

# PART I

## DESCRIPTIONS OF 762 NEBULAE AND CLUSTERS PHOTOGRAPHED WITH THE CROSSLEY REFLECTOR

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# DESCRIPTIONS OF 762 NEBULAE AND CLUSTERS PHOTOGRAPHED WITH THE CROSSLEY REFLECTOR

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Two lists of nebulae and clusters photographed with the Crossley Reflector were published in *Lick Obs. Bull.*, Nos. 219 and 248 (7, 81, 1912, and 8, 43, 1913). Since the date of the latter of these lists (November 1, 1913) photographs of over four hundred additional objects have been secured, and the growing interest in nebular studies renders it advisable that descriptions of these be published. There are manifest advantages, moreover, in collecting in one list all the work in this field accomplished with the Crossley Reflector to date, as no other programme with large-scale reflectors is so extensive. This paper accordingly comprises all photographs of nebulae and clusters made with the Crossley Reflector from 1898, when systematic work was commenced with this instrument at Mt. Hamilton, until February 1, 1918. It includes the objects listed in *Bulletins* Nos. 219 and 248, and is intended to supplant these lists. The descriptions of the two earlier lists have been revised and amplified, and a number of errors corrected. For many of the objects of the original Crossley Reflector programme better plates have been secured.

Illustrations and descriptions of seventy-eight planetary nebulae (all the known objects of this type north of  $34^{\circ}$  south declination) are published elsewhere in this volume as a separate memoir. These planetaries have been included at their proper places in this list, followed simply by the word "planetary"; for data as to the forms, dimensions, brightness, etc., of these objects reference should be made to the paper on the planetary nebulae.

Illustrations of sixty-eight of the nebulae photographed in Director Keeler's original programme were reproduced in *Publ. Lick Obs.*, Vol. VIII (referred to in this list as "Vol. VIII"); these objects, omitted in *Bulletin* No. 219, are included in the present list.

There are many cases where spirals seen edgewise or nearly so show interesting evidence of absorption effects. These have been discussed, and seventy-nine illustrations reproduced in a separate paper in this volume, "A Study of Occulting Matter in the Spiral Nebulae." The phrase, "See Abs. Eff." in the description, indicates that an illustration of the nebula will be found in the paper mentioned.

The positions given are those of Dreyer<sup>1</sup> brought up to 1900.0; a few obvious errors in the Dreyer values have been corrected.

<sup>1</sup> Dreyer, J. L. E., A New General Catalogue of Nebulae and Clusters of Stars, 1888.  
———, ———, Index Catalogue of Nebulae found in the Years 1888 to 1894, *Mem. R. A. S.*, 51, 1895.  
———, ———, Second Index Catalogue of Nebulae and Clusters of Stars, containing objects found in the Years 1895 to 1907, *Mem. R. A. S.*, 59, 1908.

This list contains 762 entries, which may be subdivided as follows, in accordance with the type of the objects:

- 513 spiral nebulae.
- 56 diffuse nebulosities.
- 36 globular clusters.
- 24 sparse clusters.
- 78 planetary nebulae.
- 8 "dark" nebulae.
- 47 unclassified, non-existent, etc.

For many of the smaller nebulae the description reads: "No trace of spiral character," or some equivalent expression. This will, I think, mislead no one. I have, in all cases, indicated where a nebula is undoubtedly of the diffuse or the planetary type. Such indications of the lack of discernible spiral character merely mean that no whorls are visible, either because these may be very compactly arranged, or because of the small size of the object, and should not be taken to signify that the nebulae thus described are not bona-fide spirals. It is my belief that all the many thousands of nebulae not definitely to be classed as diffuse or planetary are true spirals, and that the very minute spiral nebulae appear as textureless disks or ovals solely because of their small size. Were the Great Nebula in *Andromeda* situated five hundred times as far away as at present, it would appear as a structureless oval about 0.2 long, with very bright center, and not to be distinguished from the thousands of very small, round or oval nebulae found wherever the spirals are found. There is an unbroken progression from such minute objects up to the Great Nebula in *Andromeda* itself; I see no reason to believe that these very small nebulae are of a different type from their larger neighbors.

There is one fairly common type of spiral of which twenty-three examples are included in this list, and traces of the effect are seen in many nebulae. Its main characteristic is a band of matter extending diametrically across the nucleus and inner parts of the spiral. Frequently the whorls in this type form a nearly perfect ring; in other examples the whorls appear to begin at the ends of this cross-arm. The general appearance is that of the Greek letter  $\phi$ , and I have termed such objects  $\phi$ -type spirals, for lack of a better name. See figure 2, where several examples of this type are given.

Varying estimates have been made as to the probable total number of the spiral nebulae. Director Keeler, early in the course of his programme of nebular photography and before photographs of many regions were available, estimated that there were 120,000 small nebulae, and regarded this estimate as a very conservative one.<sup>2</sup> Perrine, on completing the original Keeler programme, and using the number of new nebulae found in fifty-seven of the one hundred and four regions of that programme, was of the opinion that 500,000 small uncatalogued nebulae were within reach of the Crossley Reflector. He deemed it probable that the total would ultimately be found to exceed 1,000,000.<sup>3</sup> Fath,<sup>4</sup> from a series of 139 plates in the Kapteyn areas, on which 1031 nebulae were found, estimated that the number within reach of the 60-inch reflector with exposures of one hour on Lumière Sigma plates (an approximate equivalent to the exposures of the Crossley Reflector programme) was 162,000. Sanford<sup>5</sup> made a number of very long exposures with the Crossley Reflector in the effort to determine whether by this means any considerable number of faint nebulae would be found which were not reached in more moderate exposures, and came to the conclusion that such long exposures would make very little change in the number recorded. The great numbers of small spirals found on nearly all my plates of regions distant

<sup>2</sup> *Ap. Jour.*, 11, 325, 1900, and *Publ. Lick Obs.*, 8.

<sup>3</sup> *Lick Obs. Bull.*, 3, 47, 1904.

<sup>4</sup> *Astr. Jour.*, 28, 75, 1913.

<sup>5</sup> *Lick Obs. Bull.*, 9, 80, 1917.

from the Milky Way long since led me to the belief that Perrine's estimate of half a million was likely to be under, rather than in excess of, the truth. The extent of existing nebular photographic material now makes possible a new determination.

I have made, therefore, a count of the small nebulae occurring in all the regions covered by this list, rejecting thirty-one regions where the exposure was insufficient or the plate was flawed by developer, or was otherwise of very poor quality. The average exposure of the plates is somewhat over two hours; in general, an exposure of one and a half hours is necessary to record the very faint nebulae, and two to three hours is better. Very little is gained by lengthening the exposure beyond three hours; a cleanly developed plate in sharp focus, of one and a half to two hours exposure time, will show the faintest and smallest nebulae much better than a four-hour plate where the focus is slightly out, or the guiding poor. I have not used any counts made by others, having preferred to make the count as homogeneous as possible. For many of the earlier objects of the Keeler programme better plates have since been taken. Where possible, I have checked the count on a duplicate plate, but this has been impossible for the majority of the regions, for which no duplicate plate exists or for which the duplicate plate is of poor quality. Checks made on regions where duplicate plates exist have convinced me of the essential trustworthiness of my counts, and that few spurious objects have been recorded. The results of these counts are given at the end of the descriptions in the list, abbreviated to the form "12 s. n.", i.e., twelve small nebulae were counted in this region, over and above any objects, large or small, which are given an entry in the list. Where a nebula is followed by no data as to number of small nebulae, it means either that several N. G. C. objects are found in the one region and the number of small nebulae is given elsewhere, or that the count was not made because of rejection of the region. The greatest number found on a single plate was 304 (checked by duplicate plate); the central portion of this remarkable region is reproduced in figure 3. Twenty-six other regions were counted as well; these are plates of sufficient exposure taken on some of the Kapteyn regions, and other special regions of the sky, which do not contain any object warranting a separate entry in the list accompanying this paper. These regions, with the number of small nebulae counted, are given below:

$\alpha$	$\delta$	No.	$\alpha$	$\delta$	No.
1 <sup>h</sup> 26 <sup>m</sup>	+ 30° 0'	29	18 <sup>h</sup> 12 <sup>m</sup>	+ 15° 2'	12
1 59	+ 44 30	22	18 36	0 0	2
2 10	+ 42 40	45	18 46	— 7 30	0
2 15	+ 42 30	34	18 57	— 4 34	0
2 37	+ 45 0	10	19 1	+ 30 3	0
2 39	+ 50 0	23	19 10	+ 15 0	2
4 22	+ 30 0	1	19 14	— 15 0	2
11 59	+ 29 37	48	19 15	— 0 20	1
13 33	+ 9 25	12	19 34	+ 0 10	0
16 9	— 3 26	0	19 56	+ 29 50	0
17 14	— 15 7	4	20 12	+ 15 10	2
17 41	— 0 7	4	20 50	+ 59 40	0
17 50	— 17 20	0			—
18 9	— 15 0	0			253

In all, 439 regions were counted, giving a total of 5698 small, uncatalogued nebulae. To this must be added the 513 spirals described in this list, making the total number of nebulae found in all regions 6211. In the belief that practically all these very small nebulae are spirals I have designedly omitted the diffuse nebulosities and the planetaries.

The exposed area of a Crossley plate is about nine-tenths of a square degree; the edges and corners of this area are, however, so poorly defined, owing to the distance from the optical axis, that only the brighter small nebulae can be picked up in these portions of the plate; the majority of the small nebulae are found in the more central portions having an area of about six-tenths

of a square degree, or less. I have assumed 0.75 of a square degree as the average effective area on which the counts were made; this is certainly somewhat in excess, but is an error on the conservative side.

We shall first assume that these 439 regions are uniformly distributed over the sky, and that they may be taken as a fair representation of the whole sky. Their area is 329.25 square degrees. If the proportion shown by these regions holds over the entire sky, we should expect the number of spiral nebulae to be 778,000. Because of the fact that the faintest and smallest members of the class are, in general, discernible only in the central regions of the plate, I consider the figure given an under-estimate, and believe that the total number accessible with the Crossley Reflector with rapid plates and exposures of from two to three hours may well exceed 1,000,000.

It may be argued that a preponderance of plates taken in the regions near the galactic poles would have the effect of unduly increasing the estimated number of the small spirals. This objection was urged by Fath (*loc. cit.*) in explanation of the difference between his estimate of 162,000 and that of 500,000 by Perrine; on plotting the regions used by Perrine he found that approximately 33% of the regions counted by Perrine were located within  $45^\circ$  of the north galactic pole, while less than 20% of the "Selected Areas" were found in the same region. In order to test this objection, as far as it may be applied to the present counts, I have plotted in

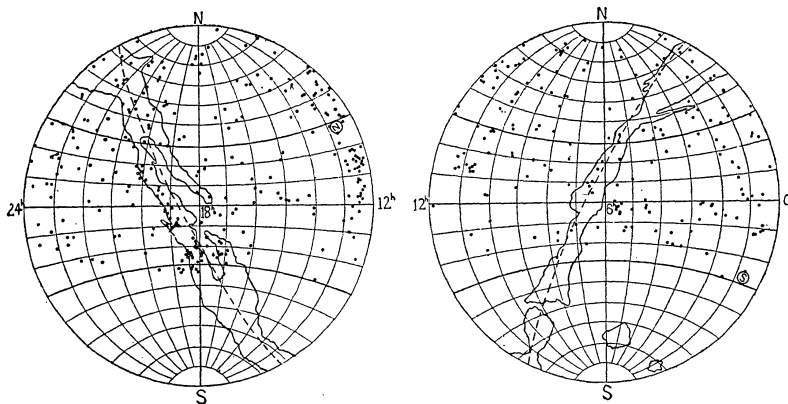


Fig. 1. Distribution of Regions on which Small Nebulae were Counted. The Position of the Galactic Plane is shown by dotted lines.

figure 1 the 439 regions in which counts were made. It will be seen from this figure that the distribution of the regions may well be regarded as an approximately uniform one. There is, it is true, a marked concentration of regions between 12 and 13 hours R. A., in the vicinity of the north galactic pole, but this would seem to be balanced by the similar preponderance of regions in the Milky Way from 17 to 20 hours R. A. If we divide the celestial sphere into two equal areas, one consisting of a zone  $60^\circ$  wide extending  $30^\circ$  on each side of the galactic plane, and the other comprising the two zones of  $60^\circ$  radius about the two galactic poles, we shall find that 49.4% of the regions are located in the first, or galactic, area, and 50.6% in the polar areas (217 regions in the galactic area, and 222 in the polar areas). The balance in the distribution of the regions in the galactic and extra-galactic zones may then be regarded as a nearly perfect one.

On the other hand, bearing in mind the well-known concentration of the spiral nebulae in the vicinity of the north galactic pole, and the fact that this programme deals primarily with the regions containing the spirals, it is necessary to investigate further any possible effect which this concentration might have upon the resulting estimate. I find that 36% of the regions used are within  $45^\circ$  of the galactic poles; as these zones comprise 29% of the sky, there is seen to be a slight preponderance. But a large part of the zone about the south galactic pole is not represented by any observed regions, so that the disproportion is greater than is apparent from the percentage just given. Taking only the zone  $45^\circ$  in radius about the north galactic pole, amount-



ing to 14.6% of the sky, there are 117 regions, or 26% of the regions used, which are situated in this area, and these 117 regions contain 2997 spirals, or about 48% of the whole.

To avoid the effect of this concentration in the galactic north polar area, it will be advisable to consider this area separately. Assuming that the 117 regions in this area, amounting to 87.75 square degrees, are sufficiently uniform in their distribution to represent adequately the occurrence of nebulae in the galactic north polar zone, this zone would contain 205,000 nebulae to correspond with the 2997 found in the 117 regions. Assuming likewise, in the remaining 0.854 of the sky, that the proportion of nebulae is adequately represented by the 3214 nebulae found in 322 regions, or 241.5 square degrees, these would correspond to 469,000 nebulae, a total for the entire sky of 674,000.

Any objection depending upon the effects of a marked concentration of the small nebulae in the north galactic area may be further met by considering separately the north galactic and south galactic polar zones, the two zones  $15^\circ$  wide extending from  $-30^\circ$  to  $-45^\circ$  and from  $+30^\circ$  to  $+45^\circ$  galactic latitude, and a zone  $60^\circ$  wide,  $30^\circ$  on each side of the galactic plane. Such a subdivision gives the following results:

Galactic Latitude	Number of Regions	Square Degrees	Number of Spirals	Number per Square Degree	Number in Area
$+45^\circ$ to $+90^\circ$	117	88.50	2,997	34	205,000
$-45^\circ$ to $-90^\circ$	43	32.25	918	28	169,000
$\pm 30^\circ$ to $\pm 45^\circ$	62	46.50	1,117	24	204,000
$-30^\circ$ to $+30^\circ$	217	162.75	1,179	7	144,000
Totals .....	439		6,211		722,000

The concentration of small nebulae is seen from the above tabulation to be greatest in the area about the north galactic pole, just as is the case with the larger spirals. While only 43 regions are available in the area about the south galactic pole, it will be seen that they indicate a similar, but less marked, concentration of the small nebulae in the southern polar area. The results given in the third line of the table for the zones  $15^\circ$  wide between the galactic zone and the two polar zones are of great interest. While the number of regions is only 62 they give the valuable indication that the density of the small nebulae persists to at least  $60^\circ$  from the galactic poles, with only a comparatively small diminution of the frequency of distribution which obtains about the two galactic poles.

I regard the estimate of 722,000 nebulae made by the foregoing subdivision of the observed data, as more reliable than the two estimates, 778,000, and 674,000, made earlier in the discussion.

As this revised estimate is equal to that of Fath plus that of Perrine, with several thousand to spare, a discussion of possible reasons for the discrepancy becomes imperative. The following points may be considered:

(a) It may be urged that my count has not been sufficiently conservative, and that I have possibly included many spurious objects. The detection of the faintest and smallest nebulae is very largely a matter of experience; all who have worked with photographic plates soon learn, by hard necessity, to recognize the average flaw at a glance. A very large proportion of the objects counted are unmistakably nebulae; as to the faintest nebulae, it is astonishing how faint and small are the nebulae which two "good" duplicate plates will reproduce. For a large proportion of my regions no duplicate plates exist, and I have necessarily been guided by the experience derived from regions taken in duplicate. I am unwilling at present to admit that as many as 5% of the nebulae counted by me are spurious. If 20% were spurious, we should still have to account for a total of over half a million nebulae.

(b) The theory may be advanced that the small spirals occur in greatest profusion in the regions immediately contiguous to the larger members of the class, which would explain why fewer nebulae were found by Fath, inasmuch as his plates were taken at the centers of Kapteyn areas where the larger nebulae would be included only by chance, whereas, from the purpose

of the Crossley nebular programme, nearly all the plates have some N. G. C. object central. This point is difficult to prove or disprove without a special investigation based upon many plates taken at random in the galactic north polar region. It is certain that the small nebulae frequently show a gregarious tendency; occasionally one-half of a plate will record many small spirals while the other half records very few; the remarkable region at  $12^{\text{h}} 55^{\text{m}}, +28^{\circ} 30'$  shows 304 nebulae, while the region about N. G. C. 4826, less than  $7^{\circ}$  distant, shows only 2. While the small nebulae are evidently quite irregular in their distribution, it would seem that the large number of regions included in this discussion is sufficient to afford a true representation of their average frequency.

(c) I have already pointed out that sharp focus and perfect images are essential for the detection of the smallest and faintest spirals. On plates where great numbers of small nebulae are found, the majority are, as a rule, detected in the area  $20'$  in radius about the optical axis as center, comprising only 0.35 of a square degree. At distances of  $30'$  from the optical axis the parabolic images are very poor, and only the brighter of the small nebulae can be detected in these regions. Almost stellar and moderately bright nebulae are easily detected at such distances from the optical axis, as they will show fan-shaped images which are as large as those of brighter stars, but much fainter, and of nebular texture, but the very faint nebulae are obliterated by the blurring and spreading of the image. These "blurring factors" and the form of the extra-axial image in optical systems have been investigated by Schwarzschild<sup>6</sup> in three papers of great power, the work of a master. For the convenience of those to whom the original papers may not be accessible the formulae are given here for the only two aberrations which affect the form of the image of an infinitely distant object in the focal plane of a single, perfect, parabolic mirror.

Radial distortion from astigmatism and field curvature (Bildwölbung)  $= 58''.6 g^2 v$ .

Radial extension of coma  $= 20''.3 g v^2$ .

In the above,  $g$  is the diameter of the field, regarding a field diameter of  $6^{\circ}$  as the unit, while  $v$  is the ratio of aperture to focal length, taking the ratio 1:10 as the unit. It will be seen that the distortion due to coma increases as the square of the focal ratio, so that this quickly becomes very large for reflectors of large focal ratio, even at small angular distances from the optical axis. Dr. Fath used very large plates,  $6\frac{1}{2} \times 8\frac{1}{2}$  inches in size, in his work with the 60-inch reflector on the number of the small nebulae, and it appears that he used nearly the full area, inasmuch as he states that the area of his plates was 1.88 square degrees. As the full exposed area of the Crossley plate is 0.9 square degrees (and the outer regions of this are so poor because of the parabolic distortions that the effective area used in the counts is believed to be less than 0.75 square degrees) this would mean, if the two reflectors were of the same focal ratio, that the images on one-half of the angular area of the large plates used by Fath were worse than on the rejected edge strips of the Crossley plates. But the greater focal ratio of the 60-inch would increase this disadvantage, even allowing for certain advantages which would partially counterbalance this due to the greater linear scale of the plates. The following comparisons, computed from Schwarzschild's formulae, will illustrate this point.

THE CROSSLEY REFLECTOR; FOCAL RATIO  $= 1:5.8$

Distance from optical axis	Distortion by field curvature	Distortion by coma
$30'$	$2''.8$	$10''.1$
$41'$ (corner of plate)	$5.2$	$13.7$

THE 60-INCH REFLECTOR; FOCAL RATIO  $= 1:5.0$ .

Distance from optical axis	Distortion by field curvature	Distortion by coma
$30'$	$3''.3$	$13''.5$
$41'$	$6.1$	$18.5$
$61'$ (corner of plate)	$13.5$	$27.5$

<sup>6</sup> Untersuchungen zur geometrischen Optik, *Abh. Kön. Ges. d. Wiss. zu Göttingen, Math.-phys. Kl.*, N. F. 4, 1, 2, and 3, 1905.



One inch on the 60-inch plates equals 11'5 as against 16'4 on the Crossley plates, but it would not appear that this increase in scale could counterbalance the effect of the larger distortions in the outer regions of the plate. From my own experience in counting these minute objects on the Crossley plates it would appear to me that the actual affective area used by Fath must have been very much less than the 1.88 square degrees assumed in his calculations.<sup>7</sup>

It is my opinion also that the Lumière Sigma plates which Fath used are not the best for the end in view. These plates are of very great speed, and are invaluable for some purposes. I have long since ceased to use them for nebular work, however, believing that the slightly slower, but beautifully "clean" Seed 27 and Seed 23 plates really show faint details better. With their smaller grain and clear background, very small and faint nebulae "stand out" on these plates much more plainly than on the more rapid Sigma plates.

(d) It is not impossible that a considerable proportion of the thirty or so plates which Fath took within 45° of the north galactic pole, happened to strike regions of few small nebulae. Had he changed to include four such regions as the following:

$\alpha$		$\delta$		Small nebulae
11 <sup>h</sup>	9 <sup>m</sup>	+55°	34'	107
11	22	+17	46	69
12	15	+ 6	1	81
12	55	+28	30	304
				—
				561

his estimate would have been increased by at least 60 per cent (he found 864 new nebulae in all, and the larger plates he used would have added a number to those counted on the smaller Crossley plates).

Perhaps all the reasons outlined above may be regarded as contributing to an explanation of the difference between Fath's estimate, and the larger ones due to Perrine and to the present investigation. Of these, the possibility noted under (b), that the small nebulae may conceivably occur in greatest profusion just where the visually discovered objects of the N.G.C. exist, would appear to be the only reason for changing the larger estimates, and evidence on this point is only to be secured by taking many additional plates at random.

In conclusion, I see no reason, at present existing, for changing the estimate made in this paper, that at least 700,000, and very probably 1,000,000 small spirals are within reach of large reflecting telescopes.

<sup>7</sup> In order that those who are not familiar with the character of the image in the field of a parabolic reflector may not misunderstand the data given above, the point must be strongly emphasized that this distortion of the image at points outside the optical axis is inherent in all reflectors, without exception, though their optical figure be perfection itself, as is undoubtedly the case with the 60-inch reflector. The reflector of small angular aperture will give a *usable* field of larger angular diameter than will a reflector of great angular aperture, while the former will be slower than the latter, on extended objects like nebulae, in the ratio of the squares of the focal ratios. For example, at a distance of 1° from the optical axis a reflector whose focal ratio is 1:10 will show aberrations of 6'3 and 6'8, while a reflector of focal ratio 1:3, over eleven times as rapid, will show at a distance of 1° from the optical axis corresponding aberrations of 20'0 and 74'9. The former will show rather poor, but usable, images on the edges of a field 2° in diameter; the latter will show images on the edge of the same field so broadened and distorted as to be absolutely unusable.

N.G.C.		$\alpha$		$\delta$	DESCRIPTION
20	0h 4m4			+32° 45'	Round, with much brighter center; 0'3 in diameter; structureless. 10 magn. star follows 30", but is not connected with the nebula. None of the many small nebulae on this plate appear to coincide with N. G. C. 21 (Swift). 41 s.n.
.....	0	5.5		+32 26	A small, fairly bright, $\phi$ -type spiral, not noted in the N. G. C.
29	0	5.6		+32 48	Somewhat irregular spiral 1'5 x 0'5 in p. a. 160°. Nucleus almost stellar; a 13 magn. star is close to whorl on north, but probably not physically connected.
40	0	7.6		+71 58	Planetary. 1 s.n.
56	0	10.2		+11 53	Described as eF, eL, Dif. No trace in an exposure of 1h 2m; either exceedingly faint or non-existent. 8 s.n.
68	0	13.2		+29 31	A rather faint, slightly oval spiral about 1'5 in diameter, with a fairly bright, almost stellar nucleus; two 14 magn. stars are involved, but are evidently not physically connected with the nebula. This region is unusually thick with small nebulae and nebulous stars: several of these are small spirals. N. G. C. 67, 69-72, and 75 are all small nebulae or nebulous stars. 98 s.n.
I 10	0	14.9		+58 45	A small area of diffuse nebulosity about 3' x 2'; very patchy, with a number of nebulous condensations. Exceedingly faint. 6 s.n.
83	0	16.1		+21 53	Thirteen nebulae are catalogued in this vicinity in the N. G. C.; in reality there are fifty or more small nebulae and nebulous stars. 83 is 15" in diameter, round, bright, structureless. 91 is an interesting two-branched spiral 1' x 0'3 in p.a. 90°. 55 s.n.
147	0	27.7		+47 57	Description in <i>Bull.</i> 248 erroneous; not yet photographed.
151	0	29.0		-10 15	A fine, symmetrical, rather open spiral about 4' x 2' in p.a. 80°. Whorls are faint; the nucleus large and moderately bright.
157	0	29.7		- 8 57	A fine, bright, slightly oval spiral 2'5 in length. Almost stellar nucleus; numerous almost stellar condensations. 17 s.n.
.....	0	29.7		- 8 28	A small, bright, very compact oval spiral 0'6 long; almost stellar nucleus.
160	0	30.8		+23 24	Relatively bright center; the spiral whorls merge into a very faint oval ring 1'8 long. 48 s.n.
162	0	30.9		+23 24	A small and very faint oval, 20" long.
163	0	31.0		-10 40	Almost stellar; structureless; bright nucleus. A very faint spindle is 1'5 s.p. 32 s.n.
.....	0	31.1		-10 27	Very faint, irregular spiral, 0'8 long; very faint stellar nucleus.
165	0	31.4		-10 40	Nearly round, 1' in diameter. A very faint, rather regular spiral. Nucleus almost stellar.
169	0	31.6		+23 26	This is a double nebula; the centers are about 28" apart. The northern one is spindle-shaped, a spiral seen nearly edgewise, with evidence of an absorbing lane at one side; 1'2 long. The southern nebula is a bright oval 0'3 long; probably a spiral. See Abs. Eff.
186	0	33.3		+ 2 37	Oval, 0'7 long; center considerably brighter; probably spiral.
185	0	33.4		+47 47	Rather irregular; slightly oval, 3' long; there are two curious rifts near the nucleus; it appears to be an irregular spiral. The nebular matter is faint and diffuse. A star of magn. 14 is north of the very faint nucleus. 30 s.n.
193	0	34.2		+ 2 47	Nearly round; 0'5 in diameter; much stronger center; probably spiral.
194	0	34.2		+ 2 29	Round; 0'3 in diameter; fairly bright; no structure discernible.
198	0	34.3		+ 2 15	Nearly round spiral 1' in diameter; quite faint.
199	0	34.4		+ 2 35	Slightly oval spiral 0'8 long whorls faint; center moderately bright.
200	0	34.4		+ 2 20	Rather faint; the nucleus is almost stellar; an interesting two-branched spiral 1'8 x 0'4. In addition to the nine N. G. C. objects found on this plate, there are sixty-five other small nebulae. 65 s.n.
202	0	34.5		+ 2 59	Small, faint, considerably elongated spiral 0'5 long.
203	0	34.5		+ 2 54	Considerably elongated; 0'7 long; center much brighter; doubtless spiral.
204	0	34.6		+ 2 45	Slightly oval; much brighter center; 0'3 in diameter; probably spiral.
205	0	34.9		+41 8	The companion n.p. the nebula in <i>Andromeda</i> . The bright central portion is about 2' in diameter, showing traces of rather irregular spiral structure; the nucleus is almost stellar. There are two small dark patches near the brighter central portion. Very much fainter matter forms the outer portion of the nebula in an oval about 8' x 3'; no whorls can be made out in this outer portion; doubtless a spiral of the <i>Andromeda</i> type. 2 s.n.
221	0	37.2		+40 19	The well-known companion south of the nebula in <i>Andromeda</i> . Exceedingly bright. In the long exposures it appears as a "burnt-out" oval 2'6 x 1'8, with no trace of spiral character in the outer portions. It lies in p.a. 150° ±. The shortest exposures show a nucleus which is nebulous, surrounded by bright nebular matter far brighter than the brightest parts of the Nebula in <i>Andromeda</i> . The nucleus and inner nebular matter show strongly in 1m on S23.

				DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$		
224	0 37	+40 43		The Great Nebula in <i>Andromeda</i> , Vol. VIII, Plate 1. This wonderful object, the largest of the spiral nebulae, is too well known to need description. Exposures of 1 <sup>m</sup> to 3 <sup>m</sup> on S23 show an almost stellar nucleus, with traces of spiral structure in the surrounding nebular matter. See Abs. Eff.
246	0 42.0	—12 25		Planetary. 11 s.n.
247	0 42.1	—21 18		A faint, very large, spiral, 18' x 5' in p.a. 175°. Nucleus stellar; many almost stellar condensations. Whorls somewhat irregular, and indistinct. 22 s.n.
253	0 42.6	—25 50		Vol. VIII, Plate 2. One of the most beautiful spirals known, 21' x 4' in p.a. 52°. There is perhaps a very faint, almost stellar nucleus and numerous almost stellar condensations. Some evidence of absorption lane effects on the northern side. 23 s.n.
255	0 42.7	—12 2		Nearly round; 1' in diameter; sharp nucleus; a rather compact spiral.
278	0 46.4	+47 1		A very bright, compact, nearly round spiral, 1.2 in diameter. The nucleus is well defined and shows in a 5 <sup>m</sup> exposure. The matter in the inner whorls is quite bright. 6 s.n.
281	0 47.4	+56 3		A large patch of faint, diffuse, irregular nebulosity 16' across. Shows considerable detail and a clearly defined "hole" with clear-cut edges. A large "bay" cuts into the s.p. side. 1? s.n.
I 59	0 51.4	+60 33		Two enormous, fan-shaped masses of diffuse nebulosity n.f. $\gamma$ <i>Cassiopeiae</i> . Each one is about 12' across at the base, while the apices point approximately toward the bright star. They show considerable structural detail. The brightest part is a streak at the apex of the southern nebula. See figure 4. 0 s.n.
II 1613	0 58.0	+ 1 25		Described as vF, eeL by, Wolf. There are a number of small nebulae in this region, but no trace of II 1613 in an exposure of 1 <sup>h</sup> 44 <sup>m</sup> . 33 s.n.
403	1 3.7	+32 13		Rather faint, considerably elongated spiral 1.5 in length; nucleus well defined.
404	1 3.9	+35 11		Round; 1.3 in diameter; quite bright. The nucleus is stellar; no spiral structure is apparent, but there is a minute, curved, dark lane n.f. the nucleus. 26 s.n.
407	1 5.1	+32 36		A spindle 1' long; moderately bright. Probably spiral; an absorbing lane is suspected.
410	1 5.4	+32 37		Slightly oval; 1' long; nucleus almost stellar; no whorls or spiral structure discernible, but is probably a spiral. 46 s.n.
414	1 5.7	+32 35		Very small; binuclear. The almost stellar nuclei are 7" apart in p.a. 142°.
428	1 7.8	+ 0 27		This is an extremely irregular mass of nebulosity 4' x 2.2'. It shows an irregular looped structure with numerous stellar condensations; probably a greatly distorted spiral. 47 s.n.
467	1 14.0	+ 2 46		Quite bright, round, 0.2 in diameter; nucleus almost stellar; no spiral structure.
470	1 14.6	+ 2 53		A rather irregular, somewhat patchy spiral, whose whorls form an oval ring 1.6 long in p.a. 155°; there is an unsymmetrical fainter extension at the south. Nucleus 13 magn.; almost stellar.
474	1 14.9	+ 2 53		Round; 0.5 in diameter. Center very bright, with much fainter matter outside. No spiral structure discernible. 28 s.n.
486	1 16.6	+ 4 49		Very small and faint; nearly round; probably spiral.
488	1 16.6	+ 4 44		Nearly round; 3' in diameter; very bright, almost stellar nucleus. An unusually symmetrical, rather faint spiral. The whorls are very delicate, and so close together that at first sight they appear to be rings around the nucleus instead of spiral whorls. 31 s.n.
490	1 16.9	+ 4 52		Nebulous star.
492	1 17.0	+ 4 55		There are two nebulae at this point, about 1' apart. The preceding one is very faint, nearly round, 0.4 in diameter, structureless. The following one is probably 492; 0.5 in diameter; stellar nucleus; a small spiral.
500	1 17.4	+ 4 53		Very small; almost stellar; perhaps spiral.
514	1 18.7	+12 23		A faint, nearly round spiral; 2' in diameter; quite regular and symmetrical. Nucleus almost stellar; a number of almost stellar condensations.
524	1 19.6	+ 9 1		Round; bright; 0.8 in diameter. Nucleus almost stellar. Very indistinct traces of spiral character. A number of small spindle-shaped nebulae in this region. 23 s.n.
584	1 26.3	— 7 23		Quite bright, with strong central portion and a sharp nucleus; 2' long; considerably elongated; no whorls visible.
598	1 28.2	+30 9		Vol. VIII, Plate 3. A close rival to the Nebula of <i>Andromeda</i> as the most beautiful spiral known. With its faintest extensions it covers an area at least 55' x 40'. Messier 33 <i>Trianguli</i> . 588, 592, 595, and 603 are simply brighter portions of 598. It is uncertain whether there is an actual stellar nucleus. A multitude of stellar condensations in the whorls; the spiral which furnishes the best known example of "resolution" into stars. 7 s.n.

				DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$		
613	1 29.6	—29 55		A very interesting $\phi$ -type spiral about 4' long. It somewhat resembles 1300 and 5921. The nucleus is pear-shaped; there are numerous rather hazy condensations. The nucleus is quite bright. A faint oval patch of nebulosity lies 21.5 to the south. 5 s.n.
628	1 31.3	+15 16		Messier 74 <i>Piscium</i> ; Vol. VIII, Plate 4. Nearly round, 8' in diameter. An unusually beautiful and symmetrical spiral, showing numerous almost stellar condensations. Nucleus bright and small, but not stellar. 34 s.n.
650-1	1 36.0	+51 4		Planetary. 5 s.n.
678	1 43.9	+21 30		Spindle-shaped; an edgewise spiral 3.5 long in p.a. 80°, with a clear-cut absorption lane passing along its length at one side of the center. Central portion fairly bright. See Abs. Eff.
680	1 44.3	+21 28		Slightly oval; 0.5 in diameter; quite bright; no whorls or structure discernible.
691	1 45.1	+21 15		A fine, open spiral 3.5 x 1.8; the whorls are very faint; nucleus almost stellar. 32 s.n.
694	1 45.4	+21 30		A very compact, fairly bright, two-branched spiral 0.5 long.
I 167	1 45.6	+21 23		Quite faint; 3' long; a very interesting two-branched spiral.
695	1 45.7	+22 4		A fairly bright, nearly round, irregular spiral, 0.4 in diameter.
697	1 45.8	+21 52		An open spiral, 4' x 1' in p.a. 150°, with a number of stellar condensations and a small, fairly distinct nucleus. A well marked dark lane on the north. See Abs. Eff.
II 1747	1 50.2	+62 49		Planetary. 0 s.n.
736	1 50.9	+32 33		Very bright; about 0.4 in diameter; strong nuclear portion; no spiral structure discernible. 737 does not exist; is simply a faint star.
738	1 50.9	+32 34		Almost stellar; slightly elongated.
740	1 51.1	+32 32		A faint oval spiral 1.0 x 0.2 in p.a. 140°, with a very faint stellar nucleus. No nebula in the position given for 739. This is described as "cF, vS, R, in triangle of stars"; there is such an object at 1 <sup>h</sup> 51 <sup>m</sup> 1, +32° 46'. 37 s.n.
750-1	1 51.7	+32 43		Double nebula; nuclei 25" apart in p.a. 175°; the northern one is the brighter; both have almost stellar nuclei, and seem to be physically connected.
761	1 52.0	+32 53		Very faint, elongated spiral about 1' long. A very faint patch 2.3 s.p. is probably 760.
.....	1 52.9	+24 54		Not given in the N. G. C. though much more conspicuous than 765 which is 29' s. A $\phi$ -type spiral with axis in p.a. 135°; 1' long. 7 s.n.
765	1 53.2	+24 25		A small, open spiral; 1' long whorls very faint.
770	1 53.7	+18 28		A very bright oval, 0.4 long; no structure discernible.
772	1 53.8	+18 31		A beautiful, rather symmetrical spiral about 5' x 3' in p.a. 120°. The nucleus is bright and almost stellar. There are several faint condensations; one whorl is much brighter than the rest. 27 s.n.
779	1 54.7	— 6 27		A narrow oval 3' x 0.5 in p.a. 165°; strong, sharp nucleus. A spiral, but the whorls are rather indistinct and show no condensations. 4 s.n.
818	2 2.7	+38 17		A faint spiral 3' x 1' in p.a. 105° with a sharp stellar nucleus. 4 s.n.
828	2 4.1	+38 43		Fairly bright; 1.5 long; no whorls discernible. There is a clear-cut dark lane south of the nucleus. See Abs. Eff.
891	2 16.2	+41 53		Vol. VIII, Plate 6. This beautiful example of an edgewise spiral with an absorbing lane down its center is 12' x 1' in p.a. 24°. Rather bright. See Abs. Eff. 54 s.n.
894) 895)	2 16.6	— 5 59		A fine two-branched spiral about 4' in length; the two main whorls are much brighter than the rest; nuclear portion bright, but not stellar. 894 is simply a whorl of 895. 8 s.n.
908	2 18.5	—21 41		Twenty nebulae in this region, all very faint and small, with the exception of 908, which is a fine, bright, somewhat irregular spiral, 4' x 1.3 in p.a. 172°. The nucleus is bright and stellar; there are a number of almost stellar condensations; the whorl extending to the s. is bifid. 20 s.n.
926	2 21.0	— 0 50		Very faint and small; elongated; faint stellar nucleus. Possibly a spiral seen nearly edgewise.
934	2 22.5	— 0 42		Described in the N. G. C. as vF, cS, O? A small, faint, slightly elongated, almost stellar nebula is near this place, but is not planetary.
936	2 22.5	— 1 36		Very interesting. The central part is very bright, and <i>Saturn</i> -shaped; there may be an almost stellar nucleus. This central portion is about 1.4 long in p.a. 85°. Outside is exceedingly faint matter, apparently spiral whorls, forming an oval ring about 3' x 2' in p.a. 150°. The spectrum is continuous. It is perhaps a $\phi$ -type spiral with unusually bright "cross-arm." 31 s.n.
941	2 23.4	— 1 36		A faint, patchy, somewhat oval, spiral about 2' in total length. Very faint, almost stellar nucleus. A faint nebula, probably an irregular spiral, 1' x 0.2 lies 12' s.
II 1805	2 24.5	+61 2		Very faint diffuse nebulosity, with some slight structural detail, shows over an area perhaps 12' square, involved in a sparse, open cluster. 0 s.n.



DESCRIPTION—(Continued)				
N.G.C.	$\alpha$	$\delta$		
949	2 24.7	+36 42	A fairly bright oval patch nearly 1' long. There are several stellar condensations, one at the southern end being brighter than the nucleus; there are traces of a faint whorl at the southern end. Quite irregular, but undoubtedly a spiral. 36 s.n.	
972	2 28.2	+28 50	A rather bright, quite irregular spiral 1.5 x 0.5 in p.a. 153°. Stellar nucleus; several strong condensations. There are vacant spaces about the two main condensations at the n. and s., and evidence of absorption effects on the south side. See Abs. Eff. 0 s.n.	
1023	2 34.1	+38 38	6' x 1.3 in p.a. 80°. Center very bright, with perhaps an almost stellar nucleus. While no spiral whorls are discernible, it is probably a spiral of the <i>Andromeda</i> type. 13 s.n.	
1055	2 36.6	+ 0 1	A moderately bright spiral 5' x 1' in p.a. 102°. Shows a few rather hazy condensations. Evidence of absorption effect on the n.	
1068	2 37.6	— 0 26	Messier 77 <i>Ceti</i> ; Vol. VIII, Plate 7. A very bright and beautiful spiral 2.5 x 1.7 in p.a. 20°. Several almost stellar condensations on the periphery of the brighter central portions, near the bright nucleus, which is apparently not stellar. The whorls are very compactly arranged. 11 s.n.	
1084	2 41.1	— 8 0	A fairly bright, condensed, very patchy spiral 2.2 x 0.8 in p.a. 30°. Very faint stellar nucleus; several condensations in the whorls. 14 s.n.	
1087	2 41.3	— 0 55	A fine spiral 2.3 x 1.3 in p.a. 10°; the whorls are rather irregular, showing numerous almost stellar condensations; the nucleus is fairly sharp.	
1090	2 41.5	— 0 40	A faint spiral 2' x 1' in p.a. 100° with a large, hazy nucleus. The whorls are faint and not clearly defined.	
1094	2 42.3	— 0 41	This appears to be the larger and more southerly nebula of two objects which are 1' apart. It is 1' long, slightly oval. The nucleus is almost stellar and surrounded by fairly bright matter, from which proceed two faint whorls which form a nearly complete oval ring. The northern nebula is a small spindle about 0.5 long. 49 s.n.	
II 1851	2 44.2	+57 54	Described as a nebulosity 5' long attached on the s.p. side to a 6.2 magn. star. An exposure of 1h 50m shows no trace of any nebulosity. 5 s.n.	
1156	2 53.8	+24 50	A faint and very irregular patch of nebulosity 2.5 long, showing a number of faint, almost stellar condensations. Not of the "diffuse" type, but, if a spiral, is of exceedingly irregular form. 9 s.n.	
1195	2 58.8	—12 26	1195 is very small, like a nebulous star. 48 s.n.	
1196	2 58.8	—12 28	Bright center; elongated fainter extensions; 0.5 long; perhaps spiral.	
1200	2 59.2	—12 23	Bright center; nearly round; 0.4 in diameter; no detail.	
1204	3 0.5	—12 44	Spindle 1' long; no details visible, but probably an edgewise spiral.	
1300	3 15.2	—19 46	An unusually interesting two-branched spiral of the $\phi$ -type, 6' x 3' in p.a. 95°; the whorls start abruptly from the extremities of straight extensions on each side of the nucleus. Figure in <i>Publ. Astr. Soc. of the Pacific</i> , Oct. 1912. Nucleus moderately large and bright; a few faint, almost stellar condensations. 16 s.n.	
1337	3 23.2	— 8 45	Rather faint, very patchy spiral 6' x 1' in p.a. 140°; no well marked nucleus. 1 s.n.	
.....	3 24.4	+43 34	<i>Nova Persei</i> . The remarkable diffuse nebulosity which appeared about this star in 1901, showing movement, has been the subject of many speculations. Illustrations are reproduced in <i>Lick Obs. Bull.</i> , 1, 170, 1902. The matter of this first outburst has since disappeared. A new outburst of nebulosity was discovered visually by Barnard in December, 1916. This is a wide fan-shaped mass proceeding from the nova on the s.p. side; there is, in addition, a faint ring of nebulosity about 16" in diameter surrounding the nova. No certain evidence of movement in this nebulosity can be detected from the Crossley plates in the interval between February 10, and November 20, 1917. Cf. papers by Pease and Ritchey in <i>Publ. Astr. Soc. Pac.</i> , 29, 256, 1917. 4 s.n.	
1393	3 34.1	—18 46	Nearly round spiral 0.8 in diameter; strong nucleus; whorls faint.	
1394	3 34.9	—18 36	Bright spindle 0.8 long in p.a. 15°; no whorls distinguishable.	
1400	3 35.0	—19 1	Bright; nearly round; 0.6 in diameter; no whorls or structure discernible.	
1402	3 35.0	—18 51	A moderately bright, small oval; 0.3 long; probably spiral.	
1407	3 35.7	—18 54	0.7 in diameter, nearly round; center much brighter; no spiral structure discernible. 27 s.n.	
1421	3 37.8	—13 49	An irregular spiral seen nearly edgewise; 3' x 0.5 in p.a. 0°. There is a faint nucleus; one whorl is quite bright and shows several condensations. A compact round spiral, 0.3 in diameter is 12' n.f. 8 s.n.	
I 348	3 38.2	+31 51	Diffuse, rather bright, irregular nebulosity of <i>Pleiades</i> type about 6' in extreme diameter. Several stars involved. Slight nebulosity also around a 10 magn. star 9.5 n.f. this nebula. 0 s.n.	
1440	3 40.5	—18 36	Small, elongated, with bright round center; 1' long; perhaps spiral.	
1455	3 40.8	—18 57	R. A. as given in the N. G. C. probably in error; no object in that place. Faint; <i>Saturn</i> -shaped; 1' long in p.a. 30°; much brighter center; probably spiral. 20 s.n.	



				DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$		
.....	3 41	+24	....	The <i>Pleiades</i> . L. O. Publ., Vol. VIII, Plate 8. 0 s.n.
I 351	3 41.1	+34	45	Planetary. 2 s.n.
1499	3 56.9	+36	8	Discovered by Barnard ( <i>Sid. Mes.</i> , 5, 27, 1886). "Probably about $\frac{1}{2}^\circ$ long." A very faint, long strip of diffuse nebulosity, 30' long in its brighter portion, 3' to 5' wide, elongated in $135^\circ$ . Much fainter extensions bring the total length to nearly a degree. 0 s.n.
1501	3 58.4	+60	39	Planetary. 0 s.n.
1514	4 2.9	+30	33	Planetary. 7 s.n.
1535	4 9.6	—13	0	Planetary. 8 s.n.
1530	4 10.7	+75	3	A spiral of somewhat irregular shape, 5' in length. The nucleus is almost stellar; there are portions of short, strong whorls near the nucleus; on the periphery are two long, almost detached whorls; a wide band of faint nebulous matter runs across the center from one whorl to the other. A somewhat irregular $\phi$ -type spiral. 11 s.n.
1555	4 16.1	+19	17	Region of T <i>Tauri</i> and Hind's variable nebula. This object is small and irregular, and has been uniformly of exceeding faintness on all plates taken between 1899 and 1917. T <i>Tauri</i> has an interesting cone-shaped nebulous wing, 4" long in p.a. $150^\circ$ , which appears either to be variable, or to rotate so as to be concealed at times. Cf. <i>Publ. Astr. Soc. Pacific</i> , 27, 242, 1915. 0 s.n.
1560	4 20.5	+71	41	Very faint; greatly elongated; about 6' x 1' in p.a. $20^\circ$ . An edgewise spiral with evidence of absorption lane at one side of the median line. 1 s.n.
1579	4 23.7	+35	41	Very irregular and patchy mass of diffuse nebulosity about 5' in diameter. Main portion somewhat resembles an $\Omega$ . Exceedingly faint diffuse nebulosity about a tenth magn. star 12' n.f. 0 s.n.
1599	4 26.7	— 4	48	Small, nearly round, irregular spiral, 0.7 in diameter.
1600	4 26.7	— 5	18	Oval; 1.5 long; rather large, brighter nucleus; no discernible spiral structure. 31 s.n.
1601	4 26.8	— 5	17	Small; round, almost stellar.
1603	4 26.9	— 5	19	Narrow oval 0.5 long; perhaps spiral.
1604	4 26.9	— 5	35	0.3 long; binuclear, or two almost stellar nebulae.
1606	4 27.0	— 5	16	Very small; slightly elongated.
1624	4 32.8	+50	15	Very faint; diffuse; a number of stars involved; about 3' in diameter. 0 s.n.
.....	4 35.6	— 2	13	Faint edgewise spiral 2' long.
1637	4 36.4	— 3	3	Slightly oval, 3' long; a symmetrical, rather open spiral. Nucleus is bright and almost stellar; whorls faint, showing numerous condensations. 8 s.n.
1638	4 36.6	— 2	0	Somewhat elongated; center very bright and nearly round; 1' long; no evidence of spiral form. 16 s.n.
1642	4 37.8	+ 0	25	A fine, rather open spiral, somewhat patchy. Nearly round; diameter about 1.7; nucleus bright and almost stellar. A very interesting spiral is 8' n.f. 1642; diameter nearly 1'; somewhat resembles M. 51 in <i>Canes Venatici</i> , except that the satellite nebula is relatively much brighter than in M. 51. 36 s.n.
J 320	5 0.0	+10	34	Planetary. 3 s.n.
1784	5 0.8	—12	1	A rather faint $\phi$ -type spiral; main portion about 1.5 long. 2 s.n.
1788	5 2.0	— 3	29	Quite irregular; 5' over all. Two stars of tenth and twelfth magn. form the nuclei; about each is diffuse nebulosity, showing some traces of spiral structure. Not a spiral nebula. 0 s.n.
1889 } 1888 }	5 17.9	—11	35	1888 is 2' long; quite narrow; in p.a. $60^\circ$ ; an irregular spiral seen edgewise; 1889 is small, round, quite bright; almost stellar, nearly opposite the middle of 1888 and 20" distant. A narrow edgewise spiral, 1.8 long, not noted in the N. G. C. is 36" f., 4.5 n. See Abs. Eff. 8 s.n.
I 418	5 22.9	—12	46	Planetary. 11 s.n.
1931	5 24.8	+34	10	Fairly bright diffuse nebulosity 3' long, involving a number of stars. A tenth magn. star 4' south of this nebula has a fan-shaped nebulous appendage extending to the south. 0 s.n.
.....	5 25.6	+30	22	<i>Nova Aurigae</i> . An exposure of 9h 30m on November 16–17, 1901, shows no evidence of exterior nebulosity. 0 s.n.
I 423	5 28.3	— 0	41	A very peculiar and interesting mass of diffuse nebulosity, 6' x 4'. The central part is vacant, giving the object the general appearance of a pear-shaped ring, rounded at the southern end and pointed at the northern end, which is directed approximately toward $\delta$ <i>Orionis</i> , 27' distant. There are flame-like protuberances on each side at the north. Quite faint. 1½ s.n.
I 424	5 28.5	— 0	23	A smaller mass of diffuse nebulosity, somewhat resembling I 423; 2.5 x 1'; the sharper western end points to $\delta$ <i>Orionis</i> , 24' distant.
1952	5 28.5	+21	57	The "Crab" Nebula in <i>Taurus</i> ; Vol. VIII, Plate 9. Planetary? 0 s.n.
1976	5 30	— 5	28	The Great Nebula in <i>Orion</i> ; Vol. VIII, Plates 10 and 11. "Circumsitae nebulae descriptio 'res Deo improba'" (D' Arrest.) 0 s.n.

DESCRIPTION—(Continued)				
N.G.C.	$\alpha$	$\delta$		
1977	5 30.5	— 4 55	A wonderful mass of bright, diffuse nebulosity covering an area nearly 30' x 20'. Vol. VIII, plate 12. 0 s.n.	
1990	5 31.2	— 1 16	Described in the N. G. C. as a very large nebula of the <i>Merope</i> type with $\epsilon$ <i>Orionis</i> at the n.p. end. It would seem that Herschel was here misled by the radiance about the bright star, or that he observed the similar nebulosity, I 434, south of $\zeta$ <i>Orionis</i> instead. Lord Rosse and D'Arrest were unable to see. I find no trace of nebulosity in an exposure of 2 <sup>h</sup> . 0 s.n.	
I 431	5 35.2	— 1 31	A mass of rather faint diffuse nebulosity about a star of magn. 8.6; 4' long.	
I 432	5 35.8	— 1 33	Moderately bright diffuse nebulosity of the <i>Pleiades</i> type, filling an area about 6' x 3' at the southeast of a star of magn. 8.4.	
2022	5 36.6	+ 9 2	Planetary. 0 s.n.	
I 434	5 36.0	— 2 27	This is one of the most wonderful regions of the sky; it is too large to be recorded on a single Crossley plate, but the portion involving I 434 and 2023 is reproduced in figure 5. At the north, beyond the edge of the illustration, is $\zeta$ <i>Orionis</i> , to the east of which lies the beautiful mass of diffuse nebulosity, 2024. This is shown in Vol. VIII, Plate 13; it covers an area about 20' x 16'; shows a wealth of structural detail, and is divided into two irregular masses by a wide, irregular, dark lane. I 434 is a line of rather faint diffuse nebulosity extending for fully 60' south from $\zeta$ <i>Orionis</i> , in p.a. about 175°; it bends somewhat to the east at a point about 10' s. of $\zeta$ and the halation effects about the bright star make it difficult to say whether the ray actually reaches $\zeta$ . On the west of the ray is very faint nebulosity and numerous faint stars; to the east of it practically none. 2023 is a mass of bright, irregular, diffuse nebulosity about 6' x 4', surrounding a star of magn. 9; it shows a number of sinuous dark lanes, of which one on the eastern side is very clear-cut, and suggests absorbing matter. Further east is I 435, a similar, but smaller and somewhat fainter mass of diffuse nebulosity, 3' in diameter, surrounding a star of magn. 8.5. But the most remarkable feature of the region is a dark bay which juts into and bifurcates I 434 at a point about 30' s. of $\zeta$ . This is 5' wide and 4' deep, like an ink-blot except for a faint wisp in its northern portion, and as clear-cut and sharp as a knife-scratch on its western and southern edges; a beautiful example of a "dark nebula." 0 s.n.	
2023	5 36.6	— 2 17		
2024	5 36.8	— 1 53		
I 435	5 37.9	— 2 21		
2070	5 39.4	—69 9	Large, fairly bright; exceedingly irregular, with curious loops; many stars involved. Made with the D. O. Mills Reflector at Santiago, Chile.	
2068	5 41.6	+ 0 1	Vol VIII, Plate 14. A mass of rather irregular, fairly bright, diffuse nebulosity, whose brighter portion is 6' x 4', involving two tenth magn. stars. Two fainter patches lie 6' west, apparently separated from the main mass by a wide lane of dark matter; the southerly one of these is 2064, and the northern one 2067. 0 s.n.	
2071	5 42.0	+ 0 16	Moderately bright diffuse nebulosity of the <i>Pleiades</i> type, 4' square, surrounding two stars of magnitudes 10 and 14.	
II 2149	5 48.9	+46 6	Planetary. 1 s.n.	
I 439	5 50.1	+32 0	Described by Wolf, <i>A. N.</i> , 3130, as 1° long and 10' wide. Could see no nebulosity visually in this region, and secured no trace in an exposure of 1 <sup>h</sup> 32 <sup>m</sup> ; probably to be recorded only in very long exposures. 0 s.n.	
2146	6 2.7	+78 23	Fairly bright, 4.5 x 1' in p.a. 147°. Bifid; an irregular spiral seen edgewise, with a rather wide, somewhat irregular dark lane down the center to the south of the faint, almost stellar nucleus. See Abs. Eff. 3 s.n.	
2174) 2175)	6 3.7	+20 30	2174 and 2175 are simply brighter portions in a very large mass of diffuse nebulosity, nearly square in general outline, 22' long; roughly central about a star of magn. 8. The brightest patch is that about B.D. +20°, 1288, and is comet-shaped. Another patch of fainter matter is about B. D. +20°, 1293. The large nebula shows much delicate structure, with curious, sharply defined rifts and lanes. 0 s.n.	
II 2165	6 17.1	—12 56	Planetary. 5 s.n.	
J 900	6 20.1	+17 51	Planetary. 1 s.n.	
2239	6 25.6	+ 5 1	Cluster and nebula in <i>Monoceros</i> . An area nearly a degree square is filled with very irregular diffuse nebulosity; some curious rifts in northeast portion. Barnard, <i>A. N.</i> , 122, 253, 1889, gives a drawing from visual observations, depicting the main portion as a ring 40' in diameter; the negative shows but little resemblance to the drawing. Swift's nebula, 2237, is a brighter patch in this region. Some of the brightest patches of nebulosity are around the central bright stars of the cluster. 0 s.n.	
II 2167	6 25.8	+10 31	A star of magn. 9.5 surrounded by an irregular mass of diffuse nebulosity; the brighter parts are 2' x 1.3; exceedingly faint extensions make the total diameter about 4'. The brighter matter is arranged in two lobes on either side of the star along an axis in p.a. 175°. Shows a slight resemblance to the planetary form. The object lies in a large vacant area about 15' in diameter; the cutting off of the fainter stars is quite marked. 0 s.n.	

				DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$		
2245	6 27.2	+10 14		Bright fan-shaped mass extending to s. from an apparently stellar nucleus; there is a bright wisp n. of the nucleus, and separated from it by a narrow lane. About $5' \times 3'$ in size; but little structural detail. 0 s.n.
2247	6 27.7	+10 24		Diffuse nebulosity of <i>Pleiades</i> type filling a space about $3'$ square about a star of magn. 8.5; it lies in a large vacant area. A similar object, of the same type and size, not given in the N.G.C., is at $6^h 25^m 7, +10^\circ 31'$ .
2261	6 33.7	+ 8 49		Bright, fan-shaped mass extending to n. from a nucleus of magn. 11; about $2' \times 1'$ ; shows considerable structural detail. Hubbell, <i>Aph. Jour.</i> , 44, 190, 1916, shows illustrations, indicating changes of form in less than eight years.
2264	6 35.5	+10 0		Vol. VIII, Plate 16. Nebula near 15 <i>Monocerotis</i> . A very interesting region. The brighter portion is about $10'$ in diameter, fairly bright, and shows a number of irregular lanes and one clear-cut "bay" on the north which strongly suggests dark matter. There are much fainter patches north and south of the main body. The nebula lies in a well-marked rift about $20'$ wide and at least a degree long, extending across the plate in p.a. $20^\circ$ ; the cutting off of the fainter stars is very noticeable. 0 s.n.
2287	6 42.7	—20 38		A large, very coarse and sparse cluster, about $25'$ in diameter. 0 s.n.
II 2177	7 0.4	+10 33		Vol. VIII, Plate 16. Moderately bright diffuse nebulosity filling, with its fainter extensions, an area nearly $16'$ in diameter, surrounding a 7.3 magn. star. A wide, irregular, dark lane crosses it from east to west. 0 s.n.
2359	7 12.9	—13 2		An exceedingly faint mass of diffuse nebulosity about $7'$ in diameter; looped or falcated structure. 0 s.n.
2366	7 18.3	+69 13		A very irregular mass of spiral type nebulosity filling an area about $6' \times 3'$ . Numerous almost stellar condensations. Rather faint. 40 s.n.
2371}	7 19.3	+29 41		Planetary. 10 s.n.
2372}				
II 2189	7 19.5	+ 9 7		Described as a stellar planetary. Search with the slitless spectroscope showed no object of planetary type in this region.
2392	7 23.3	+21 7		Planetary. 0 s.n.
2403	7 27.2	+65 49		Vol. VIII, Plate 17. A bright, beautiful spiral $16' \times 10'$ . No nucleus apparent; many almost stellar condensations; of the general type of M. 33. 7 s.n.
2437}	7 37.2	—14 29		2437 is a very large, bright, sparse cluster about $25'$ in diameter, in which is involved the planetary nebula 2438. 0 s.n.
2438}				
2440	7 37.5	—17 58		Planetary. 0 s.n.
2452	7 43.4	—27 6		Planetary. 0 s.n.
2500	7 54.4	+51 2		An exceedingly faint, open, irregular spiral about $1.6'$ in diameter. There is a very faint stellar nucleus, and a number of almost stellar condensations. 1 s.n.
2507	7 55.9	+15 59		A small, slightly oval spiral $1.2'$ long, with a faint satellite nebula as in M. 51. 59 s.n.
2514	7 57.2	+16 5		A spiral $1'$ in length; sharp stellar nucleus. The main whorls are of an S shape, with fainter whorls outside.
2518}	7 59.8	+51 24		Discovered by Lohse, and noted in the N. G. C. as "Two neb, F, L, R, gbM, $\Delta\alpha=42''$ ". These are small and inconspicuous objects, and scarcely warrant the N. G. C. description. The s.p. object is an exceedingly faint spiral perhaps $1'$ long; the n.f. nebula is very small and faint, with an almost stellar nucleus; no spiral structure discernible. 4 s.n.
2519}				
2532	8 3.8	+34 15		A fine, nearly round spiral $1.5'$ in diameter; moderately bright. It has a sharp stellar nucleus; the whorls are rather open, and show a number of almost stellar condensations. 22 s.n.
2537	8 6.2	+46 18		This is not a cluster, as described in the N. G. C., but a bright, irregular spiral, $57'' \times 44''$ in p.a. $167^\circ$ . There is no true nucleus; a line of bright matter extends along the major axis to the s. It is perhaps a spiral consisting of a single whorl, obliterated at the southern end by occulting matter; this whorl gives it the appearance of an oval ring. It is astonishingly like a planetary in its general form, but observations by Messrs. Campbell and Paddock with the 36-inch refractor have shown that its spectrum is continuous. Very bright; the brightest part is a condensation on the north-west edge, which shows well in a $2^m$ exposure. See Figure 6. 26 s.n.
II 2233	8 6.9	+46 3		A very narrow spindle $5'$ long in p.a. $17^\circ$ . An edgewise spiral; the faint nucleus is displaced to one side, and there is evidence of an absorbing lane.

## DESCRIPTION—(Continued)

N.G.C.	$\alpha$	$\delta$	
II 2262	8 11.6	+18 46	I am unable to identify any of these objects. II 2274 is described as "pB neb star with two spir branches"; this appears to be three small stars almost in contact. Most of the others appear to be simply very faint stars. The region was carefully checked. Examination with the slitless spectroscope shows no object with bright-line spectrum in this region. 0 s.n.
II 2266			
II 2270			
II 2272			
II 2273			
II 2274			
II 2275			
II 2276			
II 2277			
II 2278			
II 2279			
II 2280			
II 2281			
II 2284			
II 2289			
II 2290			
II 2291	8 13.6	+18 49	
2632	8 34	+20 ....	Praesepe cluster. Stars not nebulous with an exposure of 2 <sup>h</sup> . 14 s.n.
2610	8 28.8	—15 48	Planetary. 1 <sup>h</sup> s.n.
2649	8 37.8	+35 4	A faint, symmetrical, nearly round spiral 1 <sup>h</sup> 3 in diameter; whorls rather open; the nucleus is faint and almost stellar. 16 s.n.
2653	8 42.8	+78 48	Described as vF, vS, F st close n. No such object exists in this position. There is a small spiral ( $\phi$ -type?) at 8 <sup>h</sup> 42 <sup>m</sup> 7, +78° 58', with a faint star 1' n.f.
2655	8 43.2	+78 36	Slightly oval; exceedingly bright at center. The main portion is about 1' long; outside are narrow, very faint spiral whorls; probably 4' in extreme diameter. Curious small "hole" on s. side, close to nucleus. 28 s.n.
2682	8 45.8	+12 11	Bright, very sparse cluster about 16' in diameter. 5 s.n.
2681	8 46.4	+51 41	Very bright, rather large nucleus, surrounded by bright nebulosity; farther out, diameter about 0.7, is a strong, nearly perfect ring formed by the union of two whorls; much fainter whorls outside this ring. 30 s.n.
2683	8 46.5	+33 48	Vol. VIII, Plate 18. A moderately bright, greatly elongated spiral 10' x 1' in p.a. 40°. Whorls rather patchy; there are strong evidences of absorption effects on the n. side. See Abs. Eff. 16 s.n.
2768	9 3.8	+60 27	A rather bright oval 1 <sup>h</sup> 4 x 0.8 in p.a. 95°. Nucleus nearly stellar; a very compact spiral, but spiral structure quite indistinct. 0 s.n.
2775	9 5.0	+ 7 27	A fine, slightly oval spiral 2.1 long; there is a stellar nucleus surrounded by relatively bright matter; outside this are faint, delicate, nearly merging spiral whorls. 31 s.n.
2777	9 5.4	+ 7 38	A bright patch of nebulosity 0.5 x 0.2; nucleus fairly bright, but not stellar. A very irregular spiral, much condensed.
✓ 2808	9 9.9	—64 27	Exceedingly condensed cluster of faint stars. D. O. Mills Reflector, Santiago, Chile.
2841	9 15.1	+51 24	Vol. VIII, Plate 19. A beautiful, very regular spiral, 6' x 1.6 in p.a. 152°. Nucleus almost stellar; central portions quite bright; whorls narrow and compact. See Abs. Eff. 35 s.n.
II 2487	9 24.5	+20 32	A bright narrow oval 1.6 in p.a. 165°; faint nucleus; a compact spiral seen at a small angle. See Abs. Eff. 15 s.n.
2903 } 2905 }	9 26.5	+21 57	Vol. VIII, Plate 20. A beautiful, bright spiral 12' x 5' in p.a. 18°. Large, confused nuclear portion containing five rather nebulous condensations. Whorls rather open, showing numerous condensations. Traces of the $\phi$ -type formation. See Abs. Eff. 7 s.n.
2964	9 37.0	+32 18	A beautiful spiral 2' long; somewhat elongated; nucleus almost stellar; the two main whorls are somewhat irregular and patchy; moderately bright.
2968	9 37.3	+32 23	An irregular oval 1.2 in length; an irregular dark lane passes down its middle at one side of the almost stellar nucleus. No spiral structure discernible. See Abs. Eff. 29 s.n.
2970	9 37.6	+32 36	Very small, round, bright; almost like a nebulous star; no spiral structure discernible.
2976	9 39.0	+68 22	Quite bright oval 3.2 x 1.1 in p.a. 33°, with clear-cut edges; numerous almost stellar condensations. Structure quite irregular; probably a rather compact and very irregular spiral. 1 s.n.
2985	9 41.4	+72 45	Slightly elongated; 3' long. There is a bright stellar nucleus; the whorls are quite condensed and rather patchy near the center, fainter and much more open farther out. 12 s.n.
3003	9 42.6	+33 53	Rather bright; 6' x 1'; faint nucleus. An irregular spiral with very clearly marked absorption effect on the s. side. See Abs. Eff. 41 s.n.
3031	9 47.3	+69 32	Vol. VIII, Plate 21; M. 81. This very beautiful spiral is about 16' x 10', and is too well known to require description. Short exposures show that the nucleus is almost stellar. Central part very bright. See Abs. Eff. 10 s.n.



				DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$		
3034	9 47.6	+70 10		A very patchy and irregular elongated mass, 7' x 1.5' in p.a. 65°, showing numerous rifts; an irregular lane divides it approximately along the shorter axis. It is possibly a very irregular spiral seen edgewise. Exceedingly bright; the brighter condensations show easily in a 5 <sup>m</sup> exposure. M. 82. See Abs. Eff. 9 s.n.
3073	9 53.9	+56 6		Very bright; fading out rapidly toward the edges; round, 0.3 in diameter, structureless.
3079	9 55.1	+56 10		Quite bright; 8' x 1' in p.a. 167°; nucleus elongated and hazy; numerous condensations in the whorls. A nearly edgewise spiral, showing evidence of absorption lane on the east. See Abs. Eff. 34 s.n.
3077	9 55.3	+69 13		Roughly oval; 3' x 2'; nucleus double. The central portion is quite bright; there are several "holes," of which one near the center is crescent shaped. Quite patchy and irregular; probably a very irregular spiral, though the traces of spiral structure are very vague. 3 s.n.
3115	10 0.3	— 7 14		Vol. VIII, Plate 22. An exceedingly bright spindle 4' x 1' in p.a. 45°, with an almost spherical central portion; no stellar nucleus apparent in short exposures. There are no traces of spiral whorls, but it is doubtless a spiral of the <i>Andromeda</i> type seen edgewise. 16 s.n.
3148	10 7.4	+51 0		Described as "7 in photosphere 2' or 3' d". Probably non-existent. Was unable to distinguish any nebulosity visually, and an exposure of 50 <sup>m</sup> showed no trace. 16 s.n.
3156	10 7.5	+ 3 38		Bright oval 1' long in p.a. 45°; slight traces of spiral character.
3165	10 8.1	+ 3 52		A faint, patchy oval 1.5' long; probably an irregular spiral.
3147	10 8.4	+73 54		A nearly round, rather symmetrical and open spiral 3' in diameter; numerous almost stellar condensations. The nucleus is almost stellar and very bright, showing well in 10 <sup>m</sup> exposure. There is now no trace of the suspected nova noted by Mrs. Roberts in <i>A. N.</i> , 4708, 197, 1914, 5' 16" west and 1' 58" north of the nebula. The position given is far outside of the faintest extensions of this spiral. 2 s.n.
3166	10 8.6	+ 3 55		Bright, elongated nucleus, surrounded by bright matter 1' in diameter, showing spiral whorls. Outside this to a diameter of about 4', very faint matter. 31 s.n.
3169	10 9.0	+ 3 58		Rather irregular, patchy spiral 4' x 1.7' in p.a. 55°. Nuclear portion oval and quite bright. An absorption lane on the s.e. See Abs. Eff.
3184	10 12.2	+41 55		A beautiful, very regular, open spiral, nearly round, 6' in diameter. The nucleus is bright and almost stellar; numerous almost stellar condensations. 16 s.n.
3191	10 12.9	+46 56		A small, moderately bright, slightly oval spiral 0.7 long; stellar nucleus; most of the matter is in one whorl.
3198	10 13.7	+46 4		Vol. VIII, Plate 23. A beautiful, moderately bright spiral 9' x 3' in p.a. 40°. Small, almost stellar nucleus and numerous almost stellar condensations. 28 s.n.
3213	10 15.8	+20 10		Slightly oval, 0.2 long; no structure discernible.
3222	10 17.1	+20 23		Small oval 0.7 long; bright center; no spiral structure discernible.
3226	10 18.0	+20 24		Vol. VIII, Plate 24. The bright stellar nuclei of this interesting pair are 138" apart in p.a. 159°. Two nebulae close together, rather than a double nebula. 3226 is bright, nearly round, about 1' in diameter; no spiral structure discernible. 3227 is 3' x 1.2 in p.a. 155°, a patchy, compact spiral without clearly marked whorls. 25 s.n.
3227	10 18.0	+20 22		
3242	10 20.0	—18 5		Planetary. 1 s.n.
II 2574	10 21.1	+68 58		Coddington's new nebula in <i>Ursa Major</i> , cf. <i>Publ. Astr. Soc. Pac.</i> , 16, 123, 1893. Exceedingly faint, scattered condensations covering an area perhaps 12' x 4'. Probably an open, extremely faint spiral. 4 s.n.
3245	10 21.7	+29 1		An oval 2' long; nucleus very bright, and outer portions quite faint. Indistinct traces of spiral character. 1 s.n.
3254	10 23.7	+30 0		A symmetrical spiral 4' x 1' in p.a. 45°; nucleus bright and small; the whorls are narrow, faint, and show no condensations. 4 s.n.
3265	10 25.6	+29 18		Bright oval 0.5 long; probably spiral.
3272	10 26.2	+28 59		Somewhat elongated; 0.3 long; not very bright; doubtless spiral.
3277	10 27.3	+29 2		Nearly round, 1' in diameter; bright stellar nucleus. In the central portion, about 0.4 in diameter, the whorls are quite bright, and compactly arranged; the outermost whorls are very faint and well separated. 22 s.n.
3293	10 29.6	—57 40		Coarse cluster. D. O. Mills Reflector, Santiago, Chile.
3294	10 30.5	+37 51		A rather open spiral 3' x 1.5; nucleus faint and stellar; whorls rather faint. 1 s.n.
3344	10 38.0	+25 27		A beautiful, rather open, nearly round spiral. Nucleus is small and very bright; the whorls show many almost stellar condensations. The diameter of the main portion is 4', but there are a number of small patches in the vicinity which may be more distant portions of the spiral. 20 s.n.



					DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$			
3346	10 38.3	+15 24			Quite faint; nearly round, 2.5 in diameter; stellar nucleus. A very open spiral with numerous condensations, and some approach to the $\phi$ -type at the center. 6 s.n.
3351	10 38.7	+12 14			A beautiful object; nearly round; 3' in diameter. The whorls are rather faint and form an almost complete ring; a wide band of matter extends across the nebula from one side to the other; an example of the $\phi$ -type spiral. The center is exceedingly bright, and of unusual structure. It is about 12" in diameter, and appears trinuclear; the center of the disk is not marked by any condensation, but on its periphery are two stellar nuclei, and a short, very bright, slightly curved mass. 10 s.n.
3372	10 41.2	—59 9			Nebulosity around $\eta$ Carinae; only a portion of this nebula is shown on the plate. D. O. Mills Reflector, Santiago, Chile.
3367	10 41.3	+14 16			Nearly round; 2' in diameter; a beautiful, rather bright spiral, showing across its central portion of the band of matter characteristic of the $\phi$ -type. Nucleus bright, and stellar. Whorls are rather open and show a few almost stellar condensations. I can not locate 3371 and 3373 in the positions given. 30 s.n.
3368	10 41.5	+12 21			A fine strong spiral; brightest part 2.6 long. Bright stellar nucleus; the outer whorl of the brighter structure forms a nearly complete oval ring; a much fainter whorl outside this brings total length to about 7'. A clear-cut rift goes in to nucleus on n.p. side. Reproduced in <i>Publ. Astr. Soc. Pac.</i> , June, 1913, frontispiece. See Abs. Eff. 20 s.n.
3377	10 42.4	+14 31			2' x 1', with a rather large and very bright central portion; no spiral structure discernible.
3379	10 42.6	+13 7			This, with 3384 and 3389, forms a striking group, a right-angled triangle whose shorter sides are 7' long. 3379 is nearly round, 2' in diameter; very bright; no spiral structure discernible. 33 s.n.
3384	10 43.0	+13 10			A replica of 3379 except that it is more oval; 3' long. Nucleus very bright and elongated; no whorls can be distinguished, but it is probably a spiral of the <i>Andromeda</i> type.
3389	10 43.2	+13 4			A fine, moderately bright, somewhat oval spiral 2' long; quite irregular; numerous condensations; weak nucleus. See Abs. Eff.
3404	10 45.3	—11 21			A very narrow spindle 1.6 long in p.a. 82°. Nucleus nearly stellar and fairly bright; it is displaced to one side of the central line, suggesting absorption effects; doubtless an edgewise spiral. See Abs. Eff. 11 s.n.
3489	10 55.0	+14 26			2.5 x 1' in p.a. 70°; very bright center with an almost stellar nucleus; the whorls are rather indistinct; are most prominent at the ends of the minor axis, and fade out at the ends of the major axis.
3504	10 57.8	+28 31			2' long, somewhat oval; a $\phi$ -type spiral with a very bright, round nucleus. 9 s.n.
3512	10 58.6	+28 34			A small, rather regular, rather faint spiral, 1' in diameter, with a sharp stellar nucleus.
3515	10 59.2	+28 46			A rather faint oval 0.8 long in p.a. 50°; a compact spiral with a faint nucleus.
3556	11 5.7	+56 13			Vol. VIII, Plate 26. An irregular, patchy spiral 8' x 1.5 in p.a. 84°; quite bright. Has a faint nucleus and shows a number of condensations, three of which are almost stellar; a star of magn. 11 near the nucleus. See Abs. Eff. 35 s.n.
3587	11 9.0	+55 34			Planetary. The "Owl" nebula, Vol. VIII, Plate 27. 107 s.n.
3605	11 11.4	+18 34			A small oval, 0.3 long, with much brighter center; no spiral structure discernible.
3607	11 11.6	+18 36			Slightly oval; 1.3 long; quite bright at center, with an almost stellar nucleus; indistinct traces of whorls, and evidence of an absorbing lane on the n. See Abs. Eff. 4 s.n.
3608	11 11.7	+18 36			0.5 in diameter; bright center and almost stellar nucleus; structureless.
3613	11 12.8	+58 33			Bright, narrow oval 1.8 long in p.a. 95°; no whorls distinguishable.
3619	11 13.6	+58 18			Nearly round, 1' in diameter; center quite bright and almost stellar; whorls very faint and almost form a ring. 12 s.n.
3623	11 13.7	+13 38			Vol. VIII, Plate 28. A beautiful, bright spiral 8' x 2' in p.a. 174°. Whorls rather indistinct, with one almost stellar condensation; bright, almost stellar nucleus. Absorption lane on the east. M. 65. See Abs. Eff. 26 s.n.
3625	11 14.7	+58 20			A faint, considerably elongated two-branched spiral, 1' long. Faint, almost stellar nucleus.
3627	11 15.0	+13 32			Vol. VIII, Plate 28. A very bright, beautiful, spiral 8' x 2.5 in p.a. 180°. Bright, slightly elongated nucleus; the whorls are somewhat irregular and show numerous condensations. M. 66.
3628	11 15.0	+14 8			Moderately bright; 12' x 1.5 in p.a. 100°. There are no well marked condensations. A wide dark lane runs down its entire length; the southern portion is the narrower and fainter. An edgewise spiral. See Abs. Eff. 19 s.n.
II 2739	11 16.0	+12 28			Described as "vF, vS, annular?." A very faint small, oblong patch, perhaps 0.5 long; not annular.

## DESCRIPTION—(Continued)

N.G.C.	$\alpha$	$\delta$		
3675	11 20.7	+44	8	A rather open spiral 3' x 1' in p.a. 0°. Nucleus stellar, and appears displaced to one side of the central mass because of a well-marked dark lane on the east. The whorls show a number of very faint, almost stellar condensations. See Abs. Eff.
3681	11 21.3	+17	26	A spiral 1' in diameter. Whorls form a nearly perfect ring.
3684	11 21.9	+17	35	A slightly oval, rather patchy spiral 1½ long; fairly bright nucleus.
3686	11 22.5	+17	46	A fine, rather open, nearly round spiral, 2' in diameter. Stellar nucleus magn. 12-13; the two main whorls show numerous almost stellar condensations. In addition to the four larger nebulae, there are many small nebulae on this plate; one-sixth of these are clearly spirals. In the case of the smaller and fainter objects it is, of course, impossible to pronounce as to their spiral character, but the proportion of spirals is doubtless a much larger one. 69 s.n.
3691	11 22.9	+17	28	A moderately bright oval 0.8 x 0.5, crossed by a streak of brighter matter; a compact $\phi$ -type spiral.
3718	11 27.0	+53	37	Faint and irregular; total diameter about 3'. Bifid; an edgewise spiral with a wide absorbing lane. Fairly bright and sharp nucleus from which the matter on the n.f. side extends in a faint fan. See Abs. Eff. 19 s.n.
3726	11 27.9	+47	36	Vol. VIII, Plates 30A and 30B. A bright spiral 4.6 x 3.5 in p.a. 5°. Bright stellar nucleus; whorls are somewhat irregular, open, and show many almost stellar condensations. $\phi$ -type at center. 18 s.n.
3729	11 28.3	+53	41	A moderately bright spiral 1.5 x 0.6, with most of the matter in a single whorl which forms an irregular oval ring; almost stellar nucleus.
3892	11 43.4	+49	16	A fine, bright, nearly round spiral, 2' in diameter; bright, almost stellar nucleus. The two main whorls are rather open, and show numerous almost stellar condensations.
3896	11 43.8	+49	14	A moderately bright, binuclear patch about 0.3 in diameter (two very small nebulae close together?).
3938	11 47.6	+44	41	A beautiful, nearly round, rather open and symmetrical spiral, 4.5 in diameter. Stronger central portion, and an almost stellar nucleus. Many almost stellar condensations. 39 s.n.
.....	11 51.6	+53	43	A narrow oval 2' long in p.a. 0°; large nucleus; an irregular spiral.
3992	11 52.4	+53	55	A beautiful, slightly oval spiral 7' in length. Bright, almost stellar nucleus; whorls are rather open and show a number of faint condensations; the central portions show traces of the $\phi$ -type formation. 20 s.n.
.....	11 52.6	+53	47	A faint spindle 1' long in p.a. 150°.
.....	11 53.5	+53	58	An exceedingly faint, narrow oval 2' long in p.a. 160°. No spiral structure discernible.
4013	11 53.4	+44	30	A moderately bright, very narrow edgewise spiral 4' long in p.a. 70°. There is a clear-cut dark lane down the middle in which is a star of magn. 12. See Abs. Eff. 20 s.n.
4020	11 53.8	+30	59	A compact, rather faint, somewhat patchy oval 1.5 long; no nucleus apparent. There is evidence of an absorption lane on the east. It is not binuclear as described in the N. G. C. 42 s.n.
4026	11 54.3	+51	31	A narrow, bright spindle, 3' long, in p.a. 176°, with a very bright, somewhat enlarged center. Evidences of spiral character very indistinct, but it is doubtless an edgewise spiral. 10 s.n.
4030	11 55.3	— 0	33	A rather bright, slightly oval spiral 2' long. Nucleus almost stellar; numerous almost stellar condensations in the rather open whorls.
4036	11 56.3	+62	27	A very bright narrow oval 4' x 1' in p.a. 83°. Nucleus bright, but not stellar. Evidence of a short, curved, dark lane on the south. A spiral, though the whorls are indistinct. The nucleus just shows in 2 <sup>m</sup> on S23. 12 s.n.
4041	11 57.1	+62	42	A nearly round spiral 2' in diameter. The outer whorls are rather open; the center is occupied by compact, bright, somewhat irregular disk of matter about 0.5 diameter; no true nucleus can be seen.
4051	11 58.0	+45	5	A fine, rather bright spiral 4' x 2' in p.a. 122°. Very bright stellar nucleus. There are numerous almost stellar condensations. It is a two-branched spiral, and each branch is bifid. 15 s.n.
4062	11 58.9	+32	27	A rather faint, compact, regular spiral 3' x 1' in p.a. 95°. The whorls are rather patchy; faint stellar nucleus, which just shows in a 10 <sup>m</sup> exposure. 11 s.n.
4096	12 0.9	+48	2	A narrow spiral 6' x 1' in p.a. 18°. The whorls are distinct, but irregular. Bright, rather large nucleus, considerably to the n. of apparent center of the nebula; numerous almost stellar condensations. 12 s.n.
4100	12 1.0	+50	8	A fairly bright, rather irregular spiral 4' x 1' in p.a. 162°. Nucleus bright, but not stellar; whorls uniform in texture showing few condensations. 16 s.n.
4145	12 4.9	+40	27	An open, patchy spiral 5' x 3.5 in p.a. 90°; shows numerous almost stellar condensations and a very faint nucleus. The nebular matter is faint, and the description "B" of the N. G. C. seems unwarranted.

					DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$			
✓ 4147	12	5.0	+19	6	Bright, small cluster 2' in diameter. Probably of globular type.
4151	12	5.5	+39	58	The nucleus is almost stellar, very bright, nearly equivalent to 10 magn. This is surrounded by a bright central portion which shows traces of spiral formation. Outside of this is a vacant ring. The outer whorls form an oval 2'6" x 1'6", and these are brightest at the ends of the major axis. It somewhat resembles the planetary type, and the observations of Messrs. Campbell and Paddock show that the nucleus has bright lines in its spectrum. It is undoubtedly a spiral, however. 40 s.n.
4156	12	5.8	+40	2	A small, rather bright spiral 1' long, slightly oval. Nucleus bright and almost stellar. Shows traces of the $\phi$ -type formation in the central portions.
4186	12	8.4	+15	18	Faint, nearly round spiral, 0'7 in diameter.
4192	12	8.7	+15	27	An open, elongated spiral 8' x 2' in p.a. 150°. Bright stellar nucleus; numerous almost stellar condensations. Absorption effects on east side. Figure in Vogel I, No. 6 ( <i>Leip. Beob.</i> , Bd. 1). M. 98. See Abs. Eff. 30 s.n.
4206	12	10.2	+13	36	A greatly elongated spiral 4' x 0'6" in p.a. 5°. Quite faint; there is a faint nucleus, and evidence of an absorption lane at the east of the nucleus. See Abs. Eff.
.....	12	10.3	+14	35	A faint, narrow spindle 2' long in p.a. 120°; doubtless a spiral seen nearly edgewise.
4208	12	10.4	+14	28	A faint disk 0'2 in diameter; no structure discernible.
4212	12	10.6	+14	28	A compact, moderately bright spiral 2' x 1' in p.a. 65°. Bright, almost stellar nucleus; the whorls are somewhat patchy and irregular. See Abs. Eff. 26 s.n.
4214	12	10.6	+36	53	A very irregular aggregation of nebular matter and nebulous stars, which is about 8' x 4', with the very faint outlying condensations. There is apparently an almost stellar nucleus. The general appearance of the nebulousity is of the spiral type, but it is exceedingly irregular; not a nebulousity of the diffuse type. Quite bright. 13 s.n.
4216	12	10.8	+13	42	A greatly elongated spiral 7' x 1' in p.a. 18°. The central portion is very bright, showing well in a 10 <sup>m</sup> exposure, nucleus is not stellar. Well marked evidence of absorption lanes on the east. This, with 4206 and 4222, forms an interesting group of three almost edgewise spirals in the same field. See Abs. Eff. 41 s.n.
4218	12	10.9	+48	42	A very irregular oval patch 0'7 long, with a line of brighter matter down its center; moderately bright; no nucleus discernible. Perhaps a very irregular spiral. 22 s.n.
4220	12	11.2	+48	26	A fairly bright spiral 2'5" x 0'4" in p.a. 135°. Bright, almost stellar nucleus. Absorption effect along the n.e. side. See Abs. Eff.
4222	12	11.3	+13	54	Edgewise spiral 3' long in p.a. 60°; rather faint; no definite nucleus.
4228	12	11.6	+36	53	Non-existent.
4236	12	12.0	+70	2	Very faint; 10' to 12' long by about 2' broad; p.a. 165°. A few faint condensations, but no discernible nucleus. Quite irregular; probably an S-shaped spiral seen nearly edgewise.
4231	12	12.0	+48	2	Rather faint, nearly round, indistinct spiral 0'5 in diameter.
4232	12	12.0	+48	1	Faint oval spiral 0'7 long, with faint, almost stellar nucleus.
4244	12	12.5	+38	22	Vol. VIII, Plate 31. A fine, quite bright, edgewise spiral, 13' x 0'9" in p.a. 50°. An irregular dark lane runs down the middle. A few almost stellar condensations. Apparently no nucleus; though there is a star of magn. 14 in this position. See Abs. Eff. 10 s.n.
4248	12	12.8	+47	59	This is a faint, almost linear strip of nebulousity 1' x 0'1" in p.a. 110°; doubtless the central portion of an edgewise spiral.
4252	12	13.4	+ 6	8	A rather faint spindle 1'2" long in p.a. 47°; spiral.
4253	12	13.5	+30	24	This is a small $\phi$ -type nebulae with a fairly bright, almost stellar nucleus, and a very bright "cross-arm," which gives it a <i>Saturn</i> -like appearance; this line of matter is 0'5 long, and from its ends proceed very faint whorls.
4254	12	13.7	+14	59	Vol. VIII, Plate 32. A very bright, approximately round spiral 4'5" in diameter. Nucleus almost stellar. There are two main whorls, rather open, which show many almost stellar condensations. M. 99. 47 s.n.
4257	12	14.0	+ 6	17	Narrow oval with brighter center, 0'8 long; traces of spiral structure.
4258	12	14.0	+47	52	Vol. VIII, Plate 33. With the very faint extensions this spiral is nearly 20' x 6' in p.a. 165°; very bright, elongated nuclear portion, on the west of which is a short dark lane; there are numerous almost stellar condensations in the two principal spiral branches. See Abs. Eff. 11 s.n.
4259	12	14.3	+ 5	56	Similar to 4257, but brighter.
4261	12	14.3	+ 6	23	Very bright; slightly oval, 1'6" long; large bright central portion, but no nucleus or spiral structure discernible.
4264	12	14.5	+ 6	24	Moderately bright; nearly round; 0'5 in diameter; a small $\phi$ -type spiral.
4266	12	14.6	+ 6	7	A faint spindle, 1'5 long; spiral. See Abs. Eff.

## DESCRIPTION—(Continued)

N.G.C.	$\alpha$	$\delta$	
4268	12 14.7	+ 5 50	An oval 1' long with bright central portion; some faint traces of spiral structure.
4270	12 14.7	+ 6 1	An oval with bright center, $1' \times 0.3'$ , in p.a. $105^\circ$ , probably a spiral. This is near the center of a remarkable field which contains thirteen N. G. C. objects, and eighty-one other small and faint nebulae. 81 s.n.
4273	12 14.8	+ 5 54	A fairly bright, compact spiral $1.6' \times 1'$ ; bright, but not very sharp nucleus, which is quite asymmetrically placed.
4274	12 14.8	+30 10	The main whorl of this spiral forms an elliptical ring $3.5' \times 1'$ in p.a. $95^\circ$ ; exceedingly faint matter outside brings the total length to nearly $8'$ . Bright, rather irregular matter in the vicinity of the nucleus, which is elongated and shows well in a $5^m$ exposure. See Abs. Eff. 17 s.n.
4277	12 15.0	+ 5 54	Nearly round; $0.3'$ in diameter, with an almost stellar nucleus; a spiral.
4278	12 15.1	+29 50	Nearly round, $1'$ in diameter; central part very bright; no spiral structure discernible.
4281	12 15.3	+ 5 57	A very bright oval $1.5' \times 0.5'$ ; some slight indications of spiral structure.
4282	12 15.3	+ 6 8	About $0.6'$ long in p.a. $110^\circ$ ; bifid. See Abs. Eff.
4283	12 15.3	+29 52	Round, $0.3'$ in diameter; quite bright; structureless.
4286	12 15.6	+29 55	Very faint; slightly oval; $1'$ long; faint stellar nucleus; probably spiral.
4287	12 15.7	+ 6 12	A faint spindle $0.8'$ long in p.a. $80^\circ$ ; spiral.
4292	12 16.2	+ 5 9	Slightly oval; $1'$ long; a $\phi$ -type spiral with a bright stellar nucleus.
4301	12 16.6	+ 5 16	Bright spindle $1'$ long in p.a. $125^\circ$ , with almost stellar nucleus.
4303	12 16.8	+ 5 2	Vol. VIII, Plate 34. M. 61. Nearly round; $6'$ in diameter; very bright. A beautiful spiral, with a very bright, almost stellar nucleus, and many almost stellar condensations in its open, somewhat irregular whorls. 40 s.n.
.....	12 17.4	+ 5 8	Nearly round; rather bright; $1.2'$ in diameter. A $\phi$ -type spiral with several almost stellar condensations in its main whorls, which form a nearly complete ring.
4312	12 17.5	+16 6	Rather faint; $2.4' \times 0.5'$ in p.a. $170^\circ$ . Nucleus and whorls indistinct. See Abs. Eff.
4321	12 17.8	+16 23	Vol. VIII, Plate 35. A bright, regular, nearly round spiral $5'$ in diameter. Very faint stellar nucleus surrounded by bright, short whorls, forming a central oval. The outer whorls are rather open, quite regular, and show many stellar condensations. Two novae have appeared in this spiral. M. 100. 15 s.n.
4340	12 18.5	+17 17	A spiral of the $\phi$ -type, $3.6' \times 3'$ , with a bright, rather large nucleus.
4350	12 18.9	+17 16	A spindle $2' \times 0.4'$ in p.a. $30^\circ$ ; very bright; no spiral structure discernible. 28 s.n.
4361	12 19.4	—18 13	Planetary. 4 s.n.
4374	12 20.0	+13 27	Very bright; round, $1'$ in diameter. Center large. No spiral structure discernible.
4382	12 20.3	+18 45	Very bright oval, $4' \times 2'$ ; very slight traces of spiral structure. M. 85. 14 s.n.
4383	12 20.4	+17 1	$1.5' \times 0.5'$ in p.a. $25^\circ$ , with a large, bright center. The northeastern end is bifid, with a dark lane extending in to the nuclear portion; no lane is visible at the other end. No whorls discernible.
4387	12 20.6	+13 22	$0.8' \times 0.4'$ ; bright center; no spiral structure discernible.
4388	12 20.7	+13 13	An elongated, rather irregular spiral $3' \times 0.4'$ in p.a. $90^\circ$ . Nuclear portion fan-shaped; an irregular dark lane along the major axis. See Abs. Eff.
4389	12 20.7	+46 14	An irregular spiral $1.8' \times 0.8'$ . A bright, somewhat irregular streak lies along the major axis in p.a. $100^\circ$ . Most of the nebular matter lies at the ends of the major axis, and there is evidence of absorption on the northern side.
4392	12 20.8	+46 21	There is nothing in just this position, though there are several small nebulae near. The N. G. C. description accords best with a very small, moderately bright oval $9' n$ and $2' w$ . of 4389. 31 s.n.
4394	12 20.9	+18 46	The inner and brighter part is $1.4'$ in diameter. Exceedingly faint outer whorls make the diameter about $4'$ . The nucleus is large and very bright. It is a good example of the $\phi$ -type spiral; the cross-arm is bright and the inner whorls extending from this nearly form a ring.
4395} 4401}	12 20.9	+34 6	This appears to be an exceedingly faint, very large, and very irregular spiral, covering an area about $8'$ in diameter; many almost stellar condensations; no true nucleus. 27 s.n.
4402	12 21.0	+13 41	Very faint; $3' \times 0.5'$ in p.a. $88^\circ$ ; a patchy, irregular, edgewise spiral with an irregular dark lane down the middle. See Abs. Eff.
4406	12 21.0	+13 46	Slightly oval, $2'$ long; bright center, which is not stellar in short exposures; no spiral structure discernible. 5 s.n.
4407	12 21.2	+13 12	Non-existent.
4409	12 21.3	+ 3 3	Patchy, quite irregular spiral $1.5' \times 0.5'$ in p.a. $10^\circ$ . Fainter along its western edge; no true nucleus. The position is for 4409, while the description accords with that for 4420; there is no object in the position given for 4420. 9 s.n.



## DESCRIPTION—(Continued)

N.G.C.	$\alpha$	$\delta$	
4413	12 21.5	+13 10	Probably a faint, small oval with brighter center and slight traces of spiral character.
4414	12 21.5	+31 46	Moderately bright spiral $3' \times 1'5$ in p.a. $20^\circ$ . Some evidence of absorption effects on the eastern side. A star of magn. 15 near the nucleus. See Abs. Eff.
4425	12 22.2	+13 17	$2' \times 0'5$ in p.a. $18^\circ$ ; moderately bright center; no spiral structure discernible.
4429	12 22.4	+11 40	A fairly bright spiral $3' \times 1'$ in p.a. $80^\circ$ ; bright, rather large nucleus; a very clearly marked absorption lane on the northern side. See Abs. Eff. 34 s.n.
4448	12 23.3	+29 10	Spiral $3' \times 1'$ in p.a. $90^\circ$ ; nucleus moderately bright; whorls are vague and indistinct; absorption effect on southern side.
4449	12 23.3	+44 39	A very bright and interesting object, filling a space about $3'5 \times 2'$ . It is of exceedingly irregular structure, with many almost stellar condensations, and a bright, nearly stellar nucleus. Of spiral type as to nebulosity, but with very little evidence of spiral form.
4464	12 24.3	+ 8 43	Quite bright; slightly oval, $0'3$ long; no spiral structure discernible.
4465	12 24.4	+ 8 35	Faint oval $0'3$ long; slight evidence of spiral structure.
4466	12 24.4	+ 8 16	Faint, narrow oval $0'8$ long; no nucleus discernible; probably spiral.
4467	12 24.4	+ 8 33	Very small bright oval; almost stellar.
4470	12 24.6	+ 8 23	Rather faint $0'7 \times 0'5$ ; has a faint nucleus; irregular; the whorls form a nearly complete oval ring.
4472	12 24.7	+ 8 33	The very bright nucleus is not stellar; shows well in a $3^m$ exposure. Nearly round, $2'$ in diameter, fading out rapidly toward the edges. No structure discernible, though spiral character is suspected near the center in the short exposures. 28 s.n.
4476	12 24.9	+12 54	Slightly oval, $0'5$ long; quite bright at center; no structure discernible.
4478	12 25.2	+12 53	Nearly round; $0'5$ in diameter; bright, almost stellar nucleus. A star of magn. 15 is distant $11''$ in p.a. $352^\circ$ . Structureless.
4480	12 25.3	+ 4 48	A faint oval spiral $1'8 \times 0'9$ ; faint, small nucleus; compact, indistinct whorls.
4486	12 25.8	+12 57	Exceedingly bright; the sharp nucleus shows well in $5^m$ exposure. The brighter central portion is about $0'5$ in diameter, and the total diameter about $2'$ ; nearly round. No spiral structure is discernible. A curious straight ray lies in a gap in the nebulosity in p.a. $20^\circ$ , apparently connected with the nucleus by a thin line of matter. The ray is brightest at its inner end, which is $11''$ from the nucleus. 20 s.n.
4485	12 25.7	+42 15	Vol. VIII, Plate 36. These appear to be physically connected; 4485 is a bright irregular oval $1'$ long. 4490 is $4' \times 1'8$ in p.a. about $112^\circ$ . Very bright, with numerous almost stellar condensations; a very irregular spiral. See Abs. Eff. 15 s.n.
4490	12 25.8	+42 12	
4488	12 25.8	+ 8 55	Narrow oval $1'5 \times 0'4$ in p.a. $150^\circ$ ; moderately bright, almost stellar nucleus; probably a spiral.
4492	12 25.9	+ 8 38	Nearly round, $0'4$ in diameter; rather bright, almost stellar nucleus; slight traces of spiral character.
4496	12 26.5	+ 4 29	This object consists of two faint nebulae whose centers are $1'$ apart. Both are rather irregular spirals; the northern object is slightly oval, $1'5$ long; the southern $0'5$ in diameter, nearly round. There is no certain evidence of any occulting effect due to overlapping. 15 s.n.
II 3453	12 26.5	+15 25	A narrow, almost linear strip of nebulosity $0'6$ long.
4501	12 26.9	+14 58	Vol. VIII, Plate 37. A bright, beautiful spiral $5' \times 2'5$ in p.a. $140^\circ$ . Bright, elongated nuclear region, including a bright, almost stellar nucleus. The whorls are rather close, and show numerous condensations. 17 s.n.
.....	12 27.5	+ 3 14	Faint spindle $2'$ long in p.a. $38^\circ$ .
II 3476	12 27.6	+14 36	A fairly bright, very irregular patch of nebulosity about $1'$ in diameter.
II 3478	12 27.7	+14 45	Faint, small, round, $0'8$ in diameter; brighter center; probably spiral.
.....	12 27.8	+ 0 54	An exceedingly faint, irregular spiral, about $3' \times 2'$ .
4516	12 28.1	+15 8	Narrow oval, with brighter center and small nucleus, $1'$ long; spiral.
4517	12 28.1	+ 0 38	$10' \times 1'$ in p.a. $84^\circ$ . Rather faint; an edgewise spiral with an irregular dark lane down the middle. See Abs. Eff. 17 s.n.
4518	12 28.1	+ 8 24	A spindle $0'5$ long; brighter center; probably spiral.
4526	12 29.0	+ 8 15	$5' \times 1'$ in p.a. $112^\circ$ ; very bright central portion with a somewhat elongated nucleus, near which is a clear-cut, curved absorption lane. No whorls distinguishable. See Abs. Eff. 17 s.n.
4527	12 29.0	+ 3 12	A fine, rather bright spiral $5' \times 1'2$ in p.a. $70^\circ$ ; nucleus sharp; some evidence of absorption effect on the north. A nova appeared in this spiral shortly before March 20, 1915. See Abs. Eff. 13 s.n.
4533	12 29.2	+ 2 53	Rather faint spindle $1'5$ long in p.a. $160^\circ$ ; no nucleus discernible; doubtless spiral.



					DESCRIPTION—(Continued)
N.G.C.	$\alpha$		$\delta$		
4536	12	29.3	+ 2	44	Vol. VIII, Plate 38. A fine bright spiral $7' \times 1'8$ in p.a. $122^\circ$ . Bright nucleus; two main whorls, with several condensations; evidence of a short curved absorption lane near the nucleus. See Abs. Eff. 25 s.n.
4535	12	29.3	+ 8	45	A beautiful, rather open, two-branched spiral, with a bright, almost stellar nucleus. $6' \times 3'$ in p.a. $30^\circ$ ; two regular, well separated whorls, showing numerous almost stellar condensations.
II 3568	12	30.4	+83	7	Planetary. 0 s.n.
4546	12	30.4	— 3	14	$1'5 \times 0'5$ , with a round, very bright central portion; no nucleus or whorls discernible. 7 s.n.
4559	12	31.0	+28	31	Vol. VIII, Plate 39. A bright spiral $8' \times 2'$ in p.a. $136^\circ$ . Faint, almost stellar nucleus; numerous condensations in the rather irregular whorls. 26 s.n.
4562	12	31.0	+26	24	Faint, indistinct spiral $2' \times 0'5$ in p.a. $45^\circ$ .
4564	12	31.4	+12	0	A spindle $1'2$ long in p.a. $45^\circ$ ; the central portion is round and very bright; no nucleus or whorls discernible.
4565	12	31.4	+26	32	Vol. VIII, Plate 40. $15' \times 1'1$ ; the largest and most beautiful example of an edgewise spiral with dark absorbing lane. This runs down the central line, just north of the nucleus, which is bright and almost stellar. P.a. $134^\circ$ . Several almost stellar condensations. See Abs. Eff. 51 s.n.
4567) 4568}	12	31.5	+11	48	Two rather faint spirals so close together that they overlap slightly. The centers are $1'2$ apart in p.a. $165^\circ$ . The northern nebula is $2' \times 1'$ ; the southern $3' \times 1'$ . The northern nebula has a very bright, almost stellar nucleus; that of the southern nebula is double. Both are rather open spirals with many almost stellar condensations. There is apparently a slight amount of occulting effect, due to overlapping. See Abs. Eff. 42 s.n.
4594	12	34.8	—11	4	$7' \times 1'5$ in p.a. $92^\circ$ ; very bright. A remarkable, slightly curved, clear-cut dark lane runs along the entire length to the south of the nucleus; probably the finest known example of this phenomenon. There are very slight traces of spiral whorls. See Abs. Eff. 11 s.n.
4605	12	35.6	+62	10	A bright, quite irregular and patchy nebula $3' \times 1'$ in p.a. $116^\circ$ ; no nucleus apparent. Evidence of absorption effect on the northern side. Doubtless a very irregular spiral.
4618	12	36.8	+41	42	A very irregular nebula covering an area about $2'5$ square. Many almost stellar condensations. Quite bright. Of spiral type; probably an exceedingly irregular spiral. 8 s.n.
4625	12	37.1	+41	50	A small, rather faint, single whorled spiral $1'$ in diameter, nearly round.
4627	12	37.2	+33	9	A faint, slightly oval nebula just n. of 4631; very indistinct spiral. $1'4$ long.
4631	12	37.3	+33	6	Vol. VIII, Plate 41. Very bright; it is $12' \times 1'2$ in p.a. $86^\circ$ . Numerous almost stellar condensations, and a very irregular absorption lane extending throughout most of its length. A bright, irregular mass $1'$ e. of the center of figure may be the nucleus. See Abs. Eff. 15 s.n.
4638	12	37.7	+11	59	Bright spindle $0'7$ long in p.a. $130^\circ$ ; no spiral structure discernible.
4639	12	37.8	+13	48	Nearly round, $1'$ in diameter; moderately bright, almost stellar nucleus; the whorls form a faint ring.
4642	12	38.2	— 0	7	A faint, rather compact spiral $2' \times 0'6$ in p.a. $40^\circ$ .
4647	12	38.5	+12	8	Nearly round, $2'$ in diameter; a faint, rather patchy spiral, with an almost stellar nucleus.
4649	12	38.6	+12	6	$2'$ in diameter, growing rapidly brighter to a very bright central portion, which shows no true nucleus in short exposures; no spiral whorls discernible.
4653	12	38.9	— 0	1	A very faint, slightly oval spiral $2' \times 1'5$ ; nucleus faint and rather large; whorls regular, but very faint.
4654	12	38.9	+13	40	A very faint, somewhat irregular spiral $3' \times 1'2$ in p.a. $125^\circ$ . Faint, small nucleus. Most of the matter is in one whorl.
4656) 4657}	12	39.1	+32	43	These form a single nebula, $9'$ long by about $1'$ wide, in p.a. $33^\circ$ . The northern end corresponds to 4567; is very bright; sharply curved, and shows several almost stellar condensations. The southern half, southwest of the apparent nucleus, is quite faint, as though obliterated by absorbing matter. Description in 4656 in <i>Bull.</i> 219 in error.
4659	12	39.5	+14	2	$0'2$ in diameter; bright, round, structureless.
4660	12	39.5	+11	43	$1' \times 0'4$ in p.a. $95^\circ$ . Very bright central portion; nucleus elongated and small. Very slight traces of spiral character. 17 s.n.
4666	12	40.0	+ 0	5	Bright spiral $4' \times 0'6$ in p.a. $45^\circ$ . Nucleus bright and elongated; numerous almost stellar condensations. Well marked absorption effect on southeast side. See Abs. Eff. 8 s.n.
4667	12	40.2	+11	59	Non-existent.
4668	12	40.4	0	0	A rather faint oval $0'8 \times 0'4$ ; a compact, irregular spiral.
4689	12	42.6	+14	18	A rather faint spiral $3' \times 2'$ ; faint, almost stellar nucleus. Most of the matter is in one whorl, which forms a nearly complete oval ring. 4 s.n.

				DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$		
4697	12 43.4	— 5 15		3' x 0.7' in p.a. 68°. Bright, almost stellar nucleus; slight trace of spiral whorls. 7 s.n.
4710	12 44.6	+15 43		Bright, narrow spindle 3.5' long in p.a. 28°. Nucleus is very faint. There is a curious irregular absorption lane extending along the middle for 0.5' on each side of the nucleus. See Abs. Eff. 7 s.n.
4712	12 44.7	+26 1		A faint spiral 2' x 0.8' in p.a. 170°; faint, almost stellar nucleus.
4725	12 45.6	+26 3		Vol. VIII, Plate 42. A beautiful spiral 5' x 4' in p.a. 38°. Nucleus very bright; the whorls are on the periphery of the nebula, there being none near the center. A wide faint band of matter lies along the major axis of the nebula; an excellent exemplar of the $\phi$ -type spiral. Whorls show a number of almost stellar condensations. 19 s.n.
4736	12 46.2	+41 40		Vol. VIII, Plates 43 and 44. M. 94. A beautiful object. From the very bright, large nucleus spring many bright, closely packed whorls, forming a bright inner oval 2' x 1.5' in p.a. about 110°. These inner whorls show many stellar condensations, whose sharpness and proximity to the nucleus would seem to make this one of the most favorable examples known for the investigation of motion in spirals. Fainter, closely packed, rather uniform outer whorls bring the nebula to a size of 5' x 3.5'. 17 s.n.
4742	12 46.6	— 9 55		1' long in p.a. 80°; considerably elongated, with very bright round central portion. No spiral structure discernible.
4747	12 46 9	+26 18		A rather faint spiral 3' x 0.5' in p.a. 30°. Irregular line of brighter matter along the major axis, and evidence of an absorbing lane southeast of the nucleus.
4757	12 47.7	— 9 48		Narrow spindle 1' long in p.a. 40°, with bright, small, central portion; structureless.
4760	12 47.9	— 9 57		Round; 0.5' in diameter; growing rapidly brighter toward the center; no spiral structure discernible.
4766	12 48.2	— 9 49		Non-existent.
4781	12 49.2	—10 0		A moderately bright spiral 3' x 1' in p.a. 110°; quite irregular and patchy; no nucleus. 15 s.n.
4784	12 49.4	—10 5		Narrow spindle 1' long in p.a. 105°, with round bright nucleus; no spiral structure discernible.
4790	12 49.6	— 9 42		An irregular, slightly oval spiral 1' long, with a fairly bright, almost stellar nucleus.
4799	12 50.2	+ 3 27		Nothing in this position. The N. G. C. description is "cF, S, vS* att." There is a small, bright spindle at 12 <sup>h</sup> 51 <sup>m</sup> 2, +3° 19', with a star of magn. 15 s.f. 0.8.
4809) 4810)	12 50.8	+ 3 5		Two very irregular, elongated, faint patches of nebulosity; both are probably exceedingly irregular spirals. Their centers are about 40" apart in p.a. 170°. The northern nebula is about 1' long; the southern 0.5', and their major axes are in position angles of approximately 60° and 160°, respectively. No certain evidence of any occulting effect due to overlapping. No nucleus discernible in either nebula. 17 s.n.
4826	12 51.8	+22 14		Vol. VIII, Plate 45. The central portion of this fine nebula is very bright, and there is a bright, almost stellar nucleus. It is 8' x 4' in p.a. 110°. The whorls are rather compact, and of very uniform texture, without irregularities or condensations. The most striking feature of this spiral is the somewhat irregular, but very clear-cut, absorption area on the north of the nucleus. See Abs. Eff. 2 s.n.
.....	12 55	+28 30		This region contains the most remarkable aggregation of closely packed small nebulae known to me. About thirty are catalogued in this area in the N. G. C., and some twenty-five more are given in N. G. C. II. In reality there are more than three hundred small nebulae in an area about 50' x 40', a large proportion of which are probably spirals. None of them are conspicuous objects. They are so numerous that it is very difficult to locate those catalogued in the N. G. C. with any certainty, except for a few of the brighter objects. See figure 3. 304 s.n.
4951	13 0.0	— 5 58		Quite irregular; 1.2' long; binuclear.
4981	13 3.6	— 6 15		A small $\phi$ -type spiral 1.5' long; stellar nucleus.
5005	13 6.3	+37 36		A very bright spiral 5' x 1.5' in p.a. 68°; bright, elongated nucleus. The whorls are somewhat patchy, and show a few condensations. Several well-marked dark lanes on the s. See Abs. Eff. 17 s.n.
5003	13 6.9	+42 44		Faint; 2' x 0.4' in p.a. 30° N. G. C. R. A. wrong.
5014	13 7.0	+36 48		A narrow spindle 1.5' long; brighter center; probably spiral.
✓ 5024	13 8.0	+18 42		A fine, bright globular cluster 10' in diameter. M. 53. 19 s.n.
5033	13 8.8	+37 8		A fine, rather open spiral 6' x 3' in p.a. 175°. The nucleus is very bright, almost stellar, and the portion near the nucleus is fan-shaped. The outer whorls are rather faint, with a few almost stellar condensations. Well-marked absorption effects on western side of major axis. See Abs. Eff.

## DESCRIPTION—(Continued)

N.G.C.	$\alpha$	$\delta$	
5055	13 11.3	+42 34	Vol. VIII, Plate 46. A bright, beautiful spiral 8' x 3' in p.a. 98°. Has an almost stellar nucleus. The whorls are narrow, very compactly arranged, and show numerous almost stellar condensations. See Abs. Eff. 33 s.n.
5144	13 20.0	+71 2	This is not a planetary; its spectrum is continuous. It is about 0.5 in diameter, of unusual structure. There is no nucleus; the nebula matter is arranged in a three-branched effect, much like a short letter Y.
✓ 5139	13 20.8	—46 47	ω Centauri cluster. Taken with the D. O. Mills Reflector, Santiago Chile; reproduced in Vol. II of See's <i>Evolution of the Stellar Systems</i> , Plate 1.
5194) 5195)	13 25.7	+47 43	Vol. VIII, Plate 47. The beautiful spiral M. 51 in <i>Canes Venatici</i> . Including very faint matter to the north of 5194, scarcely visible in any of the very numerous published reproductions, it covers an area about 12' x 6' in p.a. approximately 30°. A sharp stellar nucleus in 5194, and the whorls show a multitude of stellar condensations. The satellite nebula, 5195, has a bright, elongated nucleus; its nebulosity is of a more diffuse type, without discernible spiral structure, and with several rifts which suggest absorption effects. See Abs. Eff. 22 s.n.
5236	13 31.4	—29 21	A bright and unusually beautiful spiral 10' x 8'. The nucleus is 20" in diameter and very bright; in a 2 <sup>m</sup> exposure it shows as a faint disk with a bright peripheral streak or whorl. A large number of almost stellar condensations in the rather open whorls of this fine object. See figure 7. 18 s.n.
5247	13 32.6	—17 22	A fine bright spiral 5' in diameter; nearly round. Very bright, somewhat irregular nuclear portion; the two main whorls show numerous stellar condensations. Rather open, two-branched spiral. 17 s.n.
5248	13 32.6	+ 9 25	A fine bright spiral 3.2 x 1.4 in p.a. 140°. Very bright, elongated nuclear portion 0.3 in length, a confused mass of bright nebulosity involving numerous closely packed stellar condensations. Numerous almost stellar condensations in the two bright, open whorls.
✓ 5272	13 37.6	+28 53	Vol. VIII, Plate 48. M. 3. The main portion of this very beautiful globular cluster is about 8' in diameter. 1 s.n.
5377	13 52.3	+47 43	A spiral 3' x 0.6 in p.a. 40°, with bright, rather small nucleus. The whorls are very indistinct. 6 s.n.
5373	13 52.5	+38 17	A rather faint φ-type spiral 1' in diameter; nucleus is moderately bright.
5380	13 52.7	+38 6	0.5 in diameter, with bright center; no spiral structure discernible.
5394	13 54.3	+37 56	A fine, moderately bright, two-branched spiral 1.5 in total length. Bright, almost stellar nucleus. See Abs. Eff. 23 s.n.
5395	13 54.3	+37 54	A rather irregular spiral 2' x 1' in p.a. 0°; almost stellar nucleus. Wide dark lane on western side.
5457	13 59.6	+54 50	Vol. VIII, Plate 49. M. 101. This unusually beautiful spiral is about 16' in diameter. There is an almost stellar nucleus, with two bright condensations very close which give it a tri-nuclear appearance. The open whorls show a multitude of stellar condensations. 5449, 5450, 5451, 5453, 5455, 5458, 5461, 5462, are simply brighter knots in the great nebula. 10 s.n.
5471	14 1.0	+54 56	A faint, indistinct spiral, slightly oval, 1' long; faint, almost stellar nucleus.
5496	14 6.5	— 0 41	4' x 0.6 in p.a. 170°; an elongated, bright, rather patchy spiral; no true nucleus. 15 s.n.
5506	14 8.0	— 2 44	A rather faint, irregular spiral 2' x 0.5 in p.a. 90°; rather bright stellar nucleus. Absorption lane down the middle. See Abs. Eff. 7 s.n.
5507	14 8.1	— 2 41	Round; bright; 0.3 in diameter; structureless.
5529	14 11.3	+36 41	Edgewise spiral 6' x 0.6 in p.a. 115; central portion is brighter, but no nucleus is apparent. See Abs. Eff. 47 s.n.
5544) 5545)	14 12.8	+37 2	Two small nebulae 0.5 apart in p.a. 75°. 5544 is 0.3 in diameter, with a bright stellar nucleus; no spiral structure apparent. 5545 is a spiral 1' x 0.2 in p.a. 70°, with a small faint nucleus. Though nearly in line with the major axis of 5545, it does not appear that 5544 is physically connected with it. 10 s.n.
5557	14 14.2	+36 57	Round; 0.4 in diameter, with a very bright and rather large nucleus. A star of about magn. 15 is projected on the southeastern edge of the nebulosity.
5560	14 15.0	+ 4 27	Faint, elongated spiral 1.5 x 0.4 in p.a. 98°. Elongated nuclear portion; no condensations.
5566	14 15.3	+ 4 25	Very bright oval nucleus; whorls make a faint oval 1.6 x 0.8 in p.a. 30°, and are considerably fainter at the ends of the major axis. Exceedingly faint condensations. Moderately bright. 5 s.n.
5569	14 15.5	+ 4 28	An exceedingly faint, slightly oval spiral 1' long; 3' n. of the N. G. C. position.
5673	14 28.1	+50 23	A rather faint spiral 1.5 x 0.5 in p.a. 135°; rather compact; no definite nucleus.
I 1029	14 29.0	+50 21	A spindle 3' x 0.4 in p.a. 152°; nucleus moderately large and quite bright; evidence of absorption lane on western side. See Abs. Eff.
5678	14 29.2	+58 22	A rather bright, compact, patchy spiral 2.6 x 1' in p.a. 5°; bright, almost stellar nucleus. A few rather hazy condensations. 15 s.n.

DESCRIPTION—(Continued)				
N.G.C.	$\alpha$	$\delta$		
5676	14 29.3	+49 54		A fine, bright spiral $3' \times 1\frac{1}{2}$ in p.a. $42^\circ$ . Nucleus bright, somewhat elongated, almost stellar. The whorls are rather compact, with numerous irregular condensations. 14 s.n.
5738	14 38.8	+ 2 2		A small oval $0\frac{1}{2}$ long with bright center; no spiral structure discernible.
5740	14 39.3	+ 2 6		A compact, rather bright spiral $2' \times 1\frac{1}{2}$ in p.a. $165^\circ$ . Bright nucleus; the whorls are broad and unmarked by condensations.
5746	14 39.9	+ 2 23		A fine, nearly edgewise spiral $7' \times 0\frac{1}{2}$ in p.a. $170^\circ$ ; quite bright. Bright, elongated nucleus. A broad dark lane runs along the spiral to the east of the nucleus. Most of the nebular matter is to the west of this lane, there are no prominent condensations other than the nucleus. See Abs. Eff. 18 s.n.
5806	14 54.9	+ 2 17		A very compact spiral $2' \times 1'$ ; the nucleus is rather large and quite bright. The broad whorls merge so completely that the disk is of nearly equal brightness throughout; there are no condensations. 16 s.n.
5811	14 55.4	+ 2 2		A faint oval patch $0\frac{1}{2}$ long; no structure apparent, but doubtless spiral.
5813	14 56.1	+ 2 6		Nearly round; about $1\frac{1}{4}$ in diameter; very faint on the periphery, increasing to a quite bright, almost stellar nucleus; no spiral structure discernible.
5814	14 56.3	+ 2 2		Nearly round, $0\frac{1}{2}$ in diameter; small nucleus; slight traces of spiral character.
II 4526	14 58.2	+23 45		A faint patch of nebular matter about $0\frac{1}{2}$ in diameter, showing a faint nucleus and some evidences of spiral structure.
5829	14 58.3	+23 44		A very faint, nearly round, open spiral $1\frac{1}{2}$ in diameter; stellar nucleus; several faint, almost stellar condensations. 12 s.n.
II 4531	15 0.0	+23 47		A minute oval $0\frac{1}{2}$ long, with an almost stellar nucleus; doubtless spiral.
II 4532	15 0.1	+23 36		There are two objects near this declination, one preceding, and the other following the N. G. C. position. Both are very small, nearly round; no structure apparent.
5838	15 0.4	+ 2 29		Fairly bright center; oval; $1\frac{1}{2}$ long; spiral.
5839	15 0.4	+ 2 1		Almost stellar; no structure visible.
5845	15 0.9	+ 2 1		Slightly elongated; almost stellar; no structure visible.
5841	15 1.1	+ 2 28		Very faint spindle $0\frac{1}{2}$ long. There is no object in the N. G. C. place for 5841. This nebula fits the descriptions F, S, E, though perhaps too faint to be seen visually.
5846	15 1.4	+ 1 59		Round, $1'$ in diameter; no structure apparent. Star at south does not appear to be physically connected with the nebula.
5848	15 1.6	+ 2 24		An elongated spiral $0\frac{1}{2}$ long; strong center; <i>Andromeda</i> type.
5850	15 2.0	+ 1 55		This is a faint but interesting $\phi$ -type spiral. Stellar nucleus; nearly round ring $2\frac{1}{2}$ in diameter formed by the whorls; a straight line of nebulous matter across this ring, with faint, almost stellar condensations at the ends. 16 s.n.
5857	15 2.9	+19 59	}	Vol. VIII, Plate 50. Described as a double nebulae in the N. G. C. 5857 is a bright, compact, somewhat oval spiral $1'$ long, with a bright, almost stellar nucleus; whorls of uniform texture. 5859 is $2\frac{1}{2} \times 0\frac{1}{2}$ in p.a. $130^\circ$ ; apparently a $\phi$ -type spiral seen at a considerable angle, with most of the matter in one large whorl. The nucleus is almost stellar; there are a few condensations. Moderately bright. 5 s.n.
5859	15 3.0	+19 58		
5862	15 3.4	+55 59		Minute oval patch $0\frac{1}{2}$ long.
5866	15 3.7	+56 9		Vol. VIII, Plate 51. Very bright, $3' \times 1'$ in p.a. $125^\circ$ . No spiral structure is discernible, but it appears to be a spiral of the <i>Andromeda</i> type seen edgewise. Its most striking feature is a narrow, clear-cut dark lane along the middle, making a slight angle with the major axis. See Abs. Eff. 37 s.n.
5867	15 3.7	+56 8		Almost stellar.
5870	15 3.9	+55 51		A faint oval $0\frac{1}{2}$ long; probably spiral.
✓ 5904	15 13.5	+ 2 27		Vol. VIII, Plate 52. M. 5. A beautiful, bright globular cluster; the main portion is about $12'$ in diameter. 4 s.n.
5907	15 13.3	+56 41		$11' \times 0\frac{1}{2}$ in p.a. $156^\circ$ , rather bright. A dark lane runs down the entire length; nucleus hazy; a few condensations. 5906 is simply the strip to the west of this lane. See Abs. Eff. 13 s.n.
5921	15 17.6	+ 5 22		Very interesting and typical $\phi$ -type spiral. Fairly bright nucleus, about which is an oval $1\frac{1}{2}$ long, whose longer axis is crossed by a straight lane of matter; from the ends of this oval spring the two main whorls of the spiral; other fainter whorls are visible. Diameter about $5'$ . Reproduced in <i>Publ. Astr. Soc. Pacific</i> , October, 1912. 43 s.n.
5956	15 30.3	+12 5		Small, faint, nearly round spiral $0\frac{1}{2}$ in diameter.
5957	15 30.7	+12 23		Slightly oval center with weak stellar nucleus; about this is a nearly circular ring $1'$ in diameter. Of rather irregular structure; a spiral with some traces of the $\phi$ -type. 17 s.n.
5981	15 35.9	+59 43		A narrow spindle $2\frac{1}{2}$ long in p.a. $135^\circ$ . Well-marked absorption lane effect on the northeast side. See Abs. Eff.
5982	15 36.6	+59 41		Slightly oval, $1'$ long. Center very bright, rather large, and without definite nucleus; no spiral structure discernible.



					DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$			
5985	15 37.6	+59 39			A fine spiral 4' x 2' in p.a. 5°. Bright, almost stellar nucleus; whorls rather faint and narrow, but quite regular. 19 s.n.
5989	15 39.5	+60 5			A rather faint, nearly round, irregular, compact spiral 0'8 in diameter.
6017	15 52.3	+ 6 17			Very small and rather faint; perhaps a spiral.
6049	16 0.8	+ 8 22			Described as "7 in photosphere." Non-existent? No trace in an exposure of 1 <sup>h</sup> 10 <sup>m</sup> . 16 s.n.
6058	16 1.0	+40 58			Planetary. 14 s.n.
6070	16 4.9	+ 0 59			A fine, moderately bright spiral 3' x 1'6 in p.a. 60°. Elongated bright nucleus; whorls are rather open, and show a number of almost stellar condensations. 44 s.n.
II 4592	16 6.2	—19 12			Very large diffuse nebulosity near $\nu^2$ <i>Scorpii</i> . This is exceedingly faint in an exposure of 2 <sup>h</sup> , and can doubtless be best recorded with a portrait lens and very long exposure. 0 s.n.
II 4593	16 7.0	+12 20			Planetary. 4 s.n.
✓ 6093	16 11.5	—22 44			Small, bright, globular cluster; the diameter of the brighter part is 3'. 5 s.n.
6175	16 26.7	+40 51			Two very small and faint nebulous patches whose faint nuclei are 15" apart. Not planetary. 34 s.n.
✓ 6171	16 27.0	—12 50			Bright globular cluster; the brighter part is 3' in diameter; with fainter extensions about 8'. 2 s.n.
6181	16 28.5	+20 1			Small spiral 2' x 0'7 in p.a. 0°. Bright almost stellar nucleus; two main whorls. 5 s.n.
6217	16 37.4	+78 24			A rather bright spiral of S-shape, 1'8 long. The whorls are rather irregular, with numerous condensations, which are not stellar. There is apparently no true nucleus; there is a star of magn. 13 almost precisely in the place the nucleus should occupy, but it seems to be a bona-fide star, and not an almost stellar nucleus. 11 s.n.
✓ 6205	16 38.1	+36 39			Vol. VIII, Plate 53. M. 13, the Great Cluster in <i>Hercules</i> . 10 s.n.
6207	16 39.5	+37 1			A moderately bright spiral 2' x 0'7 in p.a. 18°. Whorls are broad, patchy, and indistinct. There is a star of magn. 13 almost precisely in the position the nucleus should occupy; it does not appear to be a nebular nucleus, and is probably simply projected on the nebula.
6210	16 40.3	+23 59			Planetary. 5 s.n.
✓ 6218	16 42.0	— 1 46			Vol. VIII, Plate 54. Fine globular cluster; central part about 2'; outer about 8' in diameter. Apparently somewhat less compact than most globular clusters. 0 s.n.
✓ 6229	16 44.2	+47 42			Bright, greatly condensed globular cluster 3' in diameter. 26 s.n.
✓ 6254	16 51.4	— 3 57			Fine, bright globular cluster; diameter about 8'; central brighter part about 2'. 0 s.n.
✓ 6266	16 54.8	—29 58			Bright globular cluster, greatly condensed at center; this central part is 1'5 in diameter; main part of cluster 6'. 0 s.n.
II 4634	16 55.6	—21 40			Planetary. 0 s.n.
✓ 6287	16 59.1	—22 34			A small, comparatively faint globular cluster, 1'5 in diameter. 1 s.n.
6296	17 3.8	+ 4 4			Rather faint, nearly round spiral 0'7 long; two-branched. Faint, almost stellar nucleus. A somewhat smaller, very faint spiral is 9' n.
6309	17 8.4	—12 48			Planetary. 0 s.n.
6325	17 11.9	—23 39			The probabilities are that this is a small, faint, sparse cluster, although there seem to be some traces of spiral formation. 0 s.n.
✓ 6333	17 13.3	—18 25			Bright globular cluster 3' in diameter. 2 s.n.
✓ 6341	17 14.1	+43 15			Bright, unusually condensed globular cluster; cluster about 10' in diameter; the bright central portion 2'. M. 92. 24 s.n.
.....	17 15.9	—23 27			S-shaped "hole" or dark nebula. This remarkable object is about 22' long; would show better on plates taken with instruments of shorter focus. It lies in a dense region; the object itself is almost perfectly blank. 0 s.n.
✓ 6356	17 17.8	—17 43			Small globular cluster about 2' in diameter. 1½ s.n.
✓ 6366	17 22.4	— 4 59			This is not a nebula, but a rather sparse cluster of faint stars about 6' in diameter. From the division into two magnitude classes, it appears to approximate to the globular type. 0 s.n.
6369	17 23.2	—23 21			Planetary. 0 s.n.
.....	17 24	—25 30			A remarkable vacant region in the Milky Way southeast of $\theta$ <i>Ophiuchi</i> . Shows almost no stars in an exposure of 1 <sup>h</sup> 50 <sup>m</sup> . 0 s.n.
✓ 6402	17 32.4	— 3 11			Bright globular cluster, diameter 6'. 0 s.n.
✓ 6401	17 32.5	—23 51			A small, rather sparse cluster of faint stars, about 2' in diameter. 0 s.n.
6412	17 32.7	+75 47			A nearly round, rather open, moderately bright spiral 2' in diameter. Sharp, elongated nucleus; a number of almost stellar condensations in the whorls. 39 s.n.
✓ 6426	17 39.9	+ 3 13			A faint, rather open cluster, 2' in diameter; possibly globular; the fainter stars form an apparently nebulous background. 0 s.n.



## DESCRIPTION—(Continued)

N.G.C.	$\alpha$	$\delta$	DESCRIPTION—(Continued)
6439	17 42.5	—16 27	Planetary. 0 s.n.
6440	17 42.9	—20 19	A bright, very compact cluster, about 1'5 in diameter. There are distinct traces of spiral formation, so much so that it was at first thought to be a spiral nebula when found near the edge of a plate of a neighboring region. Cf. <i>Publ. Astr. Soc. Pac.</i> , 30, 161, 1918.
6445	17 43.3	—19 59	Planetary. 0 s.n.
6482	17 47.5	+23 6	Bright, round, 0'3 in diameter; very close to 11 magn. star; 17' n.f. is a small, faint spindle 1'5 long in p.a. 140°. 10 s.n.
6503	17 50.4	+70 11	A fine bright spiral 5' x 1' in p.a. 125°. Rather faint, almost stellar nucleus. Marked absorption effects on southwestern edge. Whorls are compact, patchy, and indistinct. See Abs. Eff. 14 s.n.
6495	17 50.5	+18 21	Round, 0'6 in diameter. Bright, rather large center; slight traces of spiral character.
6499	17 51.0	+18 24	Described in the N. G. C. as a small double star in nebulosity. There is a double star in this position, but no surrounding nebulosity can be detected.
6500	17 51.6	+18 21	Slightly oval, 1'2 long. Bright, rather large nucleus; whorls indistinct. 16 s.n.
6501	17 51.7	+18 24	Nearly round, 1'4 in diameter. Bright, rather large nucleus; no certain evidence of spiral character.
6514	17 56.3	—23 2	Vol. VIII, Plate 55. M. 20; the remarkable Trifid Nebula in <i>Sagittarius</i> . Very bright diffuse nebula covering an area 24' x 20', with remarkable dark lanes. 0 s.n.
6517	17 56.4	— 8 57	A very small cluster of faint stars; brighter center 0'2 in diameter; whole cluster about 0'8. Of globular type? 0 s.n.
.....	17 56.6	—27 50	A wonderful example of a dark nebula, lying in a remarkably dense region of the Milky Way. Discovered by Professor Barnard in 1883. Of rather irregular contour, about 6' x 4'. The most striking portion of this object is the roughly circular protuberance at the southwest corner; here the edges are defined with almost perfect sharpness, and there is an astonishingly abrupt transition from a region filled with faint stars to one absolutely blank. At this point one can really "see" the sharp edge of the dark body. On the eastern edge the transition is somewhat less abrupt. See Abs. Eff. 0 s.n.
6520	17 57.1	—27 53	A coarse cluster of bright stars, located to the east of the dark nebula mentioned above.
6523	17 58	—24 23	Vol. VIII, Plate 56. M. 8; the great diffuse nebulosity in <i>Sagittarius</i> ; very bright, and of wonderfully intricate structure; covering an area at least 50' x 36'. 0 s.n.
6543	17 58.6	+66 38	Planetary. 16 s.n.
6537	17 59.3	—19 51	Planetary. 0 s.n.
6555	18 2.7	+17 35	Faint, slightly oval spiral 2' long; rather patchy. 4 s.n.
6563	18 5.5	—33 53	Planetary. 0 s.n.
6565	18 5.6	—28 12	Planetary. 0 s.n.
6569	18 7.2	—31 51	Small globular cluster 2' in diameter. 0 s.n.
6572	18 7.2	+ 6 50	Planetary. 1 s.n.
6574	18 7.3	+14 58	Moderately bright, slightly oval spiral 1' long. Whorls rather compact; almost stellar nucleus. 6 s.n.
6567	18 7.8	—19 6	Planetary. 0 s.n.
6578	18 8.9	—20 19	Planetary. 0 s.n.
.....	18 9.6	—18 14	Two dark nebulae, noted by Barnard in <i>Ap. Jour.</i> , Dec., 1913. The larger western object is about 14' x 8', and the contrast between the dense Milky Way region and the vacant spots is very striking. The edges are less clear-cut, and the transition less abrupt than in the object at 17 <sup>h</sup> 56 <sup>m</sup> 6. Professor Barnard's portrait lens photographs of these objects are reproduced in <i>Lick Obs. Publ.</i> , 11, Plates 54 and 55. 0 s.n.
6589	18 10.3	—19 50	Star of magn. 9 surrounded by faint diffuse nebulosity about 2' in diameter. A broad, very faint wisp is 5' east and 2' north, and is perhaps an extension of the main nebulosity.
6590	18 10.5	—19 55	A double star surrounded by rather bright diffuse nebulosity filling an area about 2' square, extending mainly to the south of the stars. There is a very clearly marked "hole" in the nebulosity southwest of the southern star, about 0'3 in diameter. There is very faint diffuse nebulosity about a star 14' n.f. 6590. 6595 is non-existent as such; evidently identical with 6590. 0 s.n.
6618	18 15.0	—16 13	Vol. VIII, Plate 58. M. 17; the "Horse Shoe" or "Omega" Nebula. Very bright, very large diffuse nebulosity, showing a wealth of detail, filling an area about 26' x 20'. 0 s.n.
6620	18 15.6	—26 53	Planetary. 0 s.n.
6624	18 17.3	—30 24	Bright small globular cluster 2' in diameter. 0 s.n.

				DESCRIPTION—(Continued).	
N.G.C.	$\alpha$	$\delta$			
6626	18 18.4	—24 55		Bright globular cluster 4' in diameter. M. 28. 0 s.n.	
6629	18 19.6	—23 15		Planetary. 1 s.n.	
6643	18 22.6	+74 31		Moderately bright spiral 3' x 1'1 in p.a. 40°. Faint hazy nucleus and several hazy condensations in the compact and rather patchy whorls. 8 s.n.	
6637	18 24.8	—32 25		Bright globular cluster 3' in diameter. M. 69. 0 s.n.	
6642	18 25.6	—23 32		Description in <i>Bulletin</i> 219 in error; a small and relatively inconspicuous cluster; probably not globular.	
6654	18 26.3	+73 7		A slightly oval $\phi$ -type spiral 1'7 in diameter. Nucleus fairly large and bright, and the nebular matter in the diametral band is of moderate brightness. The ring formed by the outer whorls is exceedingly faint. 11 s.n.	
6644	18 26.4	—25 12		Planetary.	
II 4732	18 27.9	—22 43		Planetary.	
6656	18 30.3	—23 59		M. 22. A beautiful globular cluster, 12' or more in diameter. 0 s.n.	
6690	18 36.0	+70 27		Rather faint spiral 2'5 x 0'5 in p.a. 170°. Very faint nucleus. Well-marked absorption effect on eastern side; whorls compact and indistinct. See Abs. Eff. 49 s.n.	
6681	18 36.7	—32 23		M. 70. Bright condensed cluster 2' in diameter; doubtless globular. 0 s.n.	
6692	18 38.1	+34 45		Binuclear; the nuclei are 7'7 apart in p.a. 82°. Rather faint; no traces of spiral character. Not a planetary; shows continuous spectrum. 0'3 long. 21 s.n.	
I 1292	18 38.4	—27 54		Described as a planetary. Search with the slitless spectroscope disclosed no object of planetary type anywhere in this region.	
II 4776	18 38.9	—33 27		Planetary.	
6705	18 45.7	— 6 23		M. 11. Bright, rather open cluster 6' in diameter; not globular. 0 s.n.	
6712	18 47.6	— 8 50		Somewhat condensed cluster 2' in diameter. Apparently not of globular type. 0 s.n.	
6715	18 48.7	—30 36		M. 54. Remarkably condensed globular cluster 2' in diameter. 0 s.n.	
6720	18 49.9	+32 54		Vol. VIII, Plate 59. M. 57; the well-known Ring Nebula in <i>Lyra</i> . Planetary. See the sketch included in the paper on Planetary Nebulae. 5 s.n.	
6741	18 57.5	— 0 35		Planetary. 0 s.n.	
6751	19 0.5	— 6 8		Planetary. 0 s.n.	
6760	19 6.7	+ 0 53		Not a nebula as described in the N. G. C. but a cluster of faint stars 1'5 in diameter. Apparently not globular. An irregular rift runs in to the center. 0 s.n.	
6766	19 7.1	+46 6		Described as a stellar planetary. Search with the slitless spectroscope disclosed no object of planetary type in this region.	
6772	19 9.4	— 2 53		Planetary. 0 s.n.	
II 4846	19 11.0	— 9 14		Planetary. 0 s.n.	
6779	19 12.7	+30 0		M. 56. Rather bright, condensed cluster 3' in diameter. Probably globular. 0 s.n.	
.....	19 12.8	— 1 38		Fine "hole" or dark nebula 10' x 4'.	
6778	19 13.1	— 1 48		Planetary. 2 s.n.	
6781	19 13.6	+ 6 21		Planetary. 0 s.n.	
6790	19 17.9	+ 1 19		Planetary. 0 s.n.	
6803	19 26.6	+ 9 52		Planetary. 0 s.n.	
6804	19 26.8	+ 9 1		Planetary. 0 s.n.	
6807	19 29.6	+ 5 29		Planetary. 0 s.n.	
.....	19 30.9	+30 19		Wolf-Rayet hydrogen envelope star; B. D. +30°, 3639, magn. 9.3 While the spectroscope has shown the varying sizes of the monochromatic images of this object, the direct photographs, ranging in exposure time from 10 <sup>s</sup> to 30 <sup>m</sup> , show no nebulous atmosphere about the star. This is probably due to the fact that such nebulosity is too faint to show in the short exposures and is masked by halation effects in the longer.	
6809	19 33.7	—31 10		M. 55. A fine globular cluster 10' in diameter. The background of faint stars is less dense near the center than in most clusters of this type. 4 s.n.	
.....	19 34.1	+49 58		R <i>Cygni</i> . Exposure of 1 <sup>h</sup> 50 <sup>m</sup> shows no nebulosity about this star at minimum; cf. Espin, <i>M. N.</i> , May, 1912. 4 s.n.	
6814	19 37.4	—10 33		Faint, nearly round spiral 2' in diameter. Whorls rather open; stellar nucleus. 3 s.n.	
6818	19 38.3	—14 24		Planetary. 4 s.n.	
6826	19 42.1	+50 17		Planetary. 10 s.n.	
6833	19 46.9	+48 42		Planetary.	
6838	19 49.3	+18 31		Rather sparse globular cluster 5' in diameter. 0 s.n.	
6853	19 55.3	+22 27		Vol. VIII, Plate 60. M. 27; the "Dumb-bell" Nebula in <i>Vulpecula</i> . Planetary. 0 s.n.	

		N.G.C.		$\alpha$		$\delta$		DESCRIPTION—(Continued)
✓		6864	20	0.2	—22	12	M. 75. Bright, compact globular cluster 2' in diameter. Greatly condensed at center. 9 s.n.	
		6879	20	5.9	+16	38	Planetary. 0 s.n.	
		6881	20	7.2	+37	7	Planetary. 0 s.n.	
		6884	20	7.2	+46	10	Planetary. 0 s.n.	
		6886	20	8.3	+19	41	Planetary. 0 s.n.	
		6888	20	8.8	+38	6	A moderately bright, irregular, crescent-shaped band of diffuse nebulosity 18' long; network formation. 0 s.n.	
		6891	20	10.4	+12	26	Planetary. 0 s.n.	
		6894	20	12.4	+30	16	Vol. VIII, Plate 61. Annular nebula in <i>Cygnus</i> . Planetary. 0 s.n.	
II		4997	20	15.6	+16	25	Planetary. 3 s.n.	
		6905	20	17.9	+19	47	Planetary. 4 s.n.	
I		1317	20	18.2	+ 0	20	Moderately bright oval 0.2 long; no structure apparent. Not planetary; shows continuous spectrum. 0 s.n.	
		.....	20	21.1	+42	0	Faint diffuse nebulosity 2' in diameter about the star B. D. +41°, 3731.	
		.....	20	21.3	+42	4	Bright diffuse nebulosity of <i>Pleiades</i> type 2' in diameter, surrounding the star B.D. +41°, 3737.	
		6914	20	21.3	+42	10	Irregular diffuse nebulosity 4' x 3'. 6 s.n.	
		6927	20	27.8	+ 9	33	Small spindle 0.5 long; rather bright, nearly round center.	
		6928	20	28.0	+ 9	35	1.5 x 0.4 in p.a. 110°. A rather bright two-branched spiral, with absorption lane on south side. See Abs. Eff. 18 s.n.	
		6930	20	28.2	+ 9	31	1.3 x 0.2 in p.a. 10°; rather bright small nucleus; doubtless spiral. 28 s.n.	
		6933	20	28.7	+ 7	3	Non-existent.	
✓		6934	20	29.3	+ 7	4	Bright globular cluster 3' in diameter. 8 s.n.	
		6939	20	29.4	+60	18	A coarse cluster of small stars, about 8' x 6'.	
		6940	20	30.4	+27	58	A very open, sparse cluster of stars of magn. 12–13. 0 s.n.	
		6946	20	32.6	+59	48	Vol. VIII, Plate 62. Faint, open, nearly round spiral 8' in diameter. Bright, slightly elongated nucleus; many almost stellar condensations in the whorls. 5 s.n.	
		6951	20	35.8	+65	45	Rather faint, symmetrical spiral 3.5 in diameter. Very bright, slightly oval nucleus 0.2 long. $\phi$ -type. 2 s.n.	
		6960	20	41.5	+30	21	A wonderful object, over a degree in length, composed of bright filaments like the "Net-work" Nebula. 0 s.n.	
✓		6981	20	48.0	—12	55	Small bright cluster 3' in diameter; globular; comparatively open. 13 s.n.	
		.....	20	49	+59	30	Dark object in <i>Cepheus</i> . This irregular area is almost absolutely devoid of stars. The general effect is better shown on portrait lens plates.	
		6995	20	53	+30	50	Vol. VIII, Plates 63. The beautiful "Net-work" Nebula in <i>Cygnus</i> . 1.3 long. Too large to be recorded in its entirety on a Crossley plate; there are fainter extensions to the south which are not shown in Plate 63. 2 s.n.	
		7000	20	55.2	+43	56	The great "America" nebula; too large to be recorded by the Crossley Reflector, except in sections. The "Isthmus" region is full of interesting detail and shows a marked cutting off of faint stars on each side; the "Canada" region is a mass of diffuse nebulosity with no detailed structure and is of little interest. 0 s.n.	
		.....	20	56	+51	30	The northern "coal-sack." Of little interest with an instrument of this focal length. 0 s.n.	
		7006	20	56.8	+15	48	A compact cluster of faint stars 1' in diameter. Difficult to determine whether or not it contains nebulosity. It apparently has an almost stellar nucleus, and certainly shows some spiral arrangement. 3 s.n.	
		7008	20	57.6	+54	10	Planetary. 0 s.n.	
		7009	20	58.7	—11	48	Planetary. 1? s.n.	
		7023	21	0.5	+67	46	Vol. VIII, Plate 65. An interesting mass of diffuse nebulosity 12' x 10', surrounding a star of magn. 7. The central parts are very bright, not "eF" as described in the N. G. C. Shows a wealth of structural detail. Marked obliteration of fainter stars over an area 35' in diameter. 0 s.n.	
		7026	21	2.9	+47	27	Planetary. 0 s.n.	
		7027	21	3.3	+41	50	Planetary. 0 s.n.	
		7044	21	9.2	+42	5	A coarse, faint, rather irregular cluster about 4' in diameter. 0 s.n.	
		7052	21	14.2	+26	1	Slightly oval; 0.4 long; much brighter at center; probably spiral. 2 s.n.	
✓		7078	21	25.2	+11	43	M. 15. A bright, unusually beautiful globular cluster 8' in diameter. 17 s.n.	
✓		7089	21	28.3	— 1	16	M. 2. Fine globular cluster 7' in diameter. 8 s.n.	
II		5117	21	28.7	+44	10	Planetary.	
✓		7099	21	34.7	—23	38	M. 30. Bright globular cluster 5' in diameter. 25 s.n.	
		7116	21	38.2	+28	27	Faint; binuclear; 0.6 long. 1 s.n.	

				DESCRIPTION—(Continued)
N.G.C.	$\alpha$	$\delta$		
7129	21 40.7	+65 39		Bright diffuse nebulosity $5' \times 4'$ , involving five stars of magn. 9–10. The structure is quite irregular; there is a long curved quasi-whorl, but the nebulosity is not of spiral type. 2 s.n.
7133	21 42.1	+65 42		Faint diffuse nebulosity about $3'$ long involving two stars of magn. 12. Perhaps merely an extension of 7129.
7139	21 42.2	+63 10		Planetary.
7142	21 43.5	+65 21		Coarse, sparse cluster of stars of magn. 11–15, about $10'$ in diameter.
7156	21 49.5	+ 2 48		Rather faint, compact, very symmetrical spiral; nearly round; $1'$ in diameter; faint, rather hazy nucleus. 4 s.n.
II 5146	21 49.6	+46 48		A very interesting mass of diffuse nebulosity surrounding a star of magn. 9.5. The nebula shows a great deal of structural detail, including several dark lanes, which are quite irregular. The nebulosity is about $10'$ in diameter. Very clearly marked effects of dark occulting matter are shown around the nebula over an area about $16'$ in diameter; the number of faint stars decreases very abruptly. First noted by Espin, <i>A. N.</i> , 3633. A photograph by Wolf is reproduced in <i>M. N.</i> , 64, p. 838, showing that the nebula is at the end of a long starless rift which extends $2^\circ$ west to a large mass of faint diffuse nebulosity. The Crossley negative is reproduced in <i>Publ. Astr. Soc. Pac.</i> , 29, 94, 1917, Figure 2. 0 s.n.
7177	21 55.9	+17 16		Bright, compact, slightly oval spiral $3'$ long in p.a. $80^\circ$ . Nucleus rather large and indistinct; no condensations in the whorls. 17 s.n.
7180	21 56.7	—21 2		Bright narrow oval $1'$ long in p.a. $65^\circ$ ; slight trace of spiral formation.
7184	21 57.1	—21 18		Moderately bright spiral $5' \times 1'$ in p.a. $60^\circ$ . Nucleus bright, but hazy; whorls show no condensations. Some evidence of occulting effect on the north. See Abs. Eff. 21 s.n.
7185	21 57.4	—20 57		Small oval with bright center; $0.5$ long; no structure discernible.
7217	22 3.4	+30 52		Vol. VIII, Plate 66. $2.5 \times 2'$ in p.a. $85^\circ$ . Central portion very bright, with an almost stellar nucleus. Whorls near center are very compactly arranged; next follows a vacant ring; outside of this is a faint, nearly perfect ring. 7 s.n.
I 1434	22 6.9	+52 20		A coarse cluster of stars of 12–15 magn. about $8'$ in diameter. The branched effect noted in the N. G. C. is not at all prominent. 0 s.n.
7226	22 6.9	+54 55		Not a nebula; a small, coarse cluster of faint stars about $2'$ in total diameter. 0 s.n.
I 1442	22 12.7	+53 33		A sparse cluster of stars of magn. 12–16. Described in the N. G. C. as a cluster of nebulous stars; can detect no nebulosity. 0 s.n.
II 5217	22 19.9	+50 28		Planetary. 0 s.n.
7280	22 21.6	+15 38		Oval; $0.4$ long, with very bright, round center; perhaps a spiral. 1 s.n.
7293	22 24.3	—21 21		Remarkable helical nebula in <i>Aquarius</i> ; planetary. 25 s.n.
7309	22 29.0	—10 53		This is a small nebula about $1.5$ in diameter, of very unusual form. Has a faint stellar nucleus; there are three fainter nuclei from which spring short whorls; these are not arranged as in an ordinary spiral, but overlap. 10 s.n.
.....	22 32.2	+52 15		<i>Nova Lacertae</i> . Long exposure (1912, Sept. 13) shows no nebulosity. 3 s.n.
7317	22 31.3	+33 26		Nearly round, $0.4$ in diameter; bright center.
7318	22 31.4	+33 27		Faint two-branched rather open spiral with almost stellar nucleus. $1'$ in diameter.
7319	22 31.5	+33 28		Moderately bright narrow oval $0.8$ long; perhaps spiral.
7320	22 31.5	+33 26		$1.8 \times 0.8$ ; a faint, patchy spiral with hazy nucleus.
7325	22 32.2	+33 51		Very small faint patch; no structure apparent.
7326	22 32.3	+33 54		Non-existent.
7327	22 32.3	+33 57		Non-existent.
7331	22 32.5	+33 54		Vol. VIII, Plate 67. A fine bright spiral $9.5 \times 2'$ in p.a. $165^\circ$ . Very bright, elongated nuclear portion, within which is a bright, hazy nucleus. The whorls show a number of condensations, not very sharp. See Abs. Eff. 27 s.n.
7332	22 32.6	+23 17		Bright spindle $2' \times 0.3$ in p.a. $158^\circ$ ; very bright round center; slight traces of spiral structure.
7333	22 32.6	+33 55		Oval $1' \times 0.5$ , with bright, almost stellar nucleus; probably spiral.
7335	22 32.7	+33 56		Faint two-branched spiral $0.5$ in diameter; faint, almost stellar nucleus.
7336	22 32.8	+33 58		Non-existent?
7337	22 32.9	+33 51		Faint spiral $1' \times 0.6$ , with bright, almost stellar nucleus.
7338	22 32.9	+33 54		$0.4$ in diameter; round, bright center.
7339	22 33.0	+23 16		Very faint patchy spiral $1.6 \times 0.3$ in p.a. $95^\circ$ ; dark lane down the middle.
7340	22 33.2	+33 53		Non-existent.
7343	22 34.0	+33 33		Moderately bright two-branched spiral $0.7$ in diameter; bright, almost stellar nucleus.
7354	22 36.6	+60 46		Planetary. 1? s.n.
7363	22 38.7	+33 29		Faint, nearly round spiral about $0.7$ in diameter. Almost stellar nucleus. 4 s.n.



N.G.C.		$\alpha$	$\delta$	DESCRIPTION—(Continued)
7369		22 39.6	+33 48	Round; diameter 0'6. Stellar nucleus surrounded by a faint ring; doubtless a spiral, though it strongly resembles a planetary.
.....		22 40.4	+33 28	0'5 in diameter; round; bright, almost stellar nucleus; perhaps spiral. 5' n.f. is a bright elongated patch 0'4 long; perhaps spiral.
7371		22 40.8	—11 32	Faint nearly round spiral 1' in diameter; almost stellar nucleus of magn. 14. Whorls are very faint and regular, giving a ring effect. 7 s.n.
I 1453		22 41.6	—13 58	Rather faint; round, 0'5 in diameter; small nucleus. The whorls form a faint ring. 6 s.n.
7393		22 46.4	— 6 5	An unsymmetrical oval ring 1' long in p.a. 95°, with several condensations and an eccentrically placed, hazy nucleus; much fainter matter outside in major axis. Appears to be a rather irregular single-whorled spiral. Moderately bright. 12 s.n.
7431	x	22 53.2	+25 37	These are very small, almost stellar nebulae, of no particular interest. 12 s.n.
7433				
7435				
7436				
7439		22 53.9	+28 43	Described as "Long patch of F neby." Non-existent? No trace found in an exposure of 2h. 6 s.n.
7442		22 54.5	+15 0	Moderately bright, very compact, nearly round spiral 0'9 in diameter; almost stellar nucleus.
7448		22 55.1	+15 27	Bright, rather irregular, compact spiral 2' x 0'8 in p.a. 170°; small nucleus. 29 s.n.
7454		22 56.2	+15 51	Slightly elongated, 1' long; very bright center; probably spiral.
7457		22 56.2	+29 36	2' x 0'5 in p.a. 125°, with very bright round center; no evidence of spiral character. 8' n.f. is a faint spindle 1' long in p.a. 140°. 10 s.n.
7461		22 56.9	+14 59	Oval 0'7 long; very bright center.
7463		22 56.9	+15 27	2' x 0'3 in p.a. 95°; moderately bright. No nucleus apparent. Very irregular; the most prominent feature is a bright band cutting across the nebula at an angle of about 50°. Perhaps a $\phi$ -type spiral seen at a considerable angle.
7464		22 57.0	+15 27	A moderately bright, nearly round, structureless patch of nebulosity 0'3 long; probably spiral.
7465		22 57.1	+15 26	Oval 0'8 long, with very bright, round center.
7479		22 59.9	+11 47	Vol. VIII, Plate 68. Bright; 3' x 2'5. Two-branched, S-shaped spiral, probably the best example of this form. Faint, almost stellar nucleus; numerous almost stellar condensations in the whorls. 6 s.n.
7492		23 3.2	—16 10	A very sparse cluster of very faint stars, about 4' in diameter. 2 s.n.
7497		23 4.1	+17 38	Very faint; 6' long by 0'6 wide in p.a. 45°. Has a very faint elongated or double nucleus; is an irregular spiral seen nearly edgewise. 8 s.n.
7537		23 9.5	+ 3 57	2' x 0'4 in p.a. 82°. A moderately bright, indistinct spiral; no nucleus or condensations. Absorption effect on s. side. See Abs. Eff.
7541		23 9.6	+ 3 59	A moderately bright spiral 2'6 x 0'6 in p.a. 97°. No nucleus; a straight line of matter proceeds to west from the center along the major axis. Apparently a single-whorled spiral, showing a few rather hazy condensations. 11 s.n.
7579		23 12.6	+ 8 53	0'2 in diameter; slightly oval; structureless.
7584		23 12.8	+ 8 53	A replica of 7579.
7587		23 12.9	+ 9 8	A narrow spindle 0'8 long in p.a. 135°; moderately bright nucleus. A faint double nebula is 1' s.; it is not certain to which object the N. G. C. description applies.
7601		23 13.7	+ 8 41	A faint, slightly oval spiral 1' x 0'8 in p.a. 90°; faint, almost stellar nucleus. 36 s.n.
7606		23 13.9	— 9 2	A beautiful, moderately bright spiral 6' x 1'6 in p.a. 150°. Bright nucleus; whorls are narrow and rather compact. 12 s.n.
7609		23 14.4	+ 8 57	There is a group of four small nebulae at this point, and it is not certain to which of the four the N. G. C. description is intended to apply. The two southernmost nebulae are small spindles 0'5 long, showing traces of spiral structure. The two nebulae at the north form an unusual combination. The northern one is 0'3 in diameter; slightly oval; rather bright. 27" distant in p.a. 130°, is a similar fainter nebula; a single curved whorl connects the two nebulae.
7640		23 17.3	+40 18	Rather faint; 9' x 1' in p.a. 172°. An S-shaped spiral seen nearly edgewise; rather patchy; a short dark lane down the middle of the central mass. See Abs. Eff. 4 s.n.
7654		23 19.7	+61 3	A very sparse, open cluster 16' in diameter, of stars of 12–16 magn. 0 s.n.
7662		23 21.1	+41 59	Planetary. 3 s.n.
7721		23 33.7	— 7 4	A moderately bright spiral 2'6 x 1' in p.a. 15°. Nucleus indistinct; whorls rather patchy and irregular. 13 s.n.
7723		23 33.8	—13 31	A nearly round, rather faint, open spiral of the $\phi$ -type, 1'5 long. Bright stellar nucleus. 6 s.n.

				DESCRIPTION—( <i>Concluded</i> )
N.G.C.	$\alpha$	$\delta$		
7748	23 40.3	+69 12		Described as "vL neby, surround star 7 mag." Non-existent. No trace in an exposure of 2 <sup>h</sup> 10 <sup>m</sup> . 0 s.n.
7752	23 42.0	+28 57		Bright elongated patch of nebulosity 0.3 long. It is trinuclear; perhaps a very irregular spiral. It is 1' beyond the longest whorl of 7753, and strongly suggest a satellite nebula, as in the case of M. 51.
7753	23 42.1	+28 55		A rather faint, symmetrical, open spiral 2.5 long; slightly oval. Nucleus almost stellar and three almost stellar condensations in the whorls. Perhaps connected with 7752. 6 s.n.
7778	23 48.2	+ 7 19		Slightly oval; 0.5 in diameter; bright center; slight trace of spiral character.
7779	23 48.3	+ 7 19		Slightly oval; 1' in diameter. Small, hazy nucleus. The whorls form a nearly complete oval ring, and are quite faint.
7780	23 48.4	+ 7 37		Rather faint $\phi$ -type spiral 0.8 x 0.4 in p.a. 0°; nucleus almost stellar.
7781	23 48.7	+ 7 18		Bright spindle 0.8 long in p.a. 20°; very bright round center.
7782	23 48.8	+ 7 25		Rather faint spiral 2' x 1' in p.a. 175°. Nucleus rather bright; whorls compact. 25 s.n.
7789	23 52.0	+56 10		A sparse, very open cluster of stars of magn. 12-17, 16' in diameter. 0 s.n.
II 5366	23 52.6	+52 14		No trace in an exposure of 2 <sup>h</sup> . Probably can be recorded only in very long exposures. Described as 30' x 10'. 8 s.n.
7814	23 58.1	+15 34		Vol. VIII, Plate 70. 3' x 0.8 in p.a. 132°. Bright; no nucleus or whorls are discernible, but it is doubtless a spiral seen edgewise. A remarkable, clear-cut dark lane runs down its entire length. See Abs. Eff. 19 s.n.
7817	23 58.9	+20 12		Moderately bright spiral 3' x 0.5 in p.a. 44°. Small, hazy nucleus; a number of condensations in the rather compact whorls. See Abs. Eff. 9 s.n.

March, 1918.