New Zealand Astronomical Society.

REPORT OF THE SECTION FOR THE OBSERVATION OF METEORS FOR THE YEARS 1929-1931.

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THE first report of the Meteor Section of the New Zealand Astronomical Society, covering the years 1927-28, was published in 1929 (*Trans. N.Z. Inst.*, 60, p. 448, reprinted as Bulletin 5 of the N.Z. Astronomical Society). The present report, covering the work done in the past three years, is on similar lines to the preceding one.

It is a matter for satisfaction that this report has more than maintained the standard set in its predecessor. This advance is noticeable not only in membership, but also in the quantity and quality of the work performed.

A very satisfactory standard of accuracy has been maintained in the observations made. All of these have been examined and reduced by the Director, thereby ensuring uniformity in results. At the same time, it has been a special aim to train observers to perform their own reductions, with the twofold purpose of making their interest in the subject more permanent and of relieving the Director of a quantity of routine work which threatens to become unmanageable, in order that more time may be devoted to special studies which have been somewhat neglected in the past.

The observation and study of meteors in the northern hemisphere provides an opportunity for original research which is regarded as valuable. Such research is of even greater utility in this hemisphere, where we are working in a practically virgin field. It is only in recent years that the southern skies have been systematically studied by meteor observers, and the first fruits of this work are only now becoming apparent.

Despite the labours of the various observers the amount of our knowledge of the radiants, rates, and other points in connection with southern meteor showers remains surprisingly small, and the need for keen and energetic observers is as great as when the Meteor Section was initiated.

The study of meteors is an astronomical research which is eminently suited to the amateur. Nothing more than star maps and enthusiasm are required. Proficiency in observing is obtained almost at the outset, and after a little practice an observer is able to understand and interpret his observations unaided, and thereby to gain a lasting interest in his study. The possibility of original discoveries is enormous. Not only are there countless problems in meteoric astronomy requiring elucidation, but with his intimate knowledge of the starry sky there is always the chance that a meteor worker will be the first to recognise a new star or bright comet.

Personnel.

Messrs Bateson and Thomsen, original members of the section, through pressure of other astronomical work, have been unable to maintain their output of meteor observations, but the acquisition of two new and active members in Messrs Geddes (February, 1931) and Butterton (October, 1931), together with valued observations and assistance from other members of the New Zealand Astronomical Society, has kept the section in a state of vigorous activity.

The following persons have contributed to the present report:—

F. M. Bateson, Wellington (B.).
M. S. Butterton, Wellington (Bu.).
M. Geddes, Otekura and New Plymouth (G.).
R. A. McIntosh, Auckland (M.).
F. J. Morshead, New Plymouth (Mo.).
I. L. Thomsen, Wellington (T.).

Occasional assistance has also been rendered by Mrs F. M. Bateson (counts of meteor rates) and C. G. Crust (reports of meteors seen).

The observations made by the members of the section are summarised in the following table:—

Obs.	1929.		1930.		1931.		Total.		Telesc. Meteors.
	h. m.	Mets.	h. m.	Mets.	h. m.	Mets.	h. m.	Mets.	
B.	10 39	106	— —	—	3 40	50	14 19	156	—
Bu.	— —	—	— —	—	3 30	15	3 30	15	—
G.	— —	—	— —	—	130 38	1500	130 38	1500	—
M.	99 48	1500	27 49	680	17 23	236	145 0	2316	—
Mo.	— —	—	— —	—	1 12	8	1 12	8	12
T.	— —	—	1 5	7	— —	—	1 5	7	1
Total	110 27	1606	28 54	687	156 23	1809	295 44	4013	13

From the above table it will be seen that an average of 13 meteors an hour has been observed under all kinds of observing conditions.

Special Meteoric Showers.

The New Zealand meteor observers are greatly handicapped by not having prior knowledge of any but the most prominent meteoric displays of the year. Each night's observations bring to light entirely new radiants, and in most instances not even an approximate idea of the rate of meteoric activity to be expected is known beforehand.

Several years ago the Director compiled a catalogue from various lists of radiants, expecting that with the aid of this the radiants visible on any night could be determined before commencing observing, but the catalogue has failed in its object. In practice it has been found that only one or two out of perhaps a dozen radiants expected on any given night were actually active. Owing to the catalogue being arranged in order of date, it is also unsuitable for reference purposes.

A new catalogue, upon quite different lines, is now being prepared by the Director. In this, care is being taken to include only radiants which reasonably satisfy the modern conception of a radiant (see definition of a radiant on page 453). When completed and published it is hoped that observers in this hemisphere will possess a satisfactory calendar of meteoric activity throughout the year to guide them in their future observations.

With such a calendar, observers will then be able to plan their observations so as to fill the gaps in our present knowledge of southern meteor showers, determining dates of commencement and ending, and the maxima of the various displays, instead of scanning the sky for unknown radiants as at present.

Owing to the delay inevitably entailed in preparing and publishing such a calendar, it has been thought desirable to include in this report a summary of the most prominent showers, so far as is revealed by the work of the Meteor Section in the past three years. It is hoped that this list will be of immediate benefit to observers.

The following 36 showers appear most prominent in the data at present available:—

Corona Australids.—Mean centre of radiation, 272°, —40°; observed on March 9, 13, 20, and 26; radiants numbered 228, 232, 238, 243. There is possibly some connection between this shower and Comet 1877i, whose theoretical radiant-point is 273°, —40°, on March 15 (Herschel) or 283.3°, —38.3°, on March 28 (Davidson).

Nu Ophiuchids.—270°, —10°; 8 radiants from April 13 to 29; nos. 262, 264, 275, 280, 284, 291, 306, 314. A feeble shower.

Sagittarids.—303°, —30½°; April 13-21; nos. 272, 282, 286, 295, 304. A moderate shower.

Chi Librids.—234°, —20°; April 13-21; nos. 251, 259, 260, 263, 274, 278, 283, 289, 297, 300. A fairly prominent shower. If radiant no. 251 also belongs to this shower its duration is doubled, activity commencing on April 4. The Eta Librids in Denning's General Catalogue (Group 178, nos. 1 and 2) are identical with this series.

Delta Sagittarids.—276½°, —33°; April 14-22; nos. 270, 271, 276, 292, 302, 308. A moderate shower, already recorded by Denning (Group 210, 2 and 3). Other showers from this region are visible in May and June.

Aquilids.—289°, +7½°; April 16-21; nos. 285, 293, 303. This shower was noted by Denning as the Theta Serpentids (220, 1 and 2). It is probably connected with Comet 1844ii, whose theoretical radiant-point on April 21 is 288½°, +5°.

Lyrids.—272½°, +33°; April 21-22; nos. 301, 307. Bad weather at the epoch of this well-known northern shower (Denning, 209) has permitted observations on only two nights in the period under review. Given fine weather, satisfactory radiants could be obtained in this country, in spite of the northern declination of the radiant-point.

Eta Aquarids.—336½°, —1½° at maximum; April 28 to May 13; nos. 312, 316, 319, 321, 329, 334, 337, 338, 344, 351, 358, 363, 369, 374, 381, 382. This shower is the richest visible annually to the southern observer, and would probably rank higher in the northern hemisphere if it were not so unfavourably placed for observation there (Denning's group 258). Many rich displays have been witnessed in this country, and the radiants deduced show the unmistakable motion of the radiant-point first noted by Dr Olivier and R. M. Dole (*Observatory,* 44, 242, 1921). The Director's 1929 observations have already formed the subject of a paper *(Mon. Not., R.A.S.,* 90, 157) in which the motion of the radiant-point and the connection of the shower with Halley's comet have been dealt with. The radiants since obtained lend additional weight to the conclusions then reached.

Delta Capricornids.—324½°, —17°; April 29-May 7; nos. 315, 323, 326, 332, 342, 349. A moderate shower. The theoretical radiant-point of Comet 837i lies 10° preceding this radiant.

Lambda Sagittarids I.—273°, —29½; May 2-11; nos. 317, 320, 324, 331, 335, 339, 346, 364, 372, 377. A prominent southern shower, already noted in Denning's catalogue (210, 3 and 4).

Iota Piscis Australids.—326°, —35°; May 4-8; nos. 328, 333, 336, 341, 368. A new, moderate shower.

Beta Delphinids.—307°, +15½°; May 6-11; nos. 340, 348, 356, 359, 366, 380. This shower appears in the General Catalogue under the title Gamma Delphinids (243, 1). The radiants lie close to the theoretical radiant-point of Comet 1853ii, 296½°, +13½°, on May 1.

Beta Capricornids.—302½°, —15°; May 7-11; nos. 355, 365, 379. A fairly rich shower, not yet properly observed. It corresponds with D. 237, no. 2.

Alpha Aquarids.—327½°, —2½°; May 4-8; nos. 327, 343, 350, 360. A group of radiants lying close to the Eta Aquarids, but distinct.

Alpha Indids.—309°, —49°; May 7-8; nos. 357, 367, 370. Another small and insufficiently-observed shower.

Lambda Sagittarids II.—276½°, —25½°; June 14-19; nos. 391, 394, 398, 401. The third distinct shower from this region, the three being combined in Group 210 of Denning's catalogue (210, 4 and 5).

Beta Piscis Australids.—334°, —31°; July 2-4; nos. 406, 411, 415. This shower corresponds with Denning's group 262 (no. 2).

Psi 1 Aquarids.—349°, —9°; July 2-8; nos. 407, 412, 416, 419, 421. A shower moderately active.

Capricornid Radiants.—There are two distinct centres of radiation here in July and another in early August, all three being combined in Denning's group 237.

Capricornids I.—307°, —9°; July 5-28; nos. 418, 432, 440, 452.

Capricornids II.—302°, —17°; July 10-16; nos. 423, 435, 438.

Tau 3 Eridanids.—49°, —21°; July 31-August 8; nos. 465, 492, 511, 531. This shower has been very incompletely observed. It coincides with Denning's group 34, no. 1.

Beta Cetids.—3°, —21°; July 28-August 4; nos. 450, 456, 463, 478, 485, 488, 506. A fairly prominent shower (D. 4, 3) visible at the time of the Delta Aquarids' activity.

Iota Piscids.—351°, +4°; July 31-August 1; nos. 462, 477, 484. A small shower (D. 273, 3).

Delta Aquarids.—341°, —17° at maximum; July 26-August 9; nos. 443, 444, 445, 447, 453, 455, 460, 468, 470, 476, 483, 486, 501, 503, 515, 520, 523, 529, 535, 541. The radiants secured by the New Zealand observers have provided practically all we know of this prominent southern shower (D. 263). The long duration of the shower and the definite shift in its radiant-point, previously disputed but essential to theory, are well shown in the list of radiants secured. A note on this shower has been published by the Director in *Observatory*, 53, 675, 235. The region, especially at the beginning of August, abounds in radiants, and, being near the zenith, the short, darting meteors are difficult to observe.

Alpha Piscis Australids.—342°, —33° on July 31; July 26-August 9; nos. 442, 448, 454, 459, 467, 475, 482, 500, 502, 514, 534, 539. This well-known shower (D. 262) rivalled the Aquarids in 1929 and 1930, but was surprisingly weak in 1931. The various radiants show some evidence of movement, from R.A. 337° on July 26 to 350° on August 8.

Alpha Capricornids.—304°, —10½°; August 3-4; nos. 495, 512, 516. This shower has not often been observed. It is always low in the sky during the writer's observing hours, and has been neglected for the more favourably placed Aquarids and contemporary showers. It corresponds with Denning's group 237, nos. 17, 20, 21, and 22. The stream providing these meteors is undoubtedly connected with Comet 1881v (see orbits published in *Observatory*, 53, p. 235). Since the parent comet should return in 1933, we may look forward to good displays of meteors from this region in the next few years.

Iota Capricornids.—323°, —15½°; August 3-4; nos. 496, 504, 518, 526. Another Capricornid shower, active at the same time as the comet shower. (D. 249, nos. 12, 13, 18, 19.)

Beta Aquarids.—321°, —7°; August 4-8; nos. 505, 517, 522, 533. This shower (D. 249, 14) lies close to the prominent Delta Aquarids.

Zeta Aquarids.—336°, —0½°; August 4-9; nos. 513, 527, 538. Although not often observed locally, this seems a prominent shower, judging from the number of references to it in northern catalogues: D. 260, nos. 3, 4, 6, 7; A.M.S. 200, 1160, 1161, 1165, 1495, 1500, 1512.

Sigma Aquarids.—334°, —13°; August 5-13; nos. 519, 546, 550. A small shower helping to add confusion to the Aquarid region, as does the next.

d 1 Aquarids.—351°, —21½°; August 7-13; nos. 528, 540, 547, 554. Another small Aquarid radiant, identical with D. 252, 12.

Alpha Canis Majorids.—97°, —17°; October 16-22; nos. 580, 581, 583. This shower, apparently prominent in mid-October, has not been sufficiently observed. It corresponds with Denning's group 78 (no. 3).

Orionids.—91°, +15° at maximum; October 22; no. 576. Bad weather and moonlight have prevented satisfactory observations of this prominent northern shower (D. 77) in recent years. A series of earlier radiants has been published by the Director *(Mon. Not., R.A.S.,* 90, p. 160).

Leonids.—151°, +21½°; November 18; no. 585. The Leonid radiant (D. 115) does not rise much before dawn in this country, and therefore cannot be satisfactorily observed. The shower apparently reached its maximum in 1931 on November 18, confirming the northern hemisphere observations. It is to be hoped that a rich shower will eventuate this year, as New Zealand is in the right longitude, if not the right latitude, to see the best of the display.

Geminids.—101½°, +28°; December 3-13; nos. 593, 602. Only two radiants for this prominent shower have been secured (D. 88).

Sigma Puppids.—114°, —45°; December 4-12; nos. 591, 597, 601. This shower seems fairly prominent.

Meteor Rates in Southern Hemisphere.

In the first report it was shown with the scanty data then available that the maximum of meteoric activity in this hemisphere occurred in the winter months, when the meteoric apex was highest in the sky. A full discussion of meteor rates is outside the scope of the present report, but it is hoped to publish shortly a paper dealing fully with this subject. The bare results, deduced from the corrected rates shown in Table II, confirm the earlier belief in the great frequency of meteors in the winter months.

The following table shows the rates (corrected for hindrances to observing) divided into ten-day groups, with additional columns giving the mean rate for each month, together with the number of observations on which each monthly rate is based.

Month.	Date.			Whole Month.	No. of Observations.
	1-10.	11-20.	21-31.		
January -	4	14	10	10	9
February -	7	7	8	7	18
March - -	11	8	9	9	22
April - -	14	13	14	14	30
May - -	22	12	14	16	38
June - -	13	12	12	13	22
July - -	15	15	22	17	33
August -	20	14	10	17	33
September -	11	9	12	10	11
October -	11	12	13	12	17
November -	—	11	—	11	4
December -	14	13	9	12	12

The presence of the Eta Aquarids (May 1-10) and the Delta Aquarids (July 21-August 10) is clearly shown in the above table.

Further long-continued observations are required for the purpose of determining still more accurately the rate of meteoric activity from day to day.

Cometary Accordances.

Some radiants have been observed which lie close to the theoretical radiant-points of comets which closely approach the earth's orbit, as calculated by A. S. Herschel *(Mon. Not., R.A.S.,* 38, 379) and Dr M. Davidson *(Mon. Not., R.A.S.,* 80, 739).

It is difficult at this stage to determine which of these radiants, if any, are physically connected with the cometary streams. In some cases the comet concerned is an ancient one, perhaps with an orbit not excellently determined. Even in the case of a good orbit, if the comet concerned has not been seen in recent years it may have undergone considerable perturbations in the intervening centuries, so that its apparent radiant-point no longer agrees with that calculated. Even for the rich shower from Halley's comet, the best orbits for the meteor stream are not exactly the same as the orbit of the parent comet *(Astr. Nachr.,* 196, 309, 1913, and *Mon. Not.,* 90, 157).

Another factor tending to depreciate the value of the accordances is that most of the radiants cited are isolated instances, not well-defined showers. This may be due to lack of observations at the critical time, to pronounced tenuity of the stream of meteoroids, or to chance intersections near the theoretical radiant-points of comets being misinterpreted as radiants. With further knowledge of the radiants concerned, which will result from continued observations, we can expect that in a few years these cases of possible identity will be established or ruled out.

In the following table the agreements have been divided into two classes, good and fair. In the former, physical connection seems likely; in the latter the disagreement is too great for satisfaction. Other possible cases, where the agreement is even worse, are noted only in the list of radiants (Table II).

Cometary Accordances.

I.—*Good Agreements.*

No.	Date.	Radiant.		Remarks.
		o	o	
	Mar. 25	182.5	—28.0	Comet 1264.
9	1926—Mar. 18	175.0	—20.5	
239	1931—Mar. 21	176.0	—24.0	
240	1931—Mar. 26	180.0	—24.0	
	Apl. 21	288.5	+ 5.0	Comet 1844ii.
285	1929—Apl. 16	288.0	+ 7.7	
293	1929—Apl. 17	290.0	+ 7.0	
303	1929—Apl. 21	289.3	+ 2.5	
	Apl. 20	270.5	+32.0	Comet 1861i.
301	1929—Apl. 21	272.2	+32.7	Lyrids.
307	1931—Apl. 22	272.5	+33.0	„
	May 4	337.0	0.0	Comet 1910ii.

I.—*Good Agreements*—Continued.

No.	Date.	Radiant.		Remarks.
		°	°	
329	1930—May 4	336.5	— 1.5	Eta Aquarids. See Table II for 15 other radiants.
	Aug. 4	303.2	— 9.7	Comet 1881v.
495	1929—Aug. 3	303.5	—10.5	Alpha Capricornids.
512	1929—Aug. 4	304.0	—10.5	„ „
516	1931—Aug. 2-4	304.0	—11.0	„ „
	Sept. 10	53.0	—16.0	Comet 1854iv.
87	1928—Sept. 18	60.0	—17.5	
	Oct. 16	61.0	— 7.0	Comet 1580.
578	1931—Oct. 16	59.0	— 8.5	
	Nov. 13	150.5	+23.5	Comet 1866i.
585	1931—Nov. 18	150.7	+21.4	

II.—*Fair Agreements.*

No.	Date.	Radiant.		Remarks.
		°	°	
	Jan. 20	128.5	—28.5	Comet 1840i.
206	1927—Jan. 10	113.7	—30.0	
	Mar. 15	273.0	—40.0	Comet 1877i.
228	1929—Mar. 9	272.0	—40.0	
232	1929—Mar. 13	272.0	—40.0	
238	1929—Mar. 20	272.0	—40.5	
243	1931—Mar. 26	276.0	—44.0	Comet 1590, March 8, at 275°, —38°.
	May 1	334.5	—16.0	Comet 837i.
315	1930—Apl. 29	321.0	—19.0	
323	1929—May 2	326.0	—17.5	
326	1930—May 4	322.0	—16.0	
332	1929—May 5	326.0	—17.5	
342	1930—May 6	326.0	—16.5	
349	1930—May 7	324.5	—15.0	
	May 1	296.5	+13.5	Comet 1853ii.
348	1930—May 7	308.0	+15.0	Also 4 other radiants.
380	1929—May 11	307.7	+14.0	
	Aug. 9	32.0	—18.5	Comet 1877ii.
537	1931—Aug. 9	29.0	—20.0	
	Aug. 10	40.5	—13.5	Comet 1852ii.
491	1929—Aug. 3	39.5	—15.5	
509	1929—Aug. 4	39.0	—16.0	
	Aug. 26	65.0	—22.0	Comet 1558.
174	1925—Aug. 18	55.2	—28.0	In first report.
	Sept. 20	44.5	—24.0	Comet 1763.
86	1928—Sept. 18	36.3	—28.8	In first report.
180	1928—Sept. 22	41.0	—32.0	„ „ „
	Sept. 20	62.0	—13.0	Comet 961.
181	1928—Sept. 22	60.0	—20.0	In first report.

TABLE I.

Details of Observations.

Date. 1929.	Began. h. m.	Ended. h. m.	Tl. m.	Meteors.	Horary Rate.	Factor.	Corrected Rate.	Ob.	Remarks.
Jan. 16	02 10	03 20	70	21	14	1.0	14	M	Clear.
17	02 10	03 34	84	18	12	1.0	12	M	Clear.
20	01 55	02 40	45	8	10	0.7	—	M	Partly cloudy.
21	01 50	03 13	83	10	7	1.0	7	B	Clear.
21	02 11	03 40	85	17	13	0.7	18	M	Partly cloudy.
Feb. 11	02 11	04 10	119	20	10	1.0	10	M	Clear.
14	02 12	04 18	126	22	10	0.8	12	M	Clear; clouds ½hr.
Mar. 9	02 12	03 30	78	12	9	1.0	9	M	Clear.
11	02 15	03 35	80	14	12	1.0	12	M	Slight mist.
14	02 35	04 35	120	15	7	1.0	7	M	Clear.
20	03 08	04 45	97	17	10	1.0	10	M	Clear.
Apl. 5	02 30	04 00	90	13	9	0.7	13	M	Clear; moon 25d.
6	01 15	02 00	45	4	5	1.0	—	B	Clear.
6	02 30	04 45	135	26	11	0.9	13	M	Clear; moon 26d.
7	01 00	02 20	57	13	13	0.6	22	M	Misty; 23m. clouded.
14	03 36	05 05	83	16	12	0.7	17	M	Misty; passing clouds.
16	02 30	05 08	158	40	16	1.0	16	M	Slight mist ½hr.
17	02 45	05 10	130	30	14	0.9	16	M	Passing clouds.
18	02 40	05 00	140	29	12	1.0	12	M	Clear.
22	02 45	05 23	158	37	13	0.6	22	M	Clear; moon 12d.
May 3	03 00	05 30	150	36	14	0.5	28	M	Clear; moon 22d.
4	02 40	04 00	55	8	—	—	—	M	Clouds 45m.; moon 23d.
6	02 30	05 30	180	52	17	0.8	21	M	Some cloud; moon 25d.
7	02 30	03 40	70	13	11	0.6	18	M	Misty; much cloud.
8	02 30	05 30	155	57	22	1.0	22	M	Misty; 25m. off.
9	02 37	05 40	148	46	18	0.9	20	M	35m. clouded.
10	02 50	03 05	—	6	—	—	—	M	Casuals.
11	02 20	03 40	60	12	12	0.6	20	M	Clouds 20m.; misty.
12	00 25	05 40	315	80	15	1.0	15	M	Clear.
13	02 25	02 50	—	5	—	—	—	M	Almost wholly clouded.
June 1-2	11 52	01 10	78	14	10	0.9	11	M	Clear; moon.
2	00 10	02 00	110	17	9	0.9	10	B	Some light clouds.
8	01 45	02 20	35	5	8	1.0	—	B	Clear.
9	01 10	03 30	140	27	11	1.0	11	M	Clear.
July 3	02 48	05 08	140	29	12	0.8	14	M	Clear; moon 23d.
4	02 45	04 45	120	25	12	1.0	12	M	Clear.
5	02 45	05 30	165	36	13	1.0	13	M	Clear.
6	02 30	04 30	105	26	15	0.9	16	M	Fog; 15m. off.
9	02 45	04 00	50	19	23	1.0	—	M	Rain storms; 25m. off.
11	03 05	04 50	105	35	19	0.9	21	M	Clear.
27	02 45	04 30	105	17	10	0.3	—	M	Clear; moon 19d.
29	02 40	04 10	57	22	19	0.5	38	M	Clouds 23m.; moon 21d.
31	02 22	03 48	86	23	23	0.8	30	M	Clouds 48m.; moon 23d.
Aug. 1	03 30	05 30	120	51	23	0.8	30	M	Some clouds; moon 24d.
1-2	20 25	22 08	130						
	22 20	00 06	106	30	8	1.0	8	B	Clear.
2	02 30	05 30	180	67	22	0.9	25	M	Clear; moon 25d.
4	01 10	05 30	260	103	23	1.0	23	M	Clear.
4-5	23 45	01 02	77	19	15	1.0	15	B	Clear.
5	02 25	04 20	110	54	27	1.0	27	M	Clear.
9	02 30	04 30	120	41	20	1.0	20	M	Slight mist.
9-10	23 40	01 00	80	19	14	0.9	15	B	Some clouds.
13	02 44	04 45	121	41	18	0.9	20	M	Slight mist.
14	02 44	04 15	91	24	15	0.8	19	M	Passing clouds.

TABLE 1.—DETAILS OF OBSERVATIONS—Continued.

Date. 1929.	Began. h. m.	Ended. h. m.	Tl. m.	Meteors.	Horary Rate.	Factor.	Corrected Rate.	Ob.	Remarks.
Sept. 1	00 45	01 40	55	10	11	1.0	11	M	Clear.
2	02 54	04 20	86	15	10	1.0	10	M	Clear.
12	02 42	03 55	73	16	13	1.0	13	M	Clear.
30	02 25	04 15	110	18	10	1.0	10	M	Slight mist.
Oct. 5	02 30	03 05	35	3	7	1.0	—	M	Slight mist.
6	01 05	03 20	135	21	9	1.0	9	M	Clear.
7	02 30	04 05	95	17	11	1.0	11	M	Slight mist.
16	02 30	04 05	83	7	—	—	—	M	Clear; moon 13d.
17	03 05	03 45	40	2	—	—	—	M	Clear; moon 14d.
18	02 50	03 20	30	5	—	—	—	M	Clear; moon 15d.
19	03 05	03 25	20	3	—	—	—	M	Clear; moon 16d.
29	02 50	03 35	45	13	15	1.0	—	M	Clear.
Dec. 13 1930.	02 25	03 05	40	8	9	1.0	—	M	Clear.
Apl. 30	03 00	05 00	120	27	13	1.0	13	M	Clear.
May 3	02 56	05 20	144	37	15	0.9	17	M	Slight mist.
5	02 45	05 25	160	72	27	1.0	27	M	Clear.
6	02 45	05 25	160	65	24	1.0	24	M	Clear.
7	02 30	05 30	180	84	28	1.0	28	M	Clear.
8	02 30	05 30	165	63	23	0.9	25	M	Passing clouds.
9	02 40	04 25	105	39	22	1.0	22	M	Clear.
July 29	20 42	21 47	65	6	6	0.8	7	T	Clear.
29	03 26	05 10	104	45	26	0.8	33	M	Misty; some clouds.
30	02 45	04 50	125	52	25	1.0	25	M	Clear.
31	03 05	04 45	100	39	23	1.0	23	M	Clear.
Aug. 1	03 15	05 16	121	66	33	1.0	33	M	Clear.
2	02 50	05 00	120	63	32	1.0	32	M	Clear; 10m. off.
Sept. 23 1931.	03 05	04 10	65	18	16	1.0	16	M	Clear.
Feb. 3	20 16	21 16	60	1	1	—	—	G	Clear; moon 15d.
5	20 26	21 37	71	3	3	—	—	G	Clear; moon 17d.
8	19 57	22 02	125	13	6	1.0	6	G	Clear.
9	20 18	22 13	115	9	4	0.8	7	G	Smoke.
11	20 28	21 23	55	6	6	1.0	6	G	Clear.
14	19 54	21 36	102	4	2	1.0	2	G	Clear.
15	20 28	22 34	126	15	7	0.9	8	G	Light clouds.
16	20 47	21 59	72	6	5	1.0	5	G	Clear.
18	20 13	22 36	143	19	8	1.0	8	G	Clear.
26	20 05	21 05	60	3	3	0.6	5	G	Haze; moon 9d.
Mar. 12	20 05	20 12	7	1	—	—	—	G	
13	20 10	22 24	134	15	7	1.0	7	G	Clear.
14	21 08	22 10	62	7	7	1.0	7	G	Clear.
20	20 00	23 43	223	37	10	1.0	10	G	Clear.
21	03 05	03 47	42	9	13	1.0	—	M	Mist on horizon.
22	00 30	01 15	45	17	12	1.0	—	M	Clear.
27	02 45	03 35	60	12	5	1.0	5	M	Clear.
27	20 13	22 10	117	5	2	0.4	6	G	Passing clouds; moon.
28-29	21 30	01 03	213	43	12	0.8	17	G	Clear; moon 9d.
30	03 00	03 18	18	7	19	0.9	—	M	Passing clouds.
Apl. 10	20 08	21 45	97	8	6	0.4	15	G	Very cloudy.
12-13	20 05	00 22	257	48	11	1.0	11	G	Clear.
13	21 05	22 00	55	3	3	0.3	10	G	90% cloud.
14	03 00	05 05	125	33	15	0.9	16	M	Clear; moon 23d.
14-15	22 05	01 12	187	43	14	1.0	14	G	Clear.
15	03 00	04 20	80	20	15	1.0	15	M	Clear.
15	20 45	23 03	138	29	12	1.0	12	G	Clear.
17	21 18	22 50	92	15	10	0.8	12	G	Passing clouds.
21-22	22 35	00 25	110	29	16	1.0	16	G	Clear.
22	21 45	23 00	75	15	12	0.9	13	G	Slight clouds.
23	03 00	05 00	120	35	17	0.9	19	M	Slight fog.
23-24	22 47	00 15	98	22	13	1.0	13	G	Clear.
29	03 00	04 40	100	18	11	0.9	12	M	Slight mist.

TABLE 1.—Details of Observations—Continued.

Date. 1931.	Began. h. m.	Ended. h. m.	Tl. m.	Meteors.	Horary Rate.	Factor.	Corrected Rate.	Ob.	Remarks.
May 13	21 43	23 15	92	18	12	0.9	13	G	Cloud and haze.
14	02 55	03 35	40	12	18	0.9	—	M	Mist and cloud; moon.
14	21 37	22 33	56	11	12	0.9	13	G	Cloud on horizon.
15	20 47	22 02	75	13	10	0.9	11	G	Clear.
22-23	22 43	00 00	77	17	13	1.0	13	G	Clear.
June 7	20 45	23 00	135	27	12	0.9	13	G	Clear.
14	20 55	23 05	130	18	8	0.7	11	G	Much passing cloud.
15-16	19 53	01 00	307	67	13	0.9	14	G	Slight haze at first.
18-19	22 52	01 18	146	34	14	1.0	14	G	Clear.
19-20	23 13	02 33	200	56	17	1.0	17	G	Clear.
July 6	21 57	23 13	76	15	12	0.7	17	G	Passing cloud.
10-11	21 37	00 22	165	35	13	0.8	16	G	30% cloud.
14-15	20 50	21 00							
	22 15	02 20	255	48	11	0.5	22	G	60% cloud.
15-16	21 57	00 05	128	21	11	0.4	28	G	70% cloud.
16	02 57	03 40	43	12	18	—	—	M	Partially cloud.
16	20 39	22 24							
	23 12	23 58	155	28	11	0.5	22	G	50% cloud.
17	22 45	23 30	45	7	9	0.3	—	G	70% cloud.
20-21	20 05	01 55	330	61	11	0.7	16	G	25% cloud; moon 5d.
Aug. 2	19 30	22 00	150	16	6	0.3	20	G	50% cloud; moon.
4-5	21 40	00 40	180	28	9	0.7	13	G	20% cloud; moon.
5	20 15	24 00	225	64	17	1.0	17	G	Clear.
6-7	21 43	00 02	139	52	22	1.0	22	G	Clear.
7-8	22 33	01 00	147	58	22	1.0	22	G	Clear.
9-10	22 30	03 30	300	86	17	0.8	21	G	20% cloud.
10	22 05	22 35	30	6	12	0.5	—	G	Almost totally clouded.
13-14	21 25	02 25	300	69	14	1.0	14	G	Clear.
14-15	22 23	00 25	122	30	15	1.0	15	G	Clear.
21	01 26	05 00	214	44	12	1.0	12	G	Clear.
Oct. 2-3	22 45	00 45	120	22	11	0.9	12	G	Much haze.
12	02 08	02 45	37	3	6	—	—	M	Almost totally clouded.
14	02 25	03 28	63	7	7	0.9	7	M	Some clouds.
15-16	23 30	01 20	110	9	4	—	—	B	Almost totally clouded.
16	02 40	03 45	65	7	7	—	—	M	Almost totally clouded.
17	00 00	03 30	210	34	9	1.0	9	B	Clear.
17	00 00	03 30	210	15	4	1.0	4	Bu	Clear.
23	02 25	03 50	85	11	8	0.9	12	M	Clear; moon.
Nov. 15	01 18	02 30	72	8	7	0.5	16	Mo	50% cloud.
15	02 28	03 15	47	3	4	1.0	—	B	Clear.
16	02 15	03 15	60	15	11	1.0	11	M	Clear, twilight.
16	02 00	02 30	30	0	—	—	—	G	70% cloud.
18	01 50	03 00	70	13	11	0.9	12	G	Hazy.
Dec. 3-4	22 21	01 07	166	32	12	0.8	15	G	35% cloud.
4-5	22 38	01 12	154	35	12	0.8	15	G	20% cloud.
10-11	23 32	01 20	108	24	13	0.8	16	G	Hazy, twilight at end.
14	02 00	03 00	60	7	—	—	—	M	Casual watch.
28	21 07	22 07	60	8	8	0.9	9	G	Hazy.
30	21 05	22 55	110	11	6	0.9	7	G	Some cloud.

TABLE II.

List of Radiant Points Observed.

No.	Date.	G.M.T.	Radiant. R.A.	Dec.	Mets.	Wt.	Obs.	L.	Remarks.
			o	o				o	
205	1929—Jan.	15.64	107.0	—36.0	5	F	M	204.7	
206	1929—Jan.	15.64	120.0	—29.0	6	G	M	„	Comet 1840i; NZ 1.
207	1929—Jan.	15.64	132.2	+ 7.0	4	G	M	„	
208	1929—Jan.	16.64	134.0	—57.0	7	G	M	205.7	
209	1929—Jan.	16.64	177.7	—18.6	7	G	M	„	D. 132, 1; 132, 2; ? 212.
210	1929—Jan.	19.62	162.1	—13.7	5	G	M	208.7	NZ 2.
211	1929—Jan.	20.64	132.5	—50.5	5	G	M	209.7	NZ 130, 214.
212	1929—Jan.	20.64	177.0	—11.0	5	F	M	„	? 219.
213	1929—Jan.	20.64	144.0	—42.0	4	F	M	„	
214	1929—Jan.	21.60	130.0	—54.0	3	P	B	210.7	211, 130.
215	1931—Feb.	8-9	53.0	—23.0	4-5	F	G	229.3	223.
216	1931—Feb.	8-9	89.0	—43.5	4	G	G	„	
217	1931—Feb.	8-9	94.5	—27.4	4-5	G	G	„	
218	1929—Feb.	10.65	206.5	—43.4	5	G	M	230.7	222; ? Comet 1887iii.
219	1929—Feb.	10.65	212.9	—67.0	3	G	M	„	
220	1929—Feb.	10.65	221.5	—39.1	5	G	M	„	
221	1929—Feb.	13.66	189.0	—61.0	3	F	M	233.7	
222	1929—Feb.	13.66	205.5	—42.2	6	G	M	„	218.
223	1931—Feb.	15-18	53.0	—19.3	5	F	G	237.2	215.
224	1931—Feb.	15-18	59.5	—27.0	3	P	G	„	
225	1931—Feb.	15-18	71.0	—42.0	4	F	G	„	
226	1929—Mar.	9.64	241.5	—43.0	7	F	M	257.7	
227	1929—Mar.	9.64	235.0	—19.0	4	P	M	257.7	D. 178, 2; NZ 138.
228	1929—Mar.	9.64	272.0	—40.0	4	P	M	„	CrA.
229	1931—Mar.	13.41	29.0	—26.0	1	F	G	261.0	Stationary meteor.
230	1931—Mar.	13.41	100.0	—47.5	3	F	G	„	
231	1929—Mar.	13.67	231.3	—42.0	5	G	M	261.6	? BAA 158.
232	1929—Mar.	13.67	272.0	—40.0	3	F	M	„	CrA.
233	1931—Mar.	13-14	72.0	—53.5	7	G	G	261.5	Inc. 1 statn.
234	1931—Mar.	13-14	170.0	—40.0	5	F	G	„	? 244.
235	1931—Mar.	20.43	197.0	—31.0	4	F	G	268.0	
236	1931—Mar.	20.43	219.0	—45.0	5-7	G	G	„	
237	1929—Mar.	20.68	272.0	—21.5	4	G	M	268.6	
238	1929—Mar.	20.68	272.0	—40.5	7	G	M	„	CrA.
239	1931—Mar.	21.66	176.0	—24.0	4	F	M	269.1	9, 240, AMS 888; Comet 1556.
240	1931—Mar.	26.66	180.0	—24.0	2	F	M	274.1	9, 239; Comet 1264.
241	1931—Mar.	26.66	219.0	—11.5	5	F	M	„	? 246.
242	1931—Mar.	26.66	241.5	—27.0	5	G	M	„	? 10.
243	1931—Mar.	26.66	276.0	—44.0	5	F	M	„	CrA.
244	1931—Mar.	28.49	178.0	—41.0	4-5	F	G	276.0	? 234.
245	1931—Mar.	28.49	213.0	—45.0	3-4	G	G	„	
246	1931—Mar.	28.49	217.5	—15.5	5	G	G	„	? 241.
247	1931—Mar.	28.49	240.5	—19.5	3	F	G	„	BAA 21.
248	1931—Mar.	28.49	247.5	—39.0	3	F	G	„	
249	1929—Apl.	3-6	241.0	— 4.0	5	G	M	—	D. 187, 4; 187, 5; 178 ?
250	1929—Apl.	3-6	261.5	—32.0	7	G	M	—	
251	1929—Apl.	4-6	230.0	—21.0	8	G	M	—	Chi Lib.
252	1929—Apl.	4-6	247.5	—50.0	7	G	M	—	D. 189.
253	1929—Apl.	4-6	285.0	—53.0	7	G	M	—	? 11.
254	1929—Apl.	5-6	212.0	—13.0	6	G	M	—	D. 166, 4; 166, 8; 158, 11; AMS 924.
255	1931—Apl.	13.42	191.5	—15.5	6	G	G	291.6	266.
256	1931—Apl.	13.42	205.5	+ 0.7	5-7	G	G	„	267.
257	1931—Apl.	13.42	209.0	—27.0	5-7	F	G	„	Comet 1737i.
258	1931—Apl.	13.42	218.0	—64.5	4	G	G	„	268.
259	1931—Apl.	13.42	235.0	—18.0	5	F	G	„	Chi Lib.
260	1931—Apl.	13.69	233.5	—19.5	8	G	M	291.8	Chi Lib.

TABLE 2.—List of Radiant Points Observed—Continued.

No.	Date.	G.M.T.	Radiant. R.A.	Dec.	Mets.	Wt.	Obs.	L.	Remarks.
			°	°				°	
261	1931—Apl.	13.69	260.5	—36.0	5	G	M	291.8	29. 279, ? 290.
262	1931—Apl.	13.69	266.0	— 9.5	2	F	M	„	Nu Oph.
263	1929—Apl.	13.70	232.5	—20.5	6	G	M	292.3	Chi Lib.
264	1929—Apl.	13.70	270.0	—10.0	4	F	M	„	Nu Oph
265	1929—Apl.	13.70	307.5	—65.0	4	G	M	„	? 281.
266	1931—Apl.	14.50	192.0	—14.0	3	G	G	292.7	255; ? D. 158, 19.
267	1931—Apl.	14.50	209.0	— 4.0	3	F	G	„	256; ? D. 158, 14.
268	1931—Apl.	14.50	215.0	—65.0	4-5	G	G	„	258.
269	1931—Apl.	14.50	233.5	—39.0	6	G	G	„	273.
270	1931—Apl.	14.50	275.5	—32.5	3	F	G	„	Delta Sgr.
271	1931—Apl.	13-14	279.0	—39.0	5-6	F	M	292.4	Delta Sgr.
272	1931—Apl.	13-14	304.5	—34.5	7-8	G	M	„	Sgr.
273	1931—Apl.	15.43	234.0	—40.0	6	G	G	293.6	269.
274	1931—Apl.	15.43	237.0	—19.5	3	P	G	„	Chi Lib.
275	1931—Apl.	15.43	270.0	—10.0	2	P	G	„	Nu Oph.
276	1931—Apl.	15.43	275.0	—30.0	2	F	G	„	Delta Sgr.
277	1929—Apl.	15.68	152.5	—67.0	3	F	M	294.2	
278	1929—Apl.	15.68	233.5	—20.0	3	G	M	„	Chi Lib.
279	1929—Apl.	15.68	260.0	—36.0	10	G	M	„	261, 299, ? 290.
280	1929—Apl.	15.68	269.0	— 9.0	4	F	M	„	Nu Oph.
281	1929—Apl.	15.68	301.0	—68.0	2	P	M	„	? 265.
282	1929—Apl.	15.68	301.0	—31.0	5	G	M	„	Sgr.
283	1929—Apl.	16.69	238.3	—21.0	4	G	M	295.2	Chi Lib.
284	1929—Apl.	16.69	267.0	—10.0	2	P	M	„	Nu Oph.
285	1929—Apl.	16.69	288.0	+ 7.7	7	G	M	„	Aql.
286	1929—Apl.	16.69	300.0	—30.5	4	G	M	„	Sgr.
287	1929—Apl.	16.69	300.0	—53.0	3	F	M	„	? 16, ? 294.
288	1931—Apl.	17.44	226.5	—23.0	3	F	G	295.5	? 297.
289	1929—Apl.	17.68	232.5	—21.0	2	P	M	296.2	Chi Lib.
290	1929—Apl.	17.68	258.5	—42.5	6	G	M	„	? 261, ? 279.
291	1929—Apl.	17.68	269.0	—10.0	3	G	M	„	Nu Oph.
292	1929—Apl.	17.68	273.5	—28.5	5	G	M	„	Delta Sgr.
293	1929—Apl.	17.68	290.0	+ 7.0	2	P	M	„	Aql.
294	1929—Apl.	17.68	297.0	—57.5	2	P	M	„	146, ? 287.
295	1929—Apl.	17.68	300.0	—30.5	2	P	M	„	Sgr.
296	1931—Apl.	21.50	203.5	—22.4	4-5	F	G	299.5	
297	1931—Apl.	21.50	229.5	—18.7	5	G	G	„	? Chi Lib.; ? 288.
298	1931—Apl.	21.50	269.0	—45.5	4	G	G	„	
299	1931—Apl.	21.50	269.5	—37.3	4	F	G	„	261, 279, ? 290.
300	1929—Apl.	21.69	238.5	—21.7	3	F	M	300.0	Chi Lib.
301	1929—Apl.	21.69	272.2	32.7	6	G	M	„	Lyrids.
302	1929—Apl.	21.69	277.0	—34.7	7	G	M	„	Delta Sgr.
303	1929—Apl.	21.69	289.3	+ 2.5	7	G	M	„	Aql.
304	1929—Apl.	21.69	303.0	—30.0	4	G	M	„	Sgr.
305	1931—Apl.	22.69	245.0	—35.0	4-5	F	M	300.7	
306	1931—Apl.	22.69	272.0	—14.0	3	P	M	300.7	Nu Oph.
307	1931—Apl.	22.69	272.5	+33.0	4	G	M	„	Lyrids.
308	1931—Apl.	22.69	278.0	—34.0	2-3	F	M	„	Delta Sgr.
309	1931—Apl.	23.50	259.0	—67.5	3	P	G	301.5	
310	1931—Apl.	28.68	285.0	—38.0	3-4	G	M	306.5	318.
311	1931—Apl.	28.68	325.0	—28.5	3	F	M	„	
312	1931—Apl.	28.68	330.5	— 5.0	2	?	M	„	? Early Aquarids.
313	1930—Apl.	29.69	251.0	—28.7	5	G	M	307.7	
314	1930—Apl.	29.69	270.0	—10.0	4-5	F	M	„	Nu Oph.
315	1930—Apl.	29.69	321.0	—19.0	3	F	M	„	Delta Cap.
316	1930—Apl.	29.69	330.3	— 3.5	5	F	M	„	Aquarids.
317	1930—May	2.69	270.5	—27.0	2	F	M	310.6	Lambda Sgr.
318	1930—May	2.69	286.0	—37.0	3	F	M	„	D. 217, 1; NZ 310.
319	1930—May	2.69	334.0	— 2.0	19	G	M	„	Aquarids.

TABLE 2.—List of Radiant Points Observed—Continued.

No.	Date.	G.M.T.	Radiant. R.A.	Dec.	Mets.	Wt.	Obs.	L.	Remarks.
			°	°				°	
320	1929—May	2.70	272.5	—35.0	8	G	M	310.9	Lambda Sgr.
321	1929—May	2.70	334.0	— 1.5	18	G	M	„	Aquarids.
322	1929—May	2-3	313.0	—42.0	5	G	M	„	
323	1929—May	2-3	326.0	—17.5	3	F	M	„	Delta Cap.
324	1930—May	4.69	271.0	—29.0	3	F	M	312.6	Lambda Sgr.
325	1930—May	4.69	302.3	—21.5	6	G	M	„	
326	1930—May	4.69	322.0	—16.0	3	F	M	„	Delta Cap.
327	1930—May	4.69	324.0	— 4.5	6-7	G	M	„	Inc. 1 stn. Alpha Aqr.
328	1930—May	4.69	326.0	—35.0	3	F	M	„	Iota PsA.
329	1930—May	4.69	336.5	— 1.5	36	G	M	„	Aquarids.
330	1929—May	5.69	257.0	0.0	3	F	M	313.9	D. 193, 1.
331	1929—May	5.69	272.0	—27.3	8	G	M	„	Lambda Sgr.
332	1929—May	5.69	326.0	—17.5	6	G	M	„	Delta Cap.
333	1929—May	5.69	327.4	—35.0	6	G	M	„	Iota PsA.
334	1929—May	5.69	337.5	— 1.0	19	G	M	„	Aquarids.
335	1930—May	5.69	277.0	—27.0	3	F	M	313.6	Lambda Sgr.
336	1930—May	5.69	327.0	—33.0	2-3	P	M	„	Iota PsA.
337	1930—May	5.69	337.0	— 1.0	33	G	M	„	Aquarids.
338	1929—May	6.65	338.6	0.0	5	F	M	314.9	Aquarids.
339	1929—May	6.69	272.0	—27.0	5	G	M	314.6	Lambda Sgr.
340	1930—May	6.69	305.0	17.0	3	F	M	„	Beta Del.
341	1930—May	6.69	325.5	—34.5	4.5	G	M	„	Iota PsA.
342	1930—May	6.69	326.0	—16.5	3	F	M	„	Delta Cap.
343	1930—May	6.69	327.0	— 2.5	8-9	G	M	„	Alpha Aqr.
344	1930—May	6.69	338.0	— 0.5	38	G	M	„	Aquarids.
345	1930—May	6.69	356.0	— 5.0	4	G	M	„	
346	1930—May	7.68	270.0	—30.0	3	P	M	315.6	Lambda Sgr.
347	1930—May	7.68	298.5	— 1.2	4	F	M	„	D. 230, 5.
348	1930—May	7.68	308.0	15.0	5	G	M	„	Beta Del.
349	1930—May	7.68	324.5	—15.0	3	F	M	„	Delta Cap.
350	1930—May	7.68	329.0	— 1.0	5-7	G	M	„	Alpha Aqr.
351	1930—May	7.68	339.0	0.0	28	G	M	„	Aquarids.
352	1930—May	7.68	351.0	—46.0	3	F	M	„	
353	1929—May	7.69	249.0	—15.0	4	F	M	315.9	D. 190, 3.
354	1929—May	7.69	271.0	—10.0	3	F	M	„	
355	1929—May	7.69	302.5	—12.5	7	G	M	„	Beta Cap.
356	1929—May	7.69	307.0	14.0	3	F	M	„	Beta Del.
357	1929—May	7.69	308.0	—48.0	6	G	M	„	Alpha Ind.
358	1929—May	7.69	339.0	— 0.4	24	G	M	„	Aquarids.
359	1930—May	8.67	307.5	+14.5	3	G	M	316.5	Beta Del.
360	1930—May	8.67	330.0	— 1.0	3	G	M	„	Alpha Aqr.
361	1930—May	8.67	336.5	— 0.5	3-4	G	M	„	
362	1930—May	8.67	338.0	—30.5	5	G	M	„	
363	1930—May	8.67	340.0	+ 0.5	13	G	M	316.5	Aquarids.
364	1929—May	8.69	273.0	—32.0	3	P	M	316.8	Lambda Sgr.
365	1929—May	8.69	302.5	—15.0	9	G	M	„	Beta Cap.
366	1929—May	8.69	307.5	+14.5	4	G	M	„	Beta Del.
367	1929—May	8.69	308.0	—49.0	6	G	M	„	Alpha Ind.
368	1929—May	8.69	325.0	—36.0	2	P	M	„	Iota PsA.
369	1929—May	8.69	339.0	+ 0.3	10	G	M	„	Aquarids.
370	1930—May	7-8	310.5	—49.3	5	G	M	316.0	Alpha Ind.
371	1929—May	9-10	245.0	—60.0	3	F	M	317.9	BAA 163.
372	1929—May	9-10	275.0	—32.5	3	F	M	„	Lambda Sgr.
373	1929—May	9-10	300.0	—26.0	3	F	M	„	378.
374	1931—May	11.66	339.5	+ 2.0	2	P	M	319.2	? Aquarids.
375	1929—May	11.69	237.5	+ 1.0	4	P	M	319.7	? D. 177, 9; ? D. 187, 6.
376	1929—May	11.69	242.0	—30.5	10	G	M	„	
377	1929—May	11.69	275.0	—28.0	3	P	M	„	Lambda Sgr.
378	1929—May	11.69	301.0	—24.5	8	G	M	„	373.
379	1929—May	11.69	302.0	—15.0	7	F	M	„	Beta Cap.
380	1929—May	11.69	307.7	+14.0	7	G	M	„	Beta Del.
381	1929—May	11.69	342.7	+ 2.5	21	G	M	„	Aquarids.

TABLE 2.—List of Radiant Points Observed—Continued.

No.	Date.	G.M.T.	Radiant. R.A.	Dec.	Mets.	Wt.	Obs.	L.	Remarks.
			°	°				°	
382	1931—May	13.66	341.0	+ 2.0	3	P	M	321.2	? Aquarids.
383	1931—May	13-14	234.0	—54.0	4	G	G	321.6	
384	1931—May	22.49	259.0	—23.5	7	G	G	329.7	? 25, ? 32.
385	1929—June	1.54	286.5	—38.0	4	F	M	340.0	152.
386	1931—June	7.43	264.5	—42.5	8	G	G	345.3	
387	1929—June	8.62	272.0	—12.0	4	P	M	346.9	D. 204, 3; AMS 1040.
388	1929—June	8.62	277.0	—35.0	9	G	M	„	156; D. 210, 4.
389	1929—June	8.62	296.0	+ 1.0	4	F	M	„	D. 230, 7; AMS 1069.
390	1929—June	8.62	327.0	+ 0.5	3	G	M	„	D. 251, 1; D. 260, 1.
391	1931—June	14.44	275.5	—27.0	3	P	G	352.1	Lambda Sgr.
392	1931—June	15.46	254.0	—51.5	6-7	G	G	353.1	
393	1931—June	15.46	268.5	—28.0	4-5	G	G	„	D. 210, 5.
394	1931—June	15.46	276.5	—26.5	4-5	G	G	„	Lambda Sgr.
395	1931—June	15.46	285.0	—15.0	11	G	G	„	D. 218, 3; NZ 402.
396	1931—June	15.46	291.0	—27.5	4-5	F	G	„	? 40.
397	1931—June	15.46	313.5	—55.0	3-4	F	G	„	
398	1931—June	18.52	272.5	—23.0	3-4	F	G	356.0	? Lambda Sgr.
399	1931—June	18.52	292.0	— 5.0	4-6	G	G	„	
400	1931—June	18.52	292.0	—18.0	6-8	G	G	„	403.
401	1931—June	19.56	277.8	—24.5	6	G	G	357.0	Lambda Sgr.
402	1931—June	19.56	282.0	—11.5	4	F	G	„	395; D. 218, 3; AMS 1040.
403	1931—June	19.56	289.0	—18.0	3	F	G	„	400.
404	1929—July	2.69	10.0	+ 5.0	8	P	M	10.3	D. 2, 1; Comet 1864ii.
405	1929—July	2.69	310.5	—13.0	3	F	M	„	410; AMS 1098; D. 249, 1.
406	1929—July	2.69	334.0	—30.0	8	G	M	„	Beta PsA.
407	1929—July	2.69	348.5	— 9.5	5	G	M	„	Psi 1 Aqr.
408	1929—July	2.69	353.0	+25.0	5	P	M	„	D. 5, 1; ? D. 274, 1; Comet 1908c.
409	1929—July	3.68	286.0	—28.0	6	F	M	11.3	D. 221, 2; 227, 3; BAA 177.
410	1929—July	3.68	310.5	—14.0	4	F	M	„	405; AMS 1098; D. 249, 1.
411	1929—July	3.68	334.0	—31.0	5	G	M	„	Beta PsA.
412	1929—July	3.68	348.5	— 9.0	4	G	M	„	Psi 1 Aqr.
413	1929—July	2-3	326.0	—22.0	4	G	M	—	? 45.
414	1929—July	4.69	316.0	—36.0	7	F	M	12.2	425; ? D. 239, 1.
415	1929—July	4.69	334.0	—32.0	5	F	M	„	Beta PsA.
416	1929—July	4.69	348.5	— 9.0	10	G	M	„	Psi 1 Aqr.
417	1929—July	5.67	290.0	— 9.0	6	F	M	13.1	D. 226, 6.
418	1929—July	5.67	301.0	— 7.5	4	F	M	13.1	Cap. I.
419	1929—July	5.67	350.0	— 9.0	4	F	M	„	Psi 1 Aqr.
420	1929—July	6.46	287.0	—23.8	4	G	G	13.3	54; 431.
421	1929—July	8.66	348.5	— 8.0	5	G	M	16.0	Psi 1 Aqr.
422	1929—July	10.69	37.5	+ 4.7	5	F	M	17.9	D. 26, 1.
423	1929—July	10.69	302.0	—15.0	6	F	M	„	Cap. II.
424	1929—July	10.69	351.0	—41.0	5	G	M	„	449; D. 275, 1.
425	1929—July	8-10	312.0	—34.0	4	P	M	17.0	414.
426	1931—July	10-11	260.0	—60.0	4	G	G	17.7	
427	1931—July	10-11	305.0	—64.0	4	G	G	„	
428	1931—July	10-11	306.0	—30.7	5	G	G	„	
429	1931—July	10-11	323.0	—42.0	5	G	G	„	66.
430	1931—July	14.49	25.0	— 8.5	3	G	G	21.2	Inc. 1 stn. 49.
431	1931—July	14.49	291.7	—22.0	6-7	G	G	„	54, 63, 420.
432	1931—July	14.49	307.0	— 7.5	3	F	G	„	Cap. I.
433	1931—July	14.49	324.0	—52.0	4	G	G	„	
434	1931—July	14.49	309.0	—23.5	3	G	G	21.4	
435	1931—July	14-15	302.0	—17.0	6	G	G	21.7	Cap. II.
436	1931—July	14-15	344.0	—29.7	4	G	G	„	
437	1931—July	16-17	277.5	—37.0	6	G	G	23.7	? 53, A1461.
438	1931—July	16-17	300.5	—18.0	4-5	F	G	„	Cap. II.

TABLE 2.—List of Radiant Points Observed—Continued.

No.	Date.	G.M.T.	Radiant. R.A.	Dec.	Mets.	Wt.	Obs.	L.	Remarks.
			°	°				°	
439	1931—July	20.49	267.0	—30.0	5	G	G	27.0	62; Comet 568.
440	1931—July	20.49	311.0	—10.0	15	G	G	„	Cap. I.
441	1931—July	20.49	351.5	—39.0	4	G	G	„	
442	1929—July	26.67	337.0	—33.0	4	P	M	33.5	Alpha PsA.
443	1929—July	26.67	339.6	—17.0	5	G	M	„	Delta Aquarids.
444	1929—July	28.66	341.0	—16.5	8	G	M	35.5	Delta Aquarids.
445	1930—July	28.70	341.0	—17.0	26	G	M	35.7	Delta Aquarids.
446	1930—July	29.68	27.0	—11.0	3	F	M	36.7	? 464.
447	1930—July	29.68	341.7	—15.7	21	G	M	„	Delta Aquarids.
448	1930—July	29.68	346.0	—26.0	4	G	M	„	Alpha PsA.
449	1930—July	29.68	355.0	—40.0	3	F	M	„	424; D. 275, 1.
450	1930—July	28-29	3.0	—21.5	5	G	M	36.2	Beta Cet.
451	1930—July	28-29	10.0	—34.0	7-8	F	M	„	? 457; AMS 547.
452	1930—July	28-29	308.0	—10.0	8	F	M	„	Cap. I.
453	1929—July	30.65	343.5	—15.5	12	G	M	37.4	Delta Aquarids.
454	1930—July	30.68	343.0	—30.0	5	P	M	37.7	Alpha PsA.
455	1930—July	30.68	344.0	—15.5	14	G	M	„	Delta Aquarids.
456	1930—July	31.70	2.5	—19.5	2	P	M	38.7	Beta Cet.
457	1930—July	31.70	17.0	—35.0	3-6	P	M	„	? 451.
458	1930—July	31.70	37.0	—37.5	3-5	F	M	„	
459	1930—July	31.70	343.0	—29.0	5-6	F	M	„	Alpha PsA.
460	1930—July	31.70	344.5	—15.0	22	G	M	„	Delta Aquarids.
461	1930—July	31.70	346.0	—22.0	5-7	G	M	„	475.
462	1930—July	31.70	351.0	+ 5.0	5-6	P	M	„	Iota Psc.
463	1929—July	31.71	6.0	—20.0	3	F	M	38.4	Beta Cet. ?
464	1929—July	31.71	33.0	—14.5	3·	F	M	„	? 446.
465	1929—July	31.71	49.0	+22.0	4	G	M	„	492, 511.
466	1929—July	31.71	66.0	—42.0	4	P	M	„	481, ? 494.
467	1929—July	31.71	342.0	—33.0	9	F	M	„	Alpha PsA.
468	1929—July	31.71	344.5	—15.0	9	G	M	„	Delta Aquarids.
469	1929—Aug.	1.45	343.0	—18.0	3-5	G	B	39.7	Inc. 1 stn.
470	1929—Aug.	1.45	347.5	—14.0	6	G	B	„	Delta Aquarids.
471	1930—Aug.	1.68	6.0	—41.0	4	F	M	39.5	84.
472	1930—Aug.	1.68	39.0	— 1.5	5	F	M	„	510.
473	1930—Aug.	1.68	51.0	—40.0	5	F	M	„	
474	1930—Aug.	1.68	317.0	—22.5	10	G	M	39.5	? 497, ? 549.
475	1930—Aug.	1.68	345.0	—24.5	7	G	M	„	461.
476	1930—Aug.	1.68	346.0	—14.0	11	G	M	„	Delta Aquarids.
477	1930—Aug.	1.68	352.0	+ 3.5	4	G	M	„	Iota Psc.
478	1929—Aug.	1.69	7.5	—21.0	5-7	G	M	39.4	Beta Cet.
479	1929—Aug.	1.69	52.0	—24.0	3	P	M	„	
480	1929—Aug.	1.69	54.0	+ 1.0	4	F	M	„	493, D. 49, 2.
481	1929—Aug.	1.69	64.0	—41.5	4-6	F	M	„	466, ? 494.
482	1929—Aug.	1.69	342.6	+32.2	5	G	M	„	Alpha PsA.
483	1929—Aug.	1.69	345.7	—14.5	19	G	M	„	Delta Aquarids.
484	1929—Aug.	1.69	350.5	+ 2.5	6-7	G	M	„	Iota Psc.
485	1929—Aug.	1.69	359.0	—21.0	3-4	G	M	„	Beta Cet.
486	1931—Aug.	2.39	343.0	—16.0	3-4	F	G	39.6	Delta Aquarids.
487	1929—Aug.	1-3	67.0	—31.0	4	G	M	40.3	
488	1929—Aug.	3.66	2.5	—20.0	4-6	F	M	41.3	Beta Cet.
489	1929—Aug.	3.66	22.0	+18.0	3	P	M	„	508, D. 16, 1; 16, 3; AMS 68, AMS 588.
490	1929—Aug.	3.66	27.0	+21.0	5	F	M	„	D. 27, 5; AMS 594, 206.
491	1929—Aug.	3.66	39.5	—15.5	10	G	M	„	509; Comets 1852ii and 1877ii.
492	1929—Aug.	3.66	48.0	—21.0	5-6	G	M	„	D. 34, 1; NZ 465, 511, 531.
493	1929—Aug.	3.66	55.0	+ 2.0	3	F	M	„	480, D. 49, 2.
494	1929—Aug.	3.66	75.0	—41.0	4	F	M	„	? 466, ? 481.
495	1929—Aug.	3.66	303.5	—10.5	7	G	M	„	Alpha Cap.
496	1929—Aug.	3.66	319.0	—16.0	6	G	M	„	Iota Cap.

TABLE 2.—List of Radiant Points Observed—Continued.

No.	Date.	G.M.T.	Radiant. R.A.	Dec.	Mets.	Wt.	Obs.	L.	Remarks.
			o	o				o	
497	1929—Aug.	3.66	324.0	—23.0	7	P	M	41.3	? 474, D. 252, 11; 249, 11; 252, 9; AMS 1125, 1483, 1485.
498	1929—Aug.	3.66	335.0	—45.5	3	F	M	,,	
499	1929—Aug.	3.66	337.5	+12.5	4	G	M	,,	D. 261, 11; 261, 15.
500	1929—Aug.	3.66	346.0	—33.0	12	G	M	,,	Alpha PsA.
501	1929—Aug.	3.66	347.3	—13.7	17	G	M	,,	Delta Aquarids.
502	1931—Aug.	4.49	342.5	—33.5	4-5	G	G	41.5	Alpha PsA.
503	1931—Aug.	4.49	348.0	—15.0	9	G	G	,,	Delta Aquarids.
504	1929—Aug.	4.54	327.0	—15.3	4	G	B	42.1	? Iota Cap.
505	1929—Aug.	4.54	321.0	— 2.0	3	G	B	,,	Beta Aqr.
506	1929—Aug.	4.66	0.5	—23.5	4	F	M	42.2	Beta Cet.
507	1929—Aug.	4.66	9.0	—12.5	5	G	M	,,	542, D. 4, 2.
508	1929—Aug.	4.66	23.0	+16.0	3	F	M	,,	489.
509	1929—Aug.	4.66	39.0	—16.0	4-5	G	M	,,	491, Comets 1852ii, 1877i.
510	1929—Aug.	4.66	39.0	+ 1.0	3	F	M	,,	472.
511	1929—Aug.	4.66	49.0	—21.0	2-3	F	M	,,	465, 492, ? 531.
512	1929—Aug.	4.66	304.0	—10.5	2	F	M	,,	Alpha Cap.
513	1929—Aug.	4.66	333.5	— 0.5	4	F	M	,,	Zeta Aqr. Inc. 1 stn.
514	1929—Aug.	4.66	347.0	—33.0	4	P	M	,,	Alpha PsA.
515	1929—Aug.	4.66	348.5	—13.3	10	G	M	,,	Delta Aquarids.
516	1931—Aug.	2-4	304.0	—11.0	7	G	G	40.5	Alpha Cap.
517	1931—Aug.	5.44	321.0	— 9.0	13	G	G	42.5	Beta Aqr.
518	1931—Aug.	5.44	322.0	—17.5	13	G	G	,,	Iota Cap.
519	1931—Aug.	5.44	336.0	—13.0	9	G	G	,,	Sigma Aqr.
520	1931—Aug.	5.44	350.0	—14.0	4-5	G	G	,,	Delta Aquarids.
521	1931—Aug.	6.47	288.5	—45.5	3	F	G	43.5	
522	1931—Aug.	6.47	319.5	— 6.5	3	F	G	,,	Beta Aqr.
523	1931—Aug.	6.47	349.5	—14.0	10	G	G	,,	Delta Aquarids.
524	1931—Aug.	5-6	297.0	—22.0	8	P	G	,,	525, ? 63.
525	1931—Aug.	7.51	297.0	—22.0	6	F	G	44.5	524, ? 63.
526	1931—Aug.	7.51	324.0	—14.5	6	G	G	,,	Iota Cap.
527	1931—Aug.	7.51	336.0	0.0	4	G	G	,,	Zeta Aqr.
528	1931—Aug.	7.51	351.0	—19.5	3	G	G	,,	d1 Aqr.
529	1931—Aug.	7.51	352.0	—12.5	12	G	G	44.5	Delta Aquarids.
530	1929—Aug.	8.67	6.0	+12.5	4	G	M	46.1	D. 3, 7; 3, 10.
531	1929—Aug.	8.67	43.5	—27.0	4	G	M	,,	? 511, ? 492.
532	1929—Aug.	8.67	271.0	—34.5	1	G	M	,,	1 stn.
533	1929—Aug.	8.67	321.0	— 6.0	3	F	M	,,	Beta Aqr.
534	1929—Aug.	8.67	350.0	—30.5	5	G	M	,,	Alpha PsA.
535	1929—Aug.	8.67	352.3	—11.5	8	G	M	,,	Delta Aquarids.
536	1931—Aug.	9.56	18.5	+ 2.5	3	G	G	46.5	
537	1931—Aug.	9.56	29.0	—20.0	6	G	G	,,	Comet 1877ii.
538	1931—Aug.	9.56	336.5	— 1.0	5	G	G	,,	Zeta Aqr.
539	1931—Aug.	9.56	340.3	—26.7	7-8	G	G	,,	Alpha PsA.
540	1931—Aug.	9.56	352.0	—21.5	6	G	G	,,	d1 Aqr.
541	1931—Aug.	9.56	352.5	—12.0	10	G	G	,,	Delta Aquarids.
542	1929—Aug.	12.68	9.5	—14.0	3-4	G	M	50.0	507.
543	1929—Aug.	12.68	22.5	— 7.5	4-5	G	M	,,	D. 24, 1.
544	1929—Aug.	12.68	80.0	—42.5	4	F	M	,,	
545	1929—Aug.	12.68	326.0	—35.4	5	G	M	,,	? 559, AMS 1493.
546	1929—Aug.	12.68	330.7	—13.4	5	G	M	,,	Sigma Aqr.
547	1929—Aug.	12.68	350.0	—21.5	1	G	M	,,	d1 Aqr.
548	1931—Aug.	13.52	11.0	—30.5	10	P	G	50.2	557.
549	1931—Aug.	13.52	314.0	—23.0	5-6	G	G	,,	? 474, ? 497.
550	1931—Aug.	13.52	335.0	—13.0	5	G	G	,,	Sigma Aqr.
551	1931—Aug.	13.52	336.5	—26.0	3-6	F	G	,,	75.
552	1931—Aug.	13.52	350.5	— 5.7	7-9	G	G	,,	BAA 1103 ?, AMS 1191 ?
553	1929—Aug.	13.67	350.0	—60.0	3	P	M	51.0	? 78, D. 269, 1.
554	1929—Aug.	13.67	350.0	—22.0	2-4	F	M	,,	? 77, d1 Aqr.

TABLE 2.—List of Radiant Points Observed—Continued.

No.	Date.	G.M.T.	Radiant. R.A.	Dec.	Mets.	Wt.	Obs.	L.	Remarks.
			°	°				°	
555	1929—Aug.	12-13	2.5	—36.0	6	G	M	50.5	
556	1929—Aug.	12-13	14.0	—42.0	6	P	M	„	
557	1931—Aug.	14.50	11.5	—33.0	3	P	G	51.2	548.
558	1931—Aug.	14.50	23.7	—15.0	1	G	G	„	1 stn.
559	1931—Aug.	14.50	327.0	—30.0	7	G	G	„	? 545.
560	1931—Aug.	21.66	39.0	+ 9.5	5	G	G	58.3	
561	1931—Aug.	21.66	52.5	— 9.5	3	G	G	„	567; Comet 1596, 1845iii.
562	1931—Aug.	21.66	61.0	— 2.5	5	G	G	„	
563	1931—Aug.	21.66	81.5	— 7.5	1	G	G	„	1 stn.
564	1931—Aug.	21.66	103.0	—50.3	4	G	G	„	
565	1929—Aug.	31.57	11.0	—17.0	3	G	M	68.8	? D. 14.
566	1929—Sept.	1.66	44.8	—19.7	4	G	M	69.8	? D. 34.
567	1929—Sept.	1.66	55.0	—11.5	5	G	M	„	? D. 51, 7; NZ 561; Comet 1845iii.
568	1930—Sept.	22.67	82.0	+15.0	3-5	F	M	90.3	
569	1930—Sept.	22.67	84.0	+ 4.0	1-3	F	M	„	
570	1931—Oct.	2.51	28.7	— 9.5	4	P	G	99.3	
571	1931—Oct.	2.51	55.0	— 5.0	4	G	G	„	
572	1929—Oct.	5.61	41.4	— 2.3	6	G	M	102.8	D. 41, 3.
573	1929—Oct.	5.61	59.1	—13.2	6	G	M	„	D. 51, 9; 51, 10.
574	1929—Oct.	5-6	67.6	+ 7.3	8	G	M	103.3	See D. 57.
575	1929—Oct.	5-6	74.0	—52.5	4	F	M	„	
576	1929—Oct.	5.6	98.0	+15.0	5	F	M	„	D. 79.
577	1931—Oct.	16-61	31.5	—12.0	3-4	F	B	113.2	
578	1931—Oct.	16.61	59.0	— 8.5	3-4	G	B	„	Comet 1580.
579	1931—Oct.	16.61	86.0	—16.0	6	G	B	„	D. 71, 3; ? 100.
580	1931—Oct.	16.61	96.0	—17.0	3	P	B	„	Alpha CMa.
581	1931—Oct.	16.61	96.0	—16.0	4	P	Bu	„	Alpha CMa.
582	1931—Oct.	22.65	98.0	+15.3	3	F	M	119.1	Orionids.
583	1931—Oct.	22.65	99.0	—17.0	3	P	M	„	Alpha CMa.
584	1931—Nov.	15.64	115.0	— 9.3	1	G	M	143.0	1 stn.
585	1931—Nov.	18.62	150.7	+21.4	4	G	G	146.0	Leonids.
586	1931—Dec.	3.51	73.5	+12.0	3	F	G	160.8	AMS 417.
587	1931—Dec.	3.51	117.0	—40.0	6	G	G	„	592.
588	1931—Dec.	3.51	122.0	—50.8	5	G	G	„	
589	1931—Dec.	4.51	65.0	— 8.3	2	G	G	161.8	1 stn.
590	1931—Dec.	4.51	92.3	+19.5	4	F	G	„	AMS 295.
591	1931—Dec.	4.51	113.0	—44.8	5-6	G	G	„	Sigma Pup.
592	1931—Dec.	4.51	118.3	—40.8	3	F	G	„	587.
593	1931—Dec.	3-4	102.0	+27.5	2	P	G	161.3	Geminids.
594	1931—Dec.	3-4	102.3	—48.2	5	G	G	„	? 124.
595	1931—Dec.	3-4	147.0	—47.5	5	G	G	„	
596	1931—Dec.	10.54	82.5	—28.8	1	G	G	167.5	1 stn.
597	1931—Dec.	10.54	113.0	—41.7	4-5	F	G	„	Sigma Pup.
598	1931—Dec.	10.54	127.1	— 3.3	4	G	G	„	
599	1931—Dec.	10 54	130.0	—33.0	3	G	G	„	125.
600	1931—Dec.	10.54	131.0	—62.0	2-4	G	G	„	
601	1929—Dec.	12.64	117.0	—47.5	3	F	M	170.5	*Sigma* Pup.
602	1931—Dec.	13.62	101.0	+28.5	5	G	M	170.9	Geminids.
603	1931—Dec.	28-30	120.0	—21.5	5	F	G	—	

In the remarks column, D refers to Denning's General Catalogue of Meteor Radiants, the first figures to the group, the final ones to the radiant number; AMS refers to the various lists of the American Meteor Society; BAA to the Meteor Memoirs of the British Astronomical Association; numbers without letters prefixed, or in some instances with NZ, refer to the radiants of the Meteor Section of the N.Z. Astronomical Society.

TABLE III.

MAGNITUDES OF METEORS (Percentages).

Year.	Obs.	>1	1	2	3	4	5	6	Total.
1925-28		4.44	14.87	15.69	22.15	24.70	14.05	4.14	2321
1929	M	3.46	15.20	19.13	20.47	18.13	17.61	6.00	1500
1929	B	—	11.32	8.49	18.87	37.74	21.70	1.88	106
1930	M	3.85	13.76	16.12	16.72	18.93	22.34	8.28	676
1931	G	4.37	9.34	16.60	20.77	26.21	16.53	6.18	1488
1931	M	6.98	18.77	19.21	15.72	16.16	20.97	2.19	229
1931	B	—	6.00	20.00	6.00	36.00	30.00	2.00	50
Average		4.11	13.55	16.80	20.44	22.89	16.84	5.37	6370

Average magnitude of all meteors observed, 3.0.
Average magnitude of meteors fainter than mag. 0, 3.3.

TABLE IV.

COLOURS OF METEORS (Percentages).

Year.	Obs.	Red.	Orange.	Yellow.	Green.	Blue.	White.	Total.
1925-28		9.93	1.92	2.03	1.92	5.32	78.88	1823
1929	M	8.55	5.50	2.53	4.28	4.99	68.15	1146
1930	M	4.02	3.60	1.05	1.48	5.61	82.24	473
1931	M	1.70	3.40	2.28	2.84	5.11	84.67	176
1931	G	10.69	5.65	6.25	2.17	6.69	68.55	1151
1929-31	B	2.63	0.66	—	6.58	4.60	85.53	152
Average.		8.70	3.80	2.99	2.66	7.15	74.70	4921

Percentage of meteors coloured, 25.30.

TABLE V.

DURATIONS OF METEORS (Percentages).

Year.	Obs.	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	>1.0	Total.
1929-31	B	—	11.5	12.1	—	30.2	—	8.4	7.7	—	14.7	15.4	156
1931	G	2.8	13.6	11.9	16.6	15.7	13.7	8.8	6.1	2.0	3.4	5.4	1416
1925-31	M	2.2	5.6	17.7	25.5	19.7	9.0	7.8	5.3	0.3	4.8	2.1	3233
Average		2.3	8.1	15.8	22.1	18.9	10.1	8.1	5.6	0.8	4.7	3.5	4805

N.B.—B's observations were recorded in quarter seconds.

Average duration of all meteors, 0.527 secs.
Average duration of meteors less than 1.1 secs., 0.483 secs.

TABLE VI.

LENGTH OF FLIGHT (Percentages).

Year.	Ob.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
1931	G	0.5	1.7	6.0	14.5	14.4	16.5	11.3	8.9	7.0	5.6	3.4
1925-31	M	0.3	0.6	2.9	5.0	7.1	8.7	8.8	8.7	6.4	6.2	5.8
All		0.4	1.0	3.9	8.2	9.5	11.3	9.6	8.7	6.6	6.0	5.0

Year.	Ob.	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	>20°
1931	G	2.1	1.6	0.9	1.1	0.5	0.4	0.3	0.2	0.4	0.3	2.4
1925-31	M	5.2	5.4	3.1	2.9	3.5	2.8	2.6	2.3	1.3	1.7	8.7
All		4.2	4.1	2.4	2.3	2.5	2.0	1.9	1.6	1.0	1.2	6.6

Average length of flight, all meteors, 9.98°
Average length of flight (< 1.1 secs.), 7.97°
Apparent velocity, all meteors, 18.9° per second.
Apparent velocity, meteors < 1.1secs., 16.4° per second.

TABLE VII.

MAGNITUDE-DURATION RELATION.

	All Meteors.				Meteors less than 1.1 secs.			
	Geddes.		McIntosh.		Geddes.		McIntosh.	
Mag.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.
>1	0.869s	58	0.800s	93	0.488s	43	0.642s	80
1	0.596	136	0.630	339	0.497	121	0.589	327
2	0.574	238	0.515	407	0.484	216	0.495	398
3	0.529	303	0.480	441	0.486	292	0.465	436
4	0.497	386	0.467	414	0.481	380	0.461	410
5	0.438	244	0.426	445	0.428	241	0.420	444
6	0.423	92	0.412	141	0.413	91	0.412	141

TABLE VIII.

COLOUR-DURATION RELATION.

	All Meteors.				Meteors less than 1.1 secs.			
	Geddes.		McIntosh.		Geddes.		McIntosh.	
Colour.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.
Red	0.720s	118	0.665s	115	0.592s	101	0.597s	107
Orange	0.762	62	0.498	85	0.582	51	0.461	82
Yellow	0.758	75	0.515	38	0.550	62	0.489	37
Green	0.763	24	0.665	60	0.600	20	0.623	56
Blue	0.580	76	0.713	171	0.463	68	0.613	156
White	0.488	783	0.552	1062	0.460	762	0.535	1054

TABLE IX.

REMARKABLE METEORS.

Abnormality.	Bateson.	Geddes.	McIntosh.	Totals.	Per cent.
Stationary - - -	—	7	9	16	0.3
Variable light - -	—	—	30	30	0.6
Irregular path - -	—	3	8	11	0.2
Halting motion -	—	—	5	5	0.1
Curved path - - -	1	2	6	9	0.2
Remarkable train -	—	4	4	8	0.2
Remarkable nucleus	—	3	14	17	0.3
Trains > 2s. - -	1	18	51	70	1.4
Totals - - - -	2	37	127	166	—
Total meteors - -	156	1500	3462	5118	—
Per cent. abnormal	1.3	2.4	3.7	3.2	—

EXPLANATION OF TABLES.

TABLE I.—*Details of Observations:* This table gives details of the watches performed by the various observers, and is similar in form to the first table of the preceding report. The rate actually observed per hour (col. 6) is corrected by a factor (col. 7) which attempts to make allowance for any hindrances to observing such

as clouds or moonlight. The corrected rate (col. 8) gives the number of meteors estimated to be visible in one hour to an observer working under perfect conditions. No allowance is made for the time taken to record the observations (about half a minute per meteor in the case of the writer). The estimation of rates has not been attempted where very short watches have been made, or where the hindrance to observation was too great for any certainty to be attached to the factor.

Table II.—*List of Radiants:* The 399 radiants contained in this table have been determined mainly from meteors observed within four hours on one night, at least four produced paths intersecting within a circle 2° in diameter, or three meteors on one night and two on an adjacent night, intersecting as described above, or one stationary meteor, being required to form a radiant. In some cases radiants are included on weaker evidence where they fit in with a series of good radiants, or where they are confirmed by radiants in other catalogues.

In some minor points the arrangement differs from that of the first report. Following the I.A.U. recommendation, the longitude of the meteoric apex, L, is now included. The radiants, however, remain in order of date. The weights assigned to the radiants, good, fair, or poor, are shown in the column following that of the number of meteors. The full notes previously given have been reduced to a bare mention of the catalogue numbers of related radiants. The more prominent meteor showers are fully described in a separate in a separate section (page 435). Where they occur in this table, therefore, no remarks are given, but each is denoted by a proper name, on the lines adopted in Denning's General Catalogue. Another feature is the omission from this report of doubtful radiants (Table III in the previous report). These have been found in most instances to have been included on insufficient data, and their continued publication would serve no useful purpose.

Table III.—*Magnitudes of Meteors:* This table of the observed magnitudes of meteors reveals that the meteors increase in numbers with decrease of brightness, until the fainter magnitudes are reached, where many meteors are undoubtedly missed because of their extreme faintness.

Tables IV, V, and VI.—*Colours, Durations, and Length of Flight:* These tables are designed to show the average appearance and range of variation of these features in the meteors observed.

Table VII.—*The Magnitude-Duration Relation:* This table reveals strikingly that average duration decreases with loss of brightness. Geddes has pointed out that the curve resulting from plotting these data closely resembles one arm of a parabola.

TABLE VIII.—*Colour-Duration Relation:* An interesting table in the first report of the American Meteor Society *(Trans. Amer. Phil. Soc.,* 22, pt. i) prompted the formation of a similar table from the data available. While supporting Dr Olivier's figures of the low average duration of yellow and orange meteors and the high average shown by blue and green meteors, the present table does not confirm his contention that the white meteors have the longest duration of all. The difference has probably arisen from the fact that where he used only meteors actually classed as white by the observer, in the present table any meteor not assigned a colour and brighter than the fifth magnitude (i.e., in which colour should have been seen if it were present) has been regarded as white.

In the preceding statistical tables a distinction has been drawn wherever possible between normal and abnormal meteors, the view being taken that any meteor with a duration greater than 1 sec. is not normal. This distinction has generally resulted in smoothing out irregularities in the data.

TABLE IX.—*Remarkable Meteors:* It may come as a surprise to the uninitiated that only three meteors in a hundred present any marked abnormality. In the table the various types of abnormality are shown.

FIREBALLS.

During the period covered by the report six bright fireballs, four of which were of the detonating variety, have been subjected to special study. The results have been published separately as follows:

Fireball of 1929, September 5, in *Journ. B.A.A.,* 40, p. 79.

Fireball of 1929, October 7, in *Journ. B.A.A.,* 40, p. 301.

Fireballs of 1930, June 13 and 18, in *Journ. B.A.A.,* 41, p. 73.

Fireballs of 1930, July 30, and 1931, February 19, in *Journ. B.A.A.,* 42, p. 174.

In the course of collecting fireball observations through the New Zealand press and in other ways, a number of isolated reports of bright objects have been received. Special acknowledgment must be made of the assistance rendered by the following persons:—Mrs M. E. Allen, Eketahuna, press clippings; Mrs R. A. McIntosh, Auckland, apparent paths; J. W. Alexandre, Auckland, two daylight fireballs and several other objects; A. C. Gifford, Silverstream, observations; Dr C. E. Adams and I. L. Thomsen, Dominion Observatory, for making available observations of fireballs forwarded to the observatory.

Although it has been impossible to determine real paths for these objects, they have a definite value in determining rates of frequency and times of apparition. It has been found, for instance, that the monthly frequency reaches a marked maximum in June, the scanty data thus revealing a similarity to the curve of meteor rates, whereas in the northern hemisphere the curves are opposed.

Monthly Frequency.

Month.	Number.	Month.	Number.	Month.	Number.
January	1	May	2	September	6
February	4	June	14	October	3
March	2	July	9	November	3
April	5	August	5	December	0

A study of the distribution of these fireballs in time shows a marked maximum in the evening hours and a scarcity after midnight, already well established in the data compiled in the northern hemisphere. Two daylight fireballs are not included in the table.

Distribution in Time.

Hour.	17–18	18–19	19–20	20–21	21–22	22–23	23–24
No.	2	7	1	8	11	11	4

Hour.	0–1	1–2	2–3	3–4	4–5	5–6
No.	2	1	1	0	2	1

Conclusion.

Further statistical data, notably on trains and telescopic meteors, are being tabulated from the observations now in hand, but treatment of these data is withheld at present owing to the scanty material available for discussion.

In conclusion the Director would appeal to members of the New Zealand Astronomical Society to endeavour to contribute to the work being undertaken by the Meteor Section. If disinclined to actively observe meteors, there are many other ways in which assistance can be rendered. Variable-star observers and comet seekers can materially assist by recording all telescopic meteors seen. Possessors of moderate telescopes can spend a few hours at the time of rich annual showers sweeping radiant areas in a search for telescopic meteors. Any member, with little trouble to himself, can forward details of bright fireballs or initiate press campaigns for the collection of observations of such objects.

Those members of the Society not possessing telescopes, but anxious to do some research, are invited to write to the Director with a view to taking up the study of meteors, and thereby helping to maintain the section's output of observations. Every assistance will be willingly given to inexperienced observers who desire to contribute to the work being performed.

R. A. McIntosh, F.R.A.S., Director.

Private Observatory,
23 Hollywood Avenue, Epsom, Auckland,
June 7, 1932.