

The companion of *Procyon* has been observed on three nights by Mr. Lewis.

		Position Angle.	Distance.
March 20	1898·214	327 ^o ·7	3 ^{''} ·93
March 31	·244	326 ^o ·0	4 ^{''} ·02
April 4	·255	324 ^o ·4	4 ^{''} ·84

On two nights the companion was seen by Mr. Melotte.

The observer noted that the appearance of the companion of *Procyon* was not so like a star as that of *Sirius*, and that while the wire of the micrometer totally eclipsed the companion of *Sirius*, the companion of *Procyon* was seen on both sides of the wire.

Royal Observatory, Greenwich :
1898 April 4.

Observations of Nebulæ. By Herbert A. Howe.

(Communicated by the Secretaries.)

In the latter part of 1897 September a series of micrometrical measures of nebulæ was begun by the writer at the Chamberlin Observatory, University Park, Colorado, U.S.A.

The working list contains all of Swift's nebulæ, and also a large number of others between the equator and 30° of south declination, the positions of which are not known to have been micrometrically measured. As the publication of this series of observations may be considerably delayed, it has been thought best to publish from time to time such preliminary results as may be of interest.

Each nebula is connected with some star in the field of view by micrometrical measures of $\Delta\alpha$ and $\Delta\delta$. The star, if not found in any good catalogue, is connected with some catalogue star by chronographic measures of $\Delta\alpha$, and micrometric of $\Delta\delta$. The last-mentioned observations are made at times when faint nebulæ are invisible because of the brightness of the Moon. The observations given below were made during the last four months of 1897 with the 20-inch Clark equatorial refractor armed with a magnifying power of 185 diameters. The mounting of the instrument was constructed by Sæg Müller, and has proved to be very convenient for this work. When the positions of the nebulæ, as given in Dreyer's New General Catalogue, or in the supplementary catalogue in Vol. LI. of the *Memoirs of the R.A.S.*, are more than ten seconds in error in right ascension, or two minutes in declination, the correct positions are given. These places are, however, for 1900^o, which is the epoch of the working list.

By the liberality of Miss Catherine W. Bruce, of New York

City, a new micrometer has been built specially adapted to this work. Future observations will be made with it more swiftly and also more accurately than has been possible hitherto.

The numbers given are those of the N.G.C., except when the nebulae are found in the supplementary catalogue above mentioned. In that case the numbers are inclosed in brackets.

24. The length of this nebula is 3', the elongation being at 225°. A 9.5 mag. star is hard by its f extremity.
58. I cannot find this, having hunted diligently for it on two nights. Its neighbours 47 and 54 are easily seen. Probably the R.A. given for 58 is just a minute too great, and it is really identical with 47, which is a Tempel nebula.
73. Swift mentions a double star close following. Its mags. are 12, pos. angle 225°, and distance 20".
155. The position is 0^h 29^m 37^s, -11° 19'.4.
237. The position is 0^h 38^m 21^s, -0° 40'.2.
- 283, 284, 285, 286. These are all eF, eS, with stellar nuclei of mag. 13.5. Their positions are

$$\begin{aligned} & 0^{\text{h}} 48^{\text{m}} 14^{\text{s}}, -13^{\circ} 42'.4, \\ & 0^{\text{h}} 48^{\text{m}} 25^{\text{s}}, -13^{\circ} 42'.1, \\ & 0^{\text{h}} 48^{\text{m}} 31^{\text{s}}, -13^{\circ} 42'.1, \\ & 0^{\text{h}} 48^{\text{m}} 31^{\text{s}}, -13^{\circ} 39'.3. \end{aligned}$$

351. The position is 0^h 56^m 52^s, -2° 28'.6.
481. The position is 1^h 16^m 13^s, -9° 44'.1.
530. The position is 1^h 19^m 36^s, -2° 6'.5.
589. The position is 1^h 27^m 44^s, -12° 33'.4.
671. The position is 1^h 41^m 39^s, +12° 37'.5.
675. The position is 1^h 43^m 53^s, +12° 33'.5.
- (164.) The position is 1^h 44^m 5^s, -4° 24'.1.
715. The position is 1^h 48^m 20^s, -13° 21'.9.
799. This has a good nuclear point of 13 mag. Its position is 1^h 57^m 6^s, -0° 34'.9.
800. The position is 1^h 57^m 5^s, -0° 36'.7.
809. The position is 1^h 59^m 23^s, -9° 13'.0.
885. I have searched for this on three nights without success.
- 942-943. This I am inclined to call a very faint nebulous double star, the components being 35" apart. The positions of the two objects considered separately are

$$\begin{aligned} & 943. 2^{\text{h}} 24^{\text{m}} 18^{\text{s}}, -11^{\circ} 16'.4. \\ & 942. 2^{\text{h}} 24^{\text{m}} 19^{\text{s}}, -11^{\circ} 16'.9. \end{aligned}$$

Burnham also has examined these objects. His right ascensions agree with mine, but each of his declinations differs by nearly 1'. Probably his results were intended to be only approximate.

948. The position is 2^h 23^m 53^s, -10° 57'.7.

- (246.) The position is $2^{\text{h}} 35^{\text{m}} 18^{\text{s}}, +2^{\circ} 2'.9$.
 1091. The position is $2^{\text{h}} 40^{\text{m}} 43^{\text{s}}, -17^{\circ} 57'.4$.
 1092. The position is $2^{\text{h}} 40^{\text{m}} 50^{\text{s}}, -17^{\circ} 57'.9$.
 1091 and 1092 are both called vF by Leavenworth; 1092 is considerably brighter than its companion.
 1639. This is described in N.G.C. as "eF, vS, R, bet. 2 st." I find no nebula, but simply an equilateral triangle of 12.5 mag. stars.
 6797. This was searched for with considerable care on September 23. It was discovered by Peters, and is described as "Neb. with *9 m att f." Not even the 9 mag. star could be found. The sky was clear, though clouds came a few minutes after the search was abandoned.
 6835. This is about $30''$ in length, and is elongated at 80° . Two condensations are suspected in it.
 6836. There is a 13 mag. star involved; other extremely faint stellar points were seen, preceding this star. The nebulosity is faint and ill-defined, most of it preceding the 13 mag. star.
 6924. This seems to be a nebulous star of mag. 14, accompanied by a 13 mag., $20''$ south.
 6936. There is considerable confusion about the place of this object. The places obtained by Leavenworth, Professor Ormond Stone, and myself are given below, being reduced to 1900.0:—

Leavenworth	...	$20^{\text{h}} 30^{\text{m}} 33^{\text{s}}, -25^{\circ} 38'.0$.
Stone	...	$20^{\text{h}} 28^{\text{m}} 49^{\text{s}}, -25^{\circ} 45'.3$.
Howe	...	$20^{\text{h}} 29^{\text{m}} 59^{\text{s}}, -25^{\circ} 37'.5$.

As Leavenworth's declinations are usually much more accurate than his right ascensions, it seems probable that I have observed his nebula, and that Professor Stone has observed another object. I will examine the locality again next summer.

- (1329.) Swift describes this as "eeF, pL, R, bet. 4 st., v diffic." I found the four stars, and within the quadrilateral formed by them I saw quite a number of minute stars, but was not sure of any nebulosity. The sky seemed free from haze.
 6986. The position is $20^{\text{h}} 50^{\text{m}} 50^{\text{s}}, -18^{\circ} 56'.9$.
 6994. This cluster contains but four stars, of mags. 9-10, which form a letter Y.
 7005. This is simply a coarse cluster, the three brightest stars being of mag. 9. No nebulosity is discernible.
 7009. This planetary nebula is but slightly elliptical, being perhaps $15''$ by $11''$, the major axis having a position angle of about 70° . The colour is a beautiful greenish blue.
 7010. I could find no nebula in the place given for this on

either one of two nights. But there is a nebula 10' north of the given place, which is probably the one seen by h. However, the description "eF, pL, R, r" tallies only partially with mine, which is "eF, S, R, diffuse, with very faint nucleus."

The position is $20^{\text{h}} 59^{\text{m}} 11^{\text{s}}$, $-12^{\circ} 44'.1$.

7016, 7017, 7018. The positions of these extremely faint nebulae are respectively

$$\begin{aligned} 21^{\text{h}} 1^{\text{m}} 25^{\text{s}}, & -25^{\circ} 52'.3, \\ 21^{\text{h}} 1^{\text{m}} 29^{\text{s}}, & -25^{\circ} 53'.3, \\ 21^{\text{h}} 1^{\text{m}} 34^{\text{s}}, & -25^{\circ} 49'.8. \end{aligned}$$

7099. A cluster of marvellous beauty, the magnitudes ranging from 11 down. Its bright condensed centre is elongated at 100° . Following the main condensation, nearly 2' from its centre, is a coarse group composed of a few 14 mag. stars. On the north side of the cluster the stars are scattered, bright, and arranged in lines. On the south side there are multitudes of stars of mag. 14.

7115. The length of the nebula was estimated to be 45'', and its breadth 10''. There is a 13 mag. star at the preceding end and a condensation at the following end; three or four other condensations were suspected lying along the axis. The position angle of the elongation was estimated as 65° .

The position is $21^{\text{h}} 37^{\text{m}} 53^{\text{s}}$, $-25^{\circ} 48'.6$.

7134. This was discovered by Peters, and is not a nebula; it is simply a group of three or four stars of mags. 13-14, which is about 40'' south of a 10 mag. star. A most careful scrutiny revealed no trace of nebulosity.

7136. This is a stellar object of mag. 13, which Muller suspected to be a nebula. At times it looked slightly nebulous, and at other times distinctly stellar. Nothing is visible in the place given in the N.G.C.

The position is $21^{\text{h}} 44^{\text{m}} 20^{\text{s}}$, $-12^{\circ} 15'.5$.

7159. Swift says "vF * sf." I find the star to be involved in the nebula.

7208. This could not be found in the position given in the N.G.C., but a nebula corresponding to the description precedes a minute. It is in line between two stars of mags. 10.5 and 11.5, 5' apart.

The position is $22^{\text{h}} 2^{\text{m}} 41^{\text{s}}$, $-29^{\circ} 32'.4$.

7220. The position is $22^{\text{h}} 5^{\text{m}} 57^{\text{s}}$, $-23^{\circ} 26'.8$.

7246. In the N.G.C. this is given as "v1 E, vgb M, * 13 n." To me the elongation seems very decided at 180° ; there is a nuclear condensation of mag. 14. The star north of the nebula is of mag. 10.

7254 and 7256. These are identical. The place of 7254 is wrong in right ascension, and the place of 7256 is 10'

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wrong in declination. I could find only one nebular object in this vicinity. Two of the three faint stars involved, and mentioned by Marth were seen; the third was suspected. The northernmost one was brightest, and was of mag. 14. The 11 mag. star which Muller saw 4'·5 preceding the nebula was also observed.

The position is $22^{\text{h}} 17^{\text{m}} 6^{\text{s}}$, $-22^{\circ} 14' \cdot 5$.

7269. The position is $22^{\text{h}} 20^{\text{m}} 27^{\text{s}}$, $-13^{\circ} 40' \cdot 5$.

7284 and 7285. The description of 7284 in the N.G.C. is "cF, cS, lE, r, D * inv." The description of 7285, discovered by Lassell, is "Neb. * 1' dist. from 7284." I judge 7285 to be simply one of the components of 7284. Both seemed to be nebulous stars. The brighter one is of mag. 12·5. The other is of mag. 13, and lies at position angle 60° , distant about $40''$. Neither of the stars appeared to be double. I could not see any nebulosity uniting them, but the sky was somewhat dull. No other star bright enough to have been noted by Lassell is within 5'.

7413. The position is $22^{\text{h}} 50^{\text{m}} 4^{\text{s}}$, $+12^{\circ} 41' \cdot 3$.

7425. The position is $22^{\text{h}} 52^{\text{m}} 1^{\text{s}}$, $-11^{\circ} 29' \cdot 1$.

(1463.) This was discovered by Engelhardt, and is described as "neb. st. 14 m." I find in this place simply a faint double star, of distance $20''$ and angle 45° . It is within a trapezoid of 10 mag. stars, the two long sides of the trapezoid being about 5' in length.

7492. The nebulous matter is extremely faint, and besprinkled sparsely with stars of mag. 14. I can distinguish no definite form; the nebula is perhaps 2' in diameter. It is described as being "bet. 2 D st." I find only one double which follows, and is of mags. 12 and 12·5, having a position angle of 160° , and a distance of about $40''$. Though this double is thus wide and faint, there is no double as interesting preceding the nebula. There are a few scattered faint stars there.

7580. The position is $23^{\text{h}} 12^{\text{m}} 19^{\text{s}}$, $+13^{\circ} 27' \cdot 6$.

7656. The position is $23^{\text{h}} 19^{\text{m}} 17^{\text{s}}$, $-19^{\circ} 36' \cdot 4$.

7709. This is described as "R." I find it much elongated at 225° . It lies 8' south of a star of 8 mag. Its length is $20''$, with a possible further faint extension.

The position is $23^{\text{h}} 30^{\text{m}} 15^{\text{s}}$, $-17^{\circ} 15' \cdot 4$.

7736. This follows a star of mag. 8 about 30 seconds, 3' south. Professor Stone's description tallies with my observations except that he calls it "eF, gb M," while to me it appeared to have a bright centre equal to a 12·5 mag. star.

The position is $23^{\text{h}} 37^{\text{m}} 14^{\text{s}}$, $-20^{\circ} 0' \cdot 4$.

7761. I cannot find nebulae in the places given in N.G.C. for 7761 and 7776, but find one at $23^{\text{h}} 46^{\text{m}} 20^{\text{s}}$, $-13^{\circ} 56' \cdot 2$. 7761 is supposed to precede this $2^{\text{m}} 1^{\text{s}}$, and 7776 to follow mine, $1^{\text{m}} 14^{\text{s}}$. The descriptions of 7761 and 7776 agree pretty well with each other and with mine. However, my

nebula follows a star of mag. 9 by $3'.5$, while Professor Stone describes 7761 as following a 10 mag. by $8'$. Perhaps a larger telescope is required to settle the question whether 7761 and 7776 are identical with the nebula which I have found between the places assigned for them.

7803. The position is $23^{\text{h}} 56^{\text{m}} 13^{\text{s}}$, $+12^{\circ} 33'.3$.

7821. In the N.G.C. this is described as iF. Probably iR is meant. The nebula is about $40''$ long and $15''$ broad, the elongation being at 110° .

7828. The position is $0^{\text{h}} 1^{\text{m}} 20^{\text{s}}$, $-13^{\circ} 58'.3$.

7829. This follows 7828 two seconds. Leavenworth suspected it to be a nebula. I can see no nebulosity; it appears to be simply a star of mag. 13.

Second Attempt to Photograph the Leonid Meteor Swarm.

By Isaac Roberts, D.Sc., F.R.S.

The first attempt to photograph the *Leonid* Meteor Swarm was made last year, and was reported upon to the Society at the meeting held in 1897 March (*Mon. Notices*, vol. lvii. pp. 430-431).

This second attempt was made by using the ephemeris computed by Mr. Wright, of the *Nautical Almanac* office, under the directions of Dr. G. Johnstone Stoney and Dr. Downing. It included the interval between 1897 December 24 and 1898 April 8; but unfortunately the only occasions with suitable climatic conditions for taking photographs, within the range of the ephemeris, were on 1897 December 31; 1898 February 27 and March 21.

The photographs were taken simultaneously with the 20-inch reflector and the 5-inch Cooke lens, the reflector plates covering the sky area of four square degrees, and the lens an area of 230 degrees.

The December plates were exposed during 57 minutes, and the February and March plates exposed during two hours each respectively.

The sky during the exposures on each occasion was clear, and the general conditions must be considered favourable for obtaining good photographs. The stars on the plates with two hours exposures in the 20-inch reflector would be to the faintness of about 17th magnitude, and on the 5-inch lens plates about 14th to 15th magnitude.

The sum of this explanatory statement is, that after very careful examination of all the plates, three times over, no indication whatever could be perceived of the presence of the meteor swarm. We must therefore conclude that if the ephemeris is correct within the limits of the photo-fields stated above—if the meteor swarm has followed the computed orbit, in the computed

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