 December 22 to 29 I obtained a radiant at $115^{\circ} + 32^{\circ}$ from seven slow meteors (=D. 907).

During recent observations the following bright meteors were recorded:—

Date. 1892.	G.M.T. h m	Magnitude.	Apparent Path. From α δ To α δ		Probable Radiant.	Appearance.	Observer.
Dec. 9	7 30 $\pm$	Very bright.	$59\frac{1}{2} + 21\frac{3}{4}$	$39\frac{1}{2} + 2\frac{3}{4}$	Gemini. $103^{\circ} + 38^{\circ}$.	{ Very slow, train. Streak. Very slow, streak.	"H.W.M."
	7 39 $\pm$	I	85 + 35	75 + 34			H.C.
	7 39	> I	81 + 32	61 + 22			W.F.D.
	8 15 $\pm$	I	70 + 71	87 + 60		Slow, train, orange.	H.C.
11	11 0	I	180 + 62	209 + 59	Gemini.	Orange.	H.C.
	8 9	> I	71 + 16 $\frac{1}{2}$	62 + 10	Gemini.	Streak.	H.C.
	9 23	I	343 + 35	332 + 32	Musca.	Streak.	H.C.
	7 37	Capella.	95 + 43	76 $\frac{1}{2}$ + 47	Gemini.	Streak, yellow.	H.C.
12	9 54	I	130 + 19 $\frac{1}{2}$	132 + 17 $\frac{1}{2}$	Gemini.	Very slow, star-like.	W.F.D.
	10 10	2 + φ	150 + 43	188 + 41	Gemini.	Rather slow.	D.B.
	10 51	> I	110 + 38	109 + 44	Gemini. $110\frac{1}{2} + 35$.	{ Very slow, streak, duration $2\frac{1}{2}$. Streak, duration $1^{\circ}1$.	W.F.D.
	10 51 $\frac{3}{4}$	Sirius.	14 + 38	359 + 27		{ Streak, yellow. Streak 1° , duration $1^{\circ}2$.	A.S.H.
	10 55 $\pm$	I	135 + 46	149 + 50			H.C.
	11 22	2	55 + 41	45 + 20		Streak 1° , duration $1^{\circ}4$, inter- mittent light.	A.S.H.
	11 39	2	19 + 1	21 - 4	16 + 7.	Wavy course, duration $1^{\circ}4$, inter- mittent light.	A.S.H.
	12 20	1 $\frac{1}{2}$	58 + 59	30 + 60	Gemini.	White.	H.C.
	12 48	I	143 - 3	148 - 10	Gemini.	White.	H.C.
	13 28	I	210 + 68	260 + 63	153 + 42.	Streak, duration $1^{\circ}1$	A.S.H.
	14 18	Vega.	19 + 41	25 + 27	333 + 73.	Streak, duration $1^{\circ}5$	A.S.H.

Observers: Professor Herschel and Messrs. Corder, Booth, and Denning.

On comparing together all the available observations, three of the same meteors were found to have been observed at more than one station. On December 9, $7^{\text{h}} 39^{\text{m}} \pm$, a fine slow-moving Geminid, leaving a bright streak, was recorded at Bridgwater, Worcester, and Bristol. On December 12, $10^{\text{h}} 52^{\text{m}} \pm$, another bright member of this shower, estimated by Professor Herschel as equal to *Sirius*, was seen at Slough, Bridgwater, and Bristol, and on the same night, at $11^{\text{h}} 20^{\text{m}}$, a 2nd mag. Geminid was observed at Bridgwater and Bristol. Combining the various data, I have obtained the following results:—

Real Paths of 3 Geminids, 1892.

Particulars.	(1) Dec. 9. $7^{\text{h}} 39^{\text{m}}$	(2) Dec 12. $10^{\text{h}} 52^{\text{m}}$	(3) Dec. 12. $11^{\text{h}} 20^{\text{m}}$
Height at beginning	91 miles	60 miles	85 miles.
Position over	Ilford, Essex	Hungerford	5 miles north of Lynmouth.
Height at ending	57 miles	36 miles	44 miles.
Position over	Whitechurch, Hampshire	Chippenham	{ Lat. N. $51^{\circ} 25'$. Long. W. $4^{\circ} 23'$.
Earth point	Totnes	Magor, River Severn	10 miles south of Milford Haven.
Real length of path	75 miles	31 miles	50 miles.
Velocity per second	30 „	20 „	38 „
Radiant point	$103^{\circ} + 38$	$110\frac{1}{2}^{\circ} + 35^{\circ}$	$111^{\circ} + 34^{\circ}$
Direction of flight from azimuth W. of S.	243°	277°	284°
Inclination (= alt. of radiant)	28	52	55

Bristol:
1892 December 26.

Observations of Brooks' Comet (g 1892) made at the Royal Observatory, Greenwich.

(Communicated by the Astronomer Royal.)

The observations were made with the East, or Sheepshanks, Equatoreal, aperture 6·7 inches, by taking transits over two cross wires at right angles to one another, and each inclined 45° to the parallel of declination. Transits were occasionally taken also over a third wire, bisecting the angle between the other two wires. Magnifying power, 55.

Greenwich Mean Solar Time.	Observer.	♄-★ R.A. m s	Log. factor of Parallax.	Corr. for Refraction, s	♄-★ N.P.D. ' "	Log. factor of Parallax.	Corr. for Refraction. "	No of Comps.	Appt. R.A. h m s	Appt. N.P.D. ° ' "	Comp. ★
1892 Dec. 12 14 37 25	H.	+0 33·59	9·6194	0·00	- 0 22·0	0·7598	0·0	6	13 40 44·45	61 23 43·1	a
12 14 45 12	"	-0 53·17	9·6169	-0·01	- 8 17·5	0·7530	-0·1	8	13 40 44·54	61 23 5·2	b
12 15 8 33	"	-3 1·58	9·6093	-0·01	-13 4·4	0·7326	+0·1	2	13 40 47·85	61 22 8·3	c
15 14 26 11	"	+0 6·73	9·6380	+0·01	+ 5 50·9	0·7499	+0·1	3	13 51 15·95	57 40 11·3	d
15 18 1 28	A. C.	+0 28·26	9·3657	0·00	+ 3 51·2	0·5187	0·0	4	13 51 52·75	57 30 41·9	e
23 12 17 55	"	+2 28·51	9·6483	0·00	- 1 4·3	0·8391	-0·1	4	14 35 39·40	44 54 1·1	f
23 12 17 55	"	+1 11·56	9·6483	0·00	+ 1 19·3	0·8391	+0·1	4	14 35 39·52	44 54 3·3	g

<i>Comparison Stars.</i>			
Star's Name.	Mean R.A. 1892 ^o . h m s	Mean N.P.D. 1892 ^o . ° ' "	Authority.
<i>a</i> W.B. (2) XIII. 810, 811	13 40 9.41	61 23 41.5	Weisse's Bessel
<i>b</i> Lalande 25412	13 41 36.28	61 30 59.2	Lalande and Weisse's Bessel
<i>c</i> Lalande 25467	13 43 48.01	61 34 49.1	Second Armagh Catalogue
<i>d</i> Lalande 25647	13 51 7.79	57 33 55.0	Lalande
<i>e</i> B.F. 1917	13 51 23.07	57 26 25.4	Greenwich Ten Year Catalogue, 1880
<i>f</i> Radcliffe 3235	14 33 9.88	44 54 36.7	Radcliffe Catalogue and Bonn Observations, vol. vi.
<i>g</i> O.A. (N.) 14741	14 34 26.96	44 52 15.2	Oeltzen-Argelander and Bonn Observations, vol. vi.
			<i>Notes.</i>

Notes.

The observations are corrected for refraction but not for parallax. They are also corrected for the error of inclination of the wires, and, where necessary, for the motion of the comet in N.P.D.
 Dec. 12.—No nucleus to comet.
 15.—Note by H.: Comet appeared fainter than on Dec. 12. No nucleus. Frequently difficult to see.
 Note by A. C.: Comet pretty bright. Small. Central condensation.
 23.—Comet fairly bright. Central condensation.

The initials H. and A. C. are those of Mr. Hollis and Mr. Crommelin respectively.

Royal Observatory, Greenwich;
 1892 January 10.

Observations of Occultations of Stars by the Moon and of Phenomena of Jupiter's Satellites, made at the Royal Observatory, Greenwich, in the year 1892.
(Communicated by the Astronomer Royal).

Day.	Phenomena.	Telescope.	Power.	Moon's limb.	Mean Solar Time of Observation.			Observer.
					h	m	s	
1892 Feb. 1 (a)	Disapp. Piazzi XXIII. 190	E. Equat.	150	Dark	5	57	57.19	L.
	" Piazzi XXIII. 190	Altaz.	100	"	5	57	57.36	H.
	Reapp. Piazzi XXIII. 190	E. Equat.	150	"	6	54	0.19	L.
	Disapp. 118 Tauri (S*)	Altaz.	100	"	12	45	27.84	H. T.
7	" 118 Tauri (S*)	E. Equat.	150	"	12	45	26.90	L.
7	" 118 Tauri (N*)	Altaz.	100	"	12	45	29.94	H. T.
7	" 118 Tauri (N*)	E. Equat.	150	"	12	45	28.99	L.
7	" 118 Tauri (N*)	"	150	"	8	14	46.44	H.
Mar. 8	" 139 Tauri	Altaz.	100	"	12	36	22.65	L.
Apr. 2	" 139 Tauri	E. Equat.	55	"	12	36	22.97	A. C.
2	" 42 Leonis	"	55	"	7	50	15.72	C. D.
May 11	" B D -19° No. 4091	"	55	"	10	16	31.50	L.
	" B D -19° No. 4091	Altaz.	100	"	10	16	32.02	B.
11	" B D -19° No. 4093	Photo. Equat.	225	"	10	20	26.16	C.
11	Reapp. B D -18° No. 4047	E. Equat.	55	"	10	31	45.76	L.
11 (d)	Disapp. B D -19° No. 4095	Photo. Equat.	225	"	10	34	56.27	C.
11 (e)	" B D -19° No. 4095	E. Equat.	55	"	10	34	57.73	L.
11	" B D -19° No. 4095	Altaz.	100	"	10	35	(4.01)	B.
11	" B D -19° No. 4096	Photo. Equat.	225	"	10	42	34.01	C.