Nebulæ discovered at the Chamberlin Observatory, University Park, Colorado. By Herbert A. Howe.

(*Communicated by the Secretaries.*)

The following nebulæ have been incidentally noted during the past few months, while making measures of catalogued nebulæ with the 20-inch refractor. The positions given depend upon micrometric measures, and are for 1900·0. In the "Descriptions" and "Notes" numbers enclosed in brackets refer to Dreyer's Index Catalogue; other numbers are those of the N.G.C. :—

No.	Date. 1898.	R.A. h m s	Dec. ° ′	Descriptions.
1	Dec. 16	0 50 50	−10 31·6	vF, S, near 309.
2	1899. Jan. 6	2 29 16	−11 28·7	eS, vF, R. prob. nebs. ✶. Near 977 and 981.
3	Mar. 14	9 22 9	−11 40·5	F, vS, 10ᵐ ✶ p 7ˢ, 0′·8 n.
4	Apr. 10	10 31 20	−12 12·3	eF, eS, possibly a ✶.
5	May 11	12 43 46	−13 51·1	vF, vmE 210°, 2′ long.
6	May 10	12 45 2	−13 50·1	eF, vS.
7	May 10	12 45 9	−13 46·6	eF, vS.
8	May 10	12 45 16	−13 52·9	eF, vS.
9	May 10	12 45 23	−13 56·9 ±	eeF, vS, possibly a 14ᵐ ✶.
10	May 11	12 46 4	−14 1·8	F, vS, R.
11	May 10	14 14 12	− 4 1·6	vF, S, mE 200°. Near (997).
12	1898. Sept. 7	18 36 40	+39 56·1	eS, eF. Near 6685 and 6686.
13	Sept. 17	21 34 6	−22 51·4	vS, eF. Near 7103 and 7104.
14	Oct. 11	23 34 19	−22 58·0	vF, vS, R, 6′·5 n of Swift 234.
15	Nov. 16	23 41 10	−28 33·6	vF, vmE 200°, 20″ long.

Notes.

No. 1 precedes 309 51ˢ, 1′·5 south.

No. 3 follows 2881 about a minute (of time).

No. 4 is near 3295 and 3296, which precede the places given by Leavenworth by 2ᵐ 40ˢ. Leavenworth gave the same right ascension for 3295, 3296, and 3297. On 1899 April 10 I measured the places of 3295 and 3296. I could only suspect 3297. The object which I have supposed to be new follows the others 3ᵐ 30ˢ.

Nos. 5–10, together with No. 15 of my former list, published in *Monthly Notices*, vol. lviii. No. 9, are in the vicinity of 4724 and 4727. I believe 4726 and 4740 to be identical at 12ʰ 46ᵐ 18ˢ, −13° 40′·6.

No. 11 precedes (997) about 30ˢ. (998), which its discoverer pronounces "eeF, v diffic.," I did not see. In its position, or very near it, is a double star of mags. 13·5–13·5, distance 30″, and angle 160°.

No. 12 precedes 6685 less than 2ˢ, 2′·7 north. Between them lies a star of mag. 11·5.

No. 13 is in the same field with 7103, 7104 (1393), and No. 17 of my list in *Monthly Notices*, vol. lviii. No. 9. These five objects have all been seen in one night. Between my two novæ and 7103 one or two may exist, having

been suspected on more than one night. A large telescope may well deal with this group.

No. 15 has puzzled me somewhat. The southern end is the brightest portion, and at times it seems as if the object were really a very faint double star, one or both components of which are nebulous.

Observations of Nebulæ made at the Chamberlin Observatory, University Park, Colorado. By Herbert A. Howe.

(*Communicated by the Secretaries.*)

The following notes on nebulæ form a continuation of those given on pp. 515–24 of the Supplementary Number of the *Monthly Notices* for 1898. They were made during the twelve months beginning 1898 July 1 and ending 1899 June 30. During this period illness and occupation with other observations, especially upon *Eros*, have notably interfered with the regular observations of nebulæ.

The numbers given below are the current ones of the N.G.C., except those which are enclosed in brackets, which refer to the Index Catalogue in vol. li. of the *Memoirs of the R.A.S.* When the name Swift is given, followed by a number, reference is made to the list published in *A.N.* 3517. In this list Swift has collected all previous discoveries of nebulæ at the Lowe Observatory, and has numbered them consecutively. Positions of a few Marth nebulæ are given below, because those in the N.G.C. are only approximate, though they are not far astray. Data about position angles and distances found in the following notes are, in the main, not derived from measures, but from eye-estimates. I have frequently made special notes about condensations in faint nebulæ, where it has seemed that the condensations were sufficiently bright and well defined to be suitable for measures of parallax with a large telescope. All positions are referred to the mean equinox of 1900·0. The eyepiece used on the new Bruce micrometer magnifies 200 diameters, and gives a field 15′ in diameter.

As previously, all observations were made with the 20-inch Clark-Saegmuller equatorial refractor.

Swift 1. The position is $0^h\ 1^m\ 22^s$, $-4°\ 16'{\cdot}4$.

135. The position is $0^h\ 26^m\ 43^s$, $-13°\ 53'{\cdot}3$.

178. The position is $0^h\ 34^m\ 7^s$, $-14°\ 43'{\cdot}2$.

209. This may almost be called a nebulous star. Its position is $0^h\ 34^m\ 4^s$, $-19°\ 9'{\cdot}4$.

232. The position is $0^h\ 37^m\ 48^s$, $-24°\ 6'{\cdot}5$.

235. The position is $0^h\ 37^m\ 56^s$, $-24°\ 5'{\cdot}4$.

303. This is elongated at 160°. Its position is $0^h\ 49^m\ 56^s$, $-17°\ 11'{\cdot}8$.

309. The position is $0^h\ 51^m\ 41^s$, $-10°\ 27'{\cdot}2$.

333. The position is $0^h\ 53^m\ 54^s$, $-17°\ 0'{\cdot}5$.

Swift 24. This looks resolvable, and is equivalent in bright-

ness to a star of mag. 10–11. It is very small. The position is $1^h\ 43^m\ 19^s$, $-27°\ 23'{\cdot}3$.

686. In the N.G.C. is the note "2 st nr." They are of mags. 7 and 8, and precede the nebula.

808. The elongation is at 200°.

921. The position is $2^h\ 21^m\ 48^s$, $-16°\ 17'{\cdot}8$.

929. The position is $2^h\ 22^m\ 28^s$, $-12°\ 32'{\cdot}1$.

942–3. Of this very faint double nebula the southern component is the brighter, being equivalent to a star of mag. 13. The northern is of mag. 13·5. The angle is 350°, and the distance 40″. Both have good nuclei. Their positions were given in *Monthly Notices*, vol. lviii. No. 6. On one night an eF nebula was suspected 20 seconds preceding this pair.

944. This is much elongated at 210°, and looks like a nebulous double star. The position is $2^h\ 21^m\ 54^s$, $-14°\ 58'{\cdot}0$.

981. The position is $2^h\ 28^m\ 9^s$, $-11°\ 24'{\cdot}9$.

989. The position is $2^h\ 29^m\ 3^s$, $-16°\ 57'{\cdot}0$.

1013. This has a good nuclear brightening, and would be suitable for parallax measures with a large telescope.

1074. The position is $2^h\ 38^m\ 54^s$, $-16°\ 43'{\cdot}3$.

1075. This contains a condensation of mag. 13·5. Its position is $2^h\ 38^m\ 52^s$, $-16°\ 37'{\cdot}5$. It is to be noticed that 1075 really precedes 1074. The N.G.C. gives the same right ascension for both.

1151. Leavenworth queried whether this were a nebula. It seemed to me not to be stellar, as I noted it as "eF, vS."

1180 and 1181. Leavenworth gave the same right ascension for these, the southern one being 1181. It has a good nucleus of mag. 13·5. To avoid confusion the N.G.C. numbers should be retained, though 1181 really precedes 1180. The positions are :—

1180	... ...	$2^h\ 52^m\ 22^s$, $-15°\ 24'{\cdot}8$.
1181	... ...	$2^h\ 52^m\ 19^s$, $-15°\ 26'{\cdot}9$.

1182. The nucleus is of mag. 14. The position is $2^h\ 58^m\ 38^s$, $-10°\ 3'{\cdot}7$.

1413. This is almost stellar, so faint is the nebulosity surrounding the central eS condensation. The position is $3^h\ 35^m\ 35^s$, $-15°\ 56'{\cdot}0$.

1416. Muller gave this nebula as 2′ north of a star of mag. 8·6. It is really south of the star. There is another star of equal mag. about 5′ south of the star mentioned. The position of the nebula is $3^h\ 36^m\ 41^s$, $-23°\ 2'{\cdot}4$

1445. The position is $3^h\ 40^m\ 9^s$, $-10°\ 10'{\cdot}4$.

1486. The position is $3^h\ 51^m\ 57^s$, $-22°\ 6'{\cdot}7$.

1547. Leavenworth queried whether this were a cluster. I had no such suspicion. The southern end is the brightest portion. The position is $4^h\ 12^m\ 44^s$, $-18°\ 6'{\cdot}3$.

1561–5. In my communication in *Monthly Notices*, vol. lviii. No. 9, it was stated that I could not see all these nebulæ. I have finally, however, been able to find and measure nebulæ which correspond to Leavenworth's descriptions of those in this group. His positions are sufficiently erroneous to warrant the publication of the correct places. To this group I have added one new nebula, the place of which was published on p. 523 of vol. lviii. of the *Monthly Notices*. I suspect another eF nebula near 1565. Its estimated position is $4^h\ 18^m\ 54^s \pm$, $-15°\ 55' \pm$. The positions are as follows :—

	h	m	s	°	′
1561	4	18	28,	−16	4·7
1562	4	17	15,	−15	59·5
1563	4	18	21,	−15	57·9
1564	4	18	28,	−15	58·3
1565	4	18	51,	−15	58·6

It is to be noted that 1562 precedes the rest of the group over a minute. According to Leavenworth it is brighter than 1563, 1564, or 1565 ; no nebula brighter than these exists in the place given by Leavenworth for 1562. As usual, Leavenworth's declinations are much closer to the truth than his right ascensions.

1650. Two nebulæ were suspected near this, one np and the other sf, at distances of about 3′. The np one is probably only two eF stars. The position of 1650 is $4^h\ 40^m\ 40^s$, $-16°\ 3'{\cdot}2$.

1821. The elongation is at 300°. The position is $5^h\ 7^m\ 14^s$, $-15°\ 15'{\cdot}4$

Swift 80. Swift says : "bet 2 stars p and f." I see no stars in this position relative to the nebula, which are sufficiently near to aid in identifying it. The position is $5^h\ 27^m\ 52^s$, $-17°\ 17'{\cdot}7$.

2139. For this I searched on two nights unsuccessfully, though H calls it only "F." I believe it to be identical with Swift 90, which is about 10′ north, and 25^s following.

Swift 90. This seemed to me to be fainter and smaller than the description "B,L" would indicate. The position has been given in *Monthly Notices* lviii., No. 9.

Swift 91. This is bush-like, and seems to contain a star of mag. 14. The position is $6^h\ 1^m\ 22^s$, $-27°\ 50'{\cdot}9$.

2263. The two stars mentioned by h are of mags. 11·5 and 12, and lie respectively north and south of the nebula at distances of, roughly, 2′, slightly following. Another star of mag. 11·5 follows the nebula 1′·7, and is 0′·3 north.

2283. This curious object, discovered by H, is a small quadrilateral of stars of mags. 11, 12, 11 and 13, the interior of which is nearly filled by an eF nebulosity, in

which there is a condensation of mag. 14. This condensation lies at about the middle point of the sp side of the quadrilateral.

Swift 92. This is in a pretty rich field of faint stars. In the centre of the nebula is a condensation of mag. 13.

2612. h calls this "B." I make it only F. The elongation is at 100°. The two stars mentioned by h are of mags. 10 and 11. The brighter star lies 1′·2 nearly due south of the nebula. The fainter is nearer, north, and a little following.

2674. For this I have hunted on two nights in vain. Stone describes it as "eF, S, neb. ?"

2706. The elongation is at 170°, the nebula being about 1′ long and one-fourth as broad. The neighbouring star noted by Swift is of mag. 9, and follows 5^s, 0′·5 south.

2757. Muller queried whether this eF object were a star. The longer I looked at it the more positive I became that it was a double star of mags. 14, angle 45°, and distance 12″.

2811. This has a small bright centre, with faint wings at angles of 210° and 30°, and reminds one of the great nebula in *Andromeda*.

2821. At times this seemed to have a nucleus of mag. 13·5. h speaks of a "* 11 att." It is np the nebula, and I saw no connection between them.

2881. The two stars mentioned by Swift are of mags. 9·5 and 10·5, and are sf the nebula.

Swift 95. The two stars mentioned by Swift are of mags. 9 and 9·5. The brighter follows the nebula 3^s, 1′·3 south. The fainter stands at a position angle of 60° with reference to the brighter, and is about 1′·5 distant from it. The position is $9^h\ 31^m\ 16^s$, −11° 59′·4.

3030. The position is $9^h\ 45^m\ 18^s$, −11° 45′·4.

3058. The following nucleus is the brighter. The preceding is at 210°, 20″. The position of the brighter nucleus is $9^h\ 48^m\ 44^s$, −12° 0′·7.

3113. The nebula follows the two stars of mag. 8 mentioned by h as forming a triangle with it. The triangle is rudely equilateral. The nebula is eF and vL, but seems to have one spot a trifle brighter than the rest.

3280 and 3295. I found nothing in the N.G.C. position for 3295. But a nebula which corresponds to Leavenworth's description was found less than 3^m preceding, at nearly the N.G.C. declination. It involves a wide double of mags. 13·5, distance 30″, and angle 70°. 3280, discovered by Common, has a description similar to that of 3295. As the positions of Common's nebulæ are not very accurate, I judge 3280 and 3295 to be the same. The position is $10^h\ 27^m\ 48^s$, −12° 7′·3.

3296. The large error of the N.G.C. right ascension of this

object is almost exactly the same as the corresponding error for 3295, which was discovered by the same observer. The position of 3296 is $10^h\ 27^m\ 50^s$, $-12°\ 12'{\cdot}1$.

Swift 112. The doubles mentioned by Swift are very wide, and the average magnitude of the stars in them is 11. They are np and sf the nebula. Swift probably made an error of 15′ in reading his declination circle for this object. The position is $10^h\ 31^m\ 19^s$, $-23°\ 48'{\cdot}3$.

3704. I have now hunted in vain for this object on four nights, widely separated. On each night I measured the position of its neighbour 3707, which is supposed to be of the same order of brightness, and which is not at all difficult to see. Both are Tempel nebulæ.

3777. The position is $11^h\ 31^m\ 3^s$, $-12°\ 0'{\cdot}8$.

3831. h calls this "R," while I find it to be elongated at 200°.

3969. This I was unable to find in the N.G.C. place. But about 10′ further south I found one answering to its description, except that Stone notes "* 10 np 4′," while I see a star of mag. 8·5 nearly north. The stellar point in the centre of the nebula is of mag. 14. The position is $11^h\ 50^m\ 3^s$, $-18°\ 22'{\cdot}2$.

Swift 131. The elongation is at 120°.

4225. H. says, "* 170°, 60″." The star referred to is of mag. 8·5, follows the nebula $0^s{\cdot}6$, and is 1′·6 south of it.

4279. Swift rates this at the same brightness as 4280. But I could not find it on either of two nights, though it is supposed to be close to 4280 and 4285, both of which I saw. There is nothing there comparable in brightness to 4280 and 4285.

4285. This was noted on one night as fainter and smaller than 4280. On another night it was called "much fainter" than 4280. But Swift describes it as brighter.

4361. This has a vB sharply defined eS nucleus of mag. 9·5. On account of moonlight I could not see much surrounding nebulosity.

Swift 138. The star of mag. 7 mentioned by Swift follows the nebula 18^s, 2′·6 north. The position of the nebula is $12^h\ 19^m\ 44^s$, $-25°\ 28'{\cdot}6$.

4484. The N.G.C. right ascension of this seems to be 2^m in error. The position is $12^h\ 23^m\ 43^s$, $-11°\ 5'{\cdot}9$.

Swift 143. The position is $12^h\ 44^m\ 42^s$, $-25°\ 22'{\cdot}6$.

4724, 4726, 4727, and 4740. In my communication in *Monthly Notices*, vol. lviii. No. 9, I mentioned the region in which these lie as needing exploration with a large telescope because of the errors in the places of 4726 and 4740. A larger telescope than mine might show many more nebulæ in this group. The results of my work on three nights are as follows:—The N.G.C. positions of 4724 and 4727 are practically correct. I can find nothing

in the N.G.C. place for 4726. On two nights I measured the position of an object which I assume to be 4726 : it is at $12^h\ 46^m\ 18^s$, $-13°\ 40'{\cdot}6$. I cannot see anything in the N.G.C. place for 4740. Under date of 1899 August 9 Dr. Swift writes, in reply to a query : "I have examined the record of 4740, and find that it was made 1887 April 27, with position $12^h\ 46^m$, $-13°\ 41'$. The right ascension is for 1890, the declination for date of discovery. I have no recollection about it." This position agrees so well with that of 4726 that I assume them to be identical.

I have discovered in this vicinity seven objects supposed to be new. Their descriptions and positions follow :—

The first Nova is vF, vmE 210° 2′ long. The position of its brightest part is $12^h\ 43^m\ 46^s$, $-13°\ 51'{\cdot}1$.

The second Nova is eF, vS : its position is $12^h\ 45^m\ 2^s$, $-13°\ 50'{\cdot}1$.

The third Nova is eF, vS : its position is $12^h\ 45^m\ 9^s$, $-13°\ 46'{\cdot}6$.

The fourth Nova is eF, vS : its position is $12^h\ 45^m\ 16^s$, $-13°\ 52'{\cdot}9$.

The fifth Nova is eeF, vS. Possibly it is only a star of mag. 14. It precedes the sixth Nova by 15^s, at nearly the same declination. Its position therefore is $12^h\ 45^m\ 23^s$, $-13°\ 56'{\cdot}9\pm$.

The sixth Nova is vF, vS, R, $0'{\cdot}6$ n of star of mag. 11. Its position is $12^h\ 45^m\ 38^s$, $-13°\ 56'{\cdot}9$.

The seventh Nova is F, vS, R : its position is $12^h\ 46^m\ 4^s$, $-14°\ 1'{\cdot}8$.

4792. While measuring 4794 I hunted for this, which Tempel calls "vS, R, 7′ nnp 4794." I could not be sure of it. Possibly it is a suspicious-looking star of mag. 11.

4794. The nebula contains a condensation of mag. 13. The brightest of the stars mentioned by H is of mag. 9·5, and follows the condensation $1^s{\cdot}2$, 3″ north. This star appears to be close to the nf border of the nebula.

5420. The position is $13^h\ 58^m\ 36^s$, $-14°\ 8'{\cdot}1$.

Swift 168 and 169. Probably these are identical with (997) and (998). I examined the region on one night only, and saw only a very faint double star in or near the place of (998).

6230. This nebula is accompanied by a star of mag. 13, at a distance of 10″ and angle of 160°.

6235. In the N.G.C. this is given as "r r r, st 14–16." I examined it when the seeing was excellent. The brightest star is of mag. 12, and is in the np end. The object seems nebulous, but contains a number of very faint stars. Possibly the nebulous-appearing background is composed simply of minute stars, but it impressed me as truly nebulous.

6284 and 6287. The N.G.C. descriptions of these differ but

little. Each is described as a cluster. I examined them on the same night, and noted that 6284 was probably a nebula, while 6287 seemed to be a cluster. Perhaps greater optical power is necessary for a decision.

(1247). This nebula of Bigourdan's I was unable to find. 30^s preceding the place given in the Index Catalogue there is a double star of mags. 12—12, distance 3″ and angle 270°.

6369. In this annular nebula the centre is much darker than the periphery. The brightest part is in the np portion of the ring. The faintest part is in the sf portion of the ring.

6432. This "cluster" contains only four stars, two of mag. 12 and two of mag. 13.

6445. The appearance of this is remarkable. It is somewhat bullet-shaped. The sf end seems to be cut almost straight across, the position angle of its direction being 70°. The brightest part of the nebula is in the np end. The middle is much fainter than the ends.

6449. In this are two or three stellar points.

6450. This was searched for unsuccessfully on two good nights.

6465. Search was made for this on two nights. On the first no nebula could be found. On the second it was discovered that, instead of a nebula, there are simply two doubles of mag. 12. In each pair the distance is 4″, and the two pairs are 15″ apart.

6530. In the N.G.C. this is described as following 6523. It is really involved in faint nebulosity on the borders of 6523.

(1271). An examination on two nights led to the conclusion that it is simply an eF extension of 6523.

6544. In the N.G.C. this is called "r." I examined it on two nights. It evidently contains several stars. On the first night it was noted that "the apparent nebulosity may be due to faint stars." On the second night, when the definition was fine, the following note was made: "Object looks exclusively starry." If these observations are correct it is simply a faint cluster.

6551. Here I see simply a few stars of mag. 13.

(1274). Here is a nebulous region looking like a thin veil over the sky.

6556. I see nothing in the entire region except thousands of the minutest stars.

6559. The nebula itself is very faint and formless. The brightest star in it is of mag. 8·5, and has a 10·5 mag. companion at a distance of 6″ and angle of 190°.

6589. The double star mentioned by Swift as involved in the nebula is of mags. 13-13, and has a distance of 20″, with an angle of 210°. 5^s preceding the nebula is another

double of mags. 9–11·5, having a distance of 30″ and an angle of 225°.

6593. This is eS, and about as bright as a star of mag. 12. Very little nebulosity is visible.

6616. The "2 F st nr" are of mags. 9 and 10 respectively. The brighter precedes the nebula 2ˢ, 0′·6 south. The position is $18^h\ 13^m\ 28^s$, +22° 12′·0.

6618. This contains many very faint stars; changes of brightness in different parts are very abrupt. Dark "holes" are near by. The brightest part is small, elongated at about 165°, and contains some extremely faint stars. A magnificent object.

6642. The outskirts of this can be resolved. The bright centre I think to be stellar.

6660 and 6661. A careful examination of this region confirms Pechüle's statement that they are identical. The correct position is $8^h\ 30^m\ 25^s$, +22° 49′·8.

6814. This has a nucleus of mag. 13.

6822. On two nights I called this "vS," while Barnard, who discovered it with a 6 inch refractor, called it "L."

(1308). A double star follows 5ˢ, 40″ south. It is of mags. 9–12, distance 6″, and angle 150°.

6836. In this nebula, or just on its f edge, is a star of mag. 13·5, apparently not noticed by its discoverer.

Swift 185. The three stars mentioned by Swift are of mags. 9·5, 10, and 9, and are about 8′ south of the nebula. Their line prolonged does not strike the nebula, but follows it a little. The position is $19^h\ 50^m\ 10^s$, −37° 35′·6.

Swift 186. The position is $19^h\ 53^m\ 32^s$, −38° 50′·9.

Swift 187. The position is $19^h\ 54^m\ 10^s$, −38° 50′·8.

6903. h calls this "cL"; I observed it on one night, and noted it as "eS."

(1324). The position is $20^h\ 26^m\ 48^s$, −9° 23′·6.

(1325) and (1326). I am inclined to the opinion that these two Swift nebulæ are identical with two which Marth found with the 4-foot Lassell reflector, mounted at Malta, and which are Nos. 6928 and 6930 respectively in the N.G.C. Marth seems to have discovered these, as well as 6927, on the same evening, and afterwards verified them. It appears improbable that Swift, who makes no mention of seeing Marth's nebulæ, has discovered two close by them, which I did not see. A star of mag. 11 is just nf 6928, and a double star of mags. 12, and distance 5″ follows 6928 by 20ˢ, 0′·7 north. The positions are:—

6928, $20^h\ 28^m\ 1^s$, +9° 35′·2
6930, $20^h\ 28^m\ 10^s$, +9° 32′·0

When observing these objects I was unaware of the existence of 6927, which is much fainter, and which I did not see.

Swift 203. The position is $20^h\ 59^m\ 3^s$, $+11°\ 22'{\cdot}0$.

(1368). Swift calls this round, but I find it to be much elongated at 225°.

7105. On three nights I failed to find this. On the third night I noted in its vicinity a double of mags. 13–13, distance 8″, and angle 210°. This might be 7105, except that Leavenworth estimated the elongation of his at 130°.

7112. A search on two nights failed to reveal this.

Swift 207. The position is $21^h\ 41^m\ 25^s$, $-35°\ 20'{\cdot}8$.

Swift 208. The position is $21^h\ 42^m\ 20^s$, $-35°\ 24'{\cdot}9$.

7135. In the N.G.C. is noted a "* 14 att, p." This is of mag. 12, and precedes 2^s. Another star of like brightness is involved in the nebula near its northern border. I judge this to be identical with Swift 209. The object which I saw answers to both descriptions.

7152. According to the N.G.C., Lassell did not succeed in finding this. It is a small, exceedingly faint, and diffuse stain on the sky.

7157. In the N.G.C. we read for this object, "BD * p 8^s." There is no bright double star in the vicinity, and I could find no nebula. Possibly, however, the abbreviation "BD" is here used for "Bonn Durchmusterung." Spitaler also failed to find this.

7158. This nebulous star is of mag. 13. It may be double at 270°. The position is $21^h\ 52^m\ 6^s$, $-12°\ 4'{\cdot}1$.

7165. This nebula contains a condensation of mag. 13.

7188. The position is $21^h\ 57^m\ 57^s$, $-20°\ 48'{\cdot}1$.

7214. h calls this a globular cluster. To me it appeared to be a nebula having a nuclear condensation of mag. 12; the surrounding nebulosity was indefinite in extent.

7247. The position is $22^h\ 12^m\ 7^s$, $-24°\ 13'{\cdot}8$.

7252. This is small and pretty faint, but has a good nucleus.

Swift 213. The position is $22^h\ 17^m\ 4^s$, $-19°\ 22'{\cdot}4$.

Swift 214. The position is $22^h\ 17^m\ 16^s$, $-19°\ 23'{\cdot}1$.

7287. This is a double star of mags. 11·5–11·5, distance 6″ and angle 150°. The seeing was poor when I examined it; I could not see any nebulosity connected with it. The right ascension given in the N.G.C. is about 2^m too large.

(1447). The position is $22^h\ 24^m\ 48^s$, $-5°\ 38'{\cdot}0$.

7294. The position is $22^h\ 26^m\ 36^s$, $-25°\ 54'{\cdot}7$.

7300. In the N.G.C. this is called "cS." There is, however, considerable outstanding nebulosity which entitles it to the appellation "pL." The elongation is at 150°.

7310. The position is $22^h\ 29^m\ 9^s$, $-23°\ 0'0$.

7313. The position of this Marth nebula is $22^h\ 30^m\ 0^s$, $-26°37'{\cdot}1$.

7314. This is roughly estimated to be $2'{\cdot}3$ in length, and $0'{\cdot}8$ broad, the elongation being at 0°. There is a condensation of mag. 12 below the middle, near the preceding

edge. This condensation looks just like a star, and probably should be thus denominated.

7351. Swift calls this "R," but to me it appeared much elongated at 180°.

7359. The right ascension given in the Notes at the end of the Index Catalogue, and also that in the N.G.C., are erroneous. The nebula has a central condensation of about 11·5 mag., which is a trifle elongated. The position is $22^h\ 39^m\ 21^s$, $-24°\ 12'·8$.

7365. The position is $22^h\ 39^m\ 47^s$, $-20°\ 28'·6$.

7399. The position is $22^h\ 47^m\ 25^s$, $-9°\ 47'·9$.

7413. The position is $22^h\ 50^m\ 4^s$, $+12°\ 41'·4$.

(1461). I could find nothing in the N.G.C. place for this. But 10′ farther north there is a nebula corresponding fairly to Swift's description. It is, however, eS, being almost stellar, and of about mag. 12. I judge this to be Swift's object. Its position is $22^h\ 53^m\ 37^s$, $+14°\ 38'·3$.

7452. I suspected another nebula preceding this about 15^s, but the atmospheric conditions were not of the best.

7494. The position of this Marth nebula is $23^h\ 3^m\ 36^s$, $-24°\ 54'·7$.

7498. The position of this Marth nebula is $23^h\ 4^m\ 35^s$, $-24°\ 58'·0$.

7513. The position of this Marth nebula is $23^h\ 7^m\ 51^s$, $-28°\ 54'·0$.

7520. On two nights I have searched for this nebula of Tempel's without success.

Swift 229. In Swift's first list of nebular discoveries made at the Lowe Observatory, which one may find in No. 388 of the *Astronomical Journal*, this nebula is put at −18° of declination. In his later long list in *A.N.* 3517, the declination is given as −19°. I have found an object agreeing with his in description at $23^h\ 21^m\ 5^s$, $-18°\ 30'·3$. This place differs from the one in the *Astronomical Journal* by 5^s in right ascension and 5′·7 in declination. In *A.N.* 3517 the description says, "F * p close nf." In the *Astronomical Journal* the star is said to *precede*. The object which I observed had a star of mag. 10 preceding it 3^s, 0′·6 north. [*Note.*—Dr. Swift has just looked up his original record for me; it is now evident that both the *Journal* and *Nachrichten* were wrong, and that the object which I found was really Swift 229.]

Swift 231. The position is $23^h\ 24^m\ 17^s$, $-29°\ 23'·0$.

7719. The position is $23^h\ 32^m\ 49^s$, $-23°\ 31'·6$.

Swift 234. The position is $23^h\ 34^m\ 9^s$, $-23°\ 3'·1$.

7730. On two nights I searched for this nebula, which Tempel called "pB, pL," but I could not find it.

(1505). The position is $23^h\ 36^m\ 29^s$, $-4°\ 7'·1$.

Swift 236. The position is $23^h\ 42^m\ 2^s$, $-28°\ 30'·7$.

Swift 237. The position is $23^h\ 42^m\ 16^s$, $-28°\ 39'·8$.

Swift 238. The position is $23^h\ 42^m\ 16^s$, $-28°\ 41'{\cdot}4$.
Swift 239. This is binuclear, at an angle of 250°, with a distance of 20″. The position is $23^h\ 42^m\ 33^s$, $-28°\ 41'{\cdot}7$.
7807. The position given by Stone is $23^h\ 56^m\ 33^s$, $-19°\ 19'{\cdot}6$. The position found by me is $23^h\ 55^m\ 19^s$, $-19°\ 23'{\cdot}8$. On one good night I looked carefully in the place given by Stone and saw no nebula.

The Bruce Micrometer of the Chamberlin Observatory.

By Herbert A. Howe.

(*Communicated by the Secretaries.*)

Through the liberality of Miss Catherine W. Bruce, of New York City, a micrometer adapted to observations of $\Delta\alpha$ and $\Delta\delta$ was built some eighteen months since for the Chamberlin Observatory, by Saegmuller, of Washington, D.C. It was especially intended for work on faint nebulæ. Each nebula is tied to some small star near at hand by micrometric measures of $\Delta\alpha$ and $\Delta\delta$. On some ensuing night, when the Moon obliterates most nebulæ, the comparison star is connected by chronographic and micrometric observations with a catalogued star. The instrument has also been used for a long series of observations of *Eros*, and for similar work on some faint comets. So excellent has been its performance, and so efficient is it for rapid work, that I have been asked by a visiting astronomer to write a detailed description of it.

1. Such a micrometer is usually screwed on to the tail-piece of the equatorial. Whenever it is taken off and replaced, a new value of the parallel, and hence of the zero of the position-circle, must be obtained. The Bruce micrometer slides off, so that when it is put back, the zero of the position-circle is the same as before. The slipping piece, on which the micrometer slides into place, is screwed on to the tail-piece in the usual way, and is fastened by three small steel screws, so that it will not work loose. When the micrometer has been slid into place it is secured by two thumb-screws. The plane in which the sliding takes place is perpendicular to the sight-line of the telescope, and the edges of the run-way are parallel to the declination axis of the equatorial.

2. The position-circle is 9 inches in diameter, and furnished with a system of solid and accurately adjustable stops by which the box can be turned precisely 90° when micrometric measures of $\Delta\alpha$ and $\Delta\delta$ are being made, without reading the graduated circle. If it is desired at any time to have the micrometer box rotate freely, as in measures of double stars, the stops can be thrown back in a few seconds, and when needed again can be swung with equal facility into their former positions. If the box be turned till it is brought up against a stop several times in succession, and the position-circle be read each time, the readings