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 DESCRIPTIONS OF 109 NEBULAE AND CLUSTERS PHOTOGRAPHED WITH
THE CROSSLEY REFLECTOR: SECOND LIST

This list is a continuation of that published in *Lick Observatory Bulletin*, No. 219, and it comprises photographs made between September 26, 1912, and November 1, 1913. With one exception, noted at the proper place in the list, all the negatives were made by the writer, and observer's initials have been accordingly omitted.

Large numbers of small, faint nebulae are recorded on many of the plates, and I have given the numbers found on plates where these small nebulae occur in greatest number. The available area of a Crossley negative is about six tenths of a square degree, but on the edges of this area the definition is poor because of the distance from the optical axis, and small nebulae might here easily escape detection. The exposures were, in practically all cases, two hours in length; longer exposures, and counts limited to a radius of 15' from the optical axis, might easily show

larger numbers of nebulae per square degree. I have given descriptions of a few of these uncatalogued nebulae in cases where the brightness of the objects, or other features of interest, seemed to render them worthy of inclusion.

Quite a number of nebulae have been photographed which more or less closely resemble the Greek letter ϕ , and, for lack of a better term, I have called these ϕ -type spirals. These show an oval ring crossed by a straight line of matter. N. G. C. 5921 is an excellent example of this type, and a cut of this nebula may be seen in the *Publ. Astr. Soc. Pacific*, **24**, 227, 1912. When seen edgewise this type possibly gives us the *Saturn*-shaped nebula, of which a number of examples are known.

HEBER D. CURTIS.

November 1, 1913.

N.G.C. No.		α	δ	Description
20	0h 4m4	+32° 45'		Small, bright center, structureless. 10 mag. star follows 30", but is not connected with the nebula. Forty-one nebulae on this plate, but none appear to coincide with N.G.C. 21 (Swift).
29	0 5.6	+32 48		Small, somewhat irregular spiral about 1'2 long; central star; 13 mag. star close to whorl on N., but probably not physically connected.
....	0 5.5	+32 26		Small, fairly bright, ϕ -type spiral 0'6 long, not noted in the N.G.C.
68	0 13.2	+29 31		A rather faint spiral about 1'5 in diameter; rather strong stellar nucleus; two 14 mag. stars involved, but evidently not physically connected. This region unusually thick with small nebulae and nebulous stars, eighty-seven counted in an area 45' by 55'. Several of these are small spirals. N.G.C. Nos. 67, 69-72, and 75 are all small nebulae or nebulous stars.
147	0 27.7	+47 57		Rather irregular; slightly oval; 3' long; a star of 11 mag. is at one side of the faint nucleus. Two small, curious rifts; perhaps an irregular spiral.
151	0 29.0	-10 15		A fine, symmetrical, rather open spiral about 4' long.
163	0 31.0	-10 40		Strong nucleus; almost stellar. A small, faint, spindle-shaped nebula is 1'5 s.p.; twenty-seven nebulae on this plate.
....	0 31.1	-10 27		A faint, irregular spiral 0'8 long; sharp nucleus. Not given in N.G.C.
165	0 31.4	-10 40		Stellar nucleus; whorls quite faint, but very regular; nearly round; 1' in diameter.
281	0 47.4	+56 3		Large patch of diffuse, irregular nebulosity 16' across. Shows considerable detail and a clearly defined "hole" with clear-cut edges. Large "bay" cuts into s.p. side.
404	1 3.9	+35 11		Round; quite bright; strong nucleus almost stellar; no spiral structure.
467	1 14.0	+ 2 46		Quite bright; strong center; diameter about 30"; no spiral structure.

N.G.C. No.	α	δ	Description
470	1 ^h 14 ^m 6	+ 2° 53'	Nucleus about 12 mag. A rather irregular, somewhat patchy spiral, whose whorls form an oval ring 1.6 long; unsymmetrical fainter extension at south.
474	1 14.9	+ 2 53	Small; bright; center almost planetary; much fainter outside; round; diameter 30"; not spiral. Thirty small nebulae on this plate, most of them elongated, and several are clearly faint spirals.
486	1 16.6	+ 4 49	Very small, faint, nearly round, probably spiral.
488	1 16.6	+ 4 44	Nearly round; 3' in diameter; small, strong nucleus. An unusually symmetrical, rather faint spiral. Whorls very delicate, and so close together that at first sight they appear to be rings about the nucleus instead of spirals. Thirty-one nebulae on plate.
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, structureless. The following one is probably 492; 30" 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 spiral; nearly round; 2' in diameter; quite regular and symmetrical; a number of condensations.
613	1 29.6	-29 55	A very interesting ϕ -type spiral about 4' long. Somewhat resembles N.G.C. 1300 and 5921. Nucleus is pear-shaped; numerous condensations. There is a faint patch of irregular nebulosity 21'. 5 to s.
736	1 50.9	+32 33	Bright; about 25" in diameter; strong nucleus; not spiral. N.G.C. 737 is described as "Stellar neb (? F *) 27" n of 736." Does not exist; is simply a faint star.
738	1 50.9	+32 34	Very small; stellar nucleus; slightly elongated.
740	1 51.1	+32 32	A small, considerably elongated oval with faint stellar nucleus; spiral; 1.1 long. Thirty-seven small nebulae in this area, but none in position given for N.G.C. 739. This is described as "cF, vS, R, in triangle of stars"; there is such an object at 1 ^h 51 ^m 1, +32° 46'. Double nebula; nuclei 25" apart; the northern one is the brighter; apparently physically connected.
750-1	1 51.7	+32 43	Very faint, elongated spiral about 1' long. A very faint patch 2.3 s.p. is probably N.G.C. 760.
761	1 52.0	+32 53	Not given in N.G.C. though much more conspicuous than No. 765 which is 29' s. A ϕ -type spiral; axis in 135°; 1' long. 9' n.f. is a very faint spiral about 0.8 in diameter.
.....	1 52.9	+24 54	A small, open spiral; whorls very faint; 1' long.
765	1 53.2	+24 25	Fairly bright; somewhat oval; much brighter center; too small to show any structure.
770	1 53.7	+18 28	A beautiful, rather symmetrical spiral about 5' by 3'; numerous faint condensations; one whorl much brighter than the rest. Thirty-eight small nebulae near.
772	1 53.8	+18 31	Twenty-four nebulae in this region. N.G.C. 908 is a fine, bright, very patchy spiral, rather unsymmetrical; numerous condensations; 3.5 long. Whorl on f. side is bifid.
908	2 18.5	-21 41	Faint, small, elongated; central star about 14 mag. Possibly a spiral seen nearly edgewise. Negative by Perrine.
926	2 21.0	- 0 50	Forty-eight nebulae and nebulous stars on this plate. 1195 is very small; nebulous star?
1195	2 58.8	-12 26	Bright center; elongated fainter part; perhaps small spiral.
1196	2 58.8	-12 28	Bright center; small; no detail. 3' s.p. is a small, faint, elongated spiral.
1200	2 59.2	-12 23	Elongated; 1' long; no detail visible, but probably edgewise spiral.
1204	3 0.5	-12 44	Elongated, very patchy spiral about 6' by 1'. Numerous condensations; rather faint; elongation is in 140°.
1337	3 23.2	- 8 45	Safford No. 70. Diffuse, rather bright, irregular nebulosity of <i>Pleiades</i> type about 6' in extreme diameter. Several stars involved. Slight nebulosity also around 10 mag. star 9.5 n.f. this nebula.
.....	3 38.2	+31 51	Small; bright center; slightly elongated; perhaps spiral.
1440	3 40.5	-18 36	R. A. as given in the N.G.C. probably in error; no object in that place. Faint; <i>Saturn</i> -shaped; 1' long; much brighter center; perhaps spiral. Twenty faint nebulae on this plate.
1455	3 40.8	-18 57	Discovered by Barnard (<i>Sid. Mes.</i> , 5, 27, 1886). "Probably about $\frac{1}{2}$ ° long." A very faint, long strip of diffuse nebulosity, 30' long in its brighter portion, 3' to 5' wide, elongated in 135°. Much fainter extensions bring total length to nearly a degree.
1499	3 56.9	+36 8	Very irregular and patchy mass of nebulosity about 5' in extreme diameter; main portion somewhat resembles an Ω . Exceedingly faint nebulosity about a tenth mag. star 12' n.f.
1579	4 23.7	+35 41	Small, nearly round, rather irregular spiral, 40" in diameter.
1599	4 26.7	- 4 48	Oval; 1.5 long; nucleus; no evidence of spiral character. Thirty-one nebulae on this plate.
1600	4 26.7	- 5 18	1601 is almost stellar; 1603 is elongated and is perhaps a faint spiral, 1604 about 20" long, binuclear; 1606 is very small, slightly elongated.
1624	4 32.8	+50 15	Very faint; diffuse; a number of stars involved; about 3' in diameter.
1637	4 36.4	- 3 3	Slightly oval; 3' long; a symmetrical, rather open spiral; quite faint; numerous condensations.
.....	4 35.6	- 2 13	Faint; 2' long; edgewise spiral.
1638	4 36.6	- 2 0	Small, round, quite bright; no evidence of spiral character.
1642	4 37.8	+ 0 25	A fine, rather open spiral; somewhat patchy; diameter about 1.7. Thirty-six nebulae on this plate, quite a proportion of which are doubtless spirals. A very interesting one 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.
1784	5 0.8	-12 1	A rather faint ϕ -type spiral; main portion about 1.5 long.
1788	5 2.0	- 3 29	Quite irregular; 5' over all. Two stars of tenth and twelfth magnitudes form the nuclei, and about each are traces of spiral structure.
1888-9	5 17.9	-11 35	1888 is 2' long; quite narrow; an irregular spiral seen edgewise; 1889 is small, round, quite bright, almost stellar, nearly opposite middle of 1888 and 20" distant. A narrow, faint nebula 1.8 long (edgewise spiral) is 36" f. 4.5 n., not noted in N.G.C.
1990	5 31.2	- 1 16	Described in the N.G.C. as a very large nebula of the <i>Merope</i> class with ϵ <i>Orionis</i> at the n.p. end. It seems that Herschel must have been misled here by the radiance about the very bright star. Lord Rosse was unable to see on two occasions; so also D'Arrest under very favorable conditions. I find no trace of nebulosity in an exposure of two hours.
2146	6 2.7	+78 23	Fairly bright, total length 4.5; some traces of original spiral character; bifid; the dark lane is very irregular and sharply indented.

N.G.C. No.	α	δ	Description
2174-5	6h 3m7	+20° 30'	N.G.C. 2174 and 2175 are simply brighter portions in a very large mass of nebulosity, nearly square in general outline; 22' long; roughly central about star of 8 mag.; brightest on following edge. 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.
2245	6 27.2	+10 14	Bright fan-shaped mass extending s. from strong nucleus. Bright wisp n. of nucleus, and separated from it by a narrow lane. About 6' by 3' in size; but little structural detail.
2247	6 27.7	+10 4	Diffuse nebulosity of <i>Pleades</i> type filling space about 3' square about a star of 8.5 mag. A similar object of same type and size, not given in the N.G.C., is at 6h 25m7, +10° 31'.
2261	6 33.7	+ 8 49	Bright, fan-shaped mass proceeding to n. from a nucleus of 11 mag; about 2' by 1'; considerable structural detail.
2653	8 42.8	+78 48	Described as vF, vS, F* close n. No such object exists in this position. Twenty-eight nebulae on plate. There is a small spiral (ϕ -type?) at 8h 42m7, +78 58' with faint star 1' n.f.
2655	8 43.2	+78 36	Very bright at center; main portion 1' long; outside are narrow, exceedingly faint spiral whorls; probably 4' in total diameter. Curious small hole on s. side, close to nucleus.
2682	8 45.8	+12 11	Very large, very open cluster.
2681	8 46.4	+51 41	Very bright nucleus, surrounded by strong nebulosity; farther out, diameter about 40", is a strong, nearly perfect ring, probably formed by the union of two whorls; very faint whorls outside this ring. Thirty or more small nebulae on this plate.
2768	9 3.8	+60 27	Fairly bright; 1/4 long; nucleus nearly stellar; a compact spiral, but whorls indistinct.
2976	9 39.0	+68 22	Quite bright oval 3/2 by 1/1, with very clear cut edges; very many almost stellar knots; structure very irregular; probably spiral; though spiral character is not at all clearly marked. No well defined center.
3346	10 38.3	+15 24	Quite faint; nearly round; diameter 2/5; stellar nucleus. A very open spiral with numerous condensations, and some approach to a ϕ -type at the center.
3368	10 41.5	+12 21	A fine strong spiral; brightest part 2/6 long. Strong nucleus; outer part of brighter structure forms a nearly complete oval ring; a much fainter whorl outside this brings total length to about 7'; clear-cut rift goes in to nucleus on n.p. side. Reproduced in <i>Publ. Astr. Soc. Pacific</i> , June, 1913, frontispiece.
3379	10 42.6	+13 7	This, with 3384 and 3389, forms a striking group, a right-angled triangle whose shorter sides are about 7' long. 3379 is nearly round, very bright; very strong center; diameter 2'; no evidence of spiral character.
3384	10 43.0	+13 10	A replica of 3379 except that it is more oval; 3' long. Nucleus is oval; no whorls can be made out, but is possibly a spiral of the <i>Andromeda</i> type.
3389	10 43.2	+13 4	A fine, somewhat oval spiral 2' long; quite irregular; numerous condensations; weak nucleus. Besides the three catalogued in the N.G.C., there are forty-seven small nebulae on this plate.
3681	11 21.3	+17 26	A spiral 1' in diameter; very bright center. Whorls are faint, and form a nearly perfect ring.
3684	11 21.9	+17 35	Slightly oval; 1/2 long; rather patchy spiral; nucleus fairly strong.
3686	11 22.5	+17 46	A fine, rather open spiral, with stellar nucleus of about mag. 12. Nearly round; 2' in diameter. The two main whorls show many condensations, faint, but nearly stellar. In addition to the four large nebulae, there are sixty-nine 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.
3691	11 22.9	+17 28	Faint oval 1' long, crossed by streak of brighter matter; a ϕ -type spiral.
3718	11 27.0	+53 37	Bifid; irregular; total diameter about 3'. On n.f. side a faint nucleus from which a wide, faint fan extends; bright patch on s.p. side, separated from nucleus by a clear lane.
3729	11 28.3	+53 41	Stellar nucleus; an oval 1/5 long; structure rather irregular; a spiral, though most of the matter is in an irregular oval ring.
4186	12 8.4	+15 18	Nucleus almost stellar; nebulous portion very faint, nearly round, 45" in diameter; a spiral.
4192	12 8.7	+15 27	An open, greatly elongated spiral, 14' by 3'. Stellar nucleus; numerous almost stellar condensations. Fig. in Vogel I, No. 6 (<i>Leip. Beob.</i> , Bd I). Twenty-eight very small and faint nebulae on plate.
4951	13 0.0	— 5 58	Quite irregular, 1/2 long; not spiral; bi-nuclear?
4981	13 3.6	— 6 15	Small ϕ -type spiral 1/5 long; stellar nucleus.
5838	15 0.4	+ 2 29	Fairly bright center; oval; 1/6 long; probably spiral.
5839	15 0.4	+ 2 1	Almost stellar; no structure visible.
5845	15 0.9	+ 2 1	Almost stellar; no structure visible; slightly elongated.
5841	15 1.1	+ 2 28	Very faint; spindle-shaped; 40" long. There is no object in the N.G.C. place for 5841. This nebula fits the description F, S, E, though perhaps too faint to be seen visually.
5846	15 1.4	+ 1 59	Bright center; round; diameter 1'; no structure apparent; star at s. does not appear to be physically connected.
5850	15 2.0	+ 1 55	This is a very faint but interesting ϕ -type spiral. Stellar nucleus; nearly round ring of matter about 2/2 in diameter; straight line of nebulous matter across ring with faint stars or condensations at the extremities of this axis. Sixteen uncatalogued nebulae on this plate.
5848	15 1.6	+ 2 24	A small, elongated spiral; strong center; <i>Andromeda</i> type.
5907	15 13.3	+56 41	11' long by 0/6 wide; a spiral seen edgewise. Vacant lane down the center for almost the entire length; nucleus (not stellar) is on n. side of this lane. Seventeen small nebulae on this plate.
5956	15 30.3	+12 5	Small, faint, nearly round spiral, 35" 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 ϕ -type.
6017	15 52.3	+ 6 17	Very small and rather faint; perhaps a spiral.
6555	18 2.7	+17 35	Small, faint, rather patchy spiral 2' long.
7156	21 49.5	+ 2 28	Small, rather compact, very symmetrical spiral 1' in diameter.
7280	22 21.6	+15 38	Very small; rather faint; perhaps a spiral.

N.G.C. No.	α	δ	Description
7309	22h 29m0	-10° 53'	This is a small nebula about 1'5 in size, of very unusual form. Has faint stellar nucleus; there are three fainter nuclei from which spring short whorls; these are not arranged as in an ordinary spiral, but overlap.
7332	22 32.6	+23 17	2' long, spindle shaped; very bright center; probably an <i>Andromeda</i> -type spiral seen edgewise.
7339	22 33.0	+23 16	Faint, greatly elongated, very patchy oval 1'6 long; probably an irregular spiral seen edgewise; clear lane down middle.
7363	22 38.7	+33 29	Faint; about 0'7 in diameter; nearly round; a spiral.
7369	22 39.6	+33 48	Diameter 40". Stellar nucleus, about which is a faint ring; doubtless spiral.
.....	22 40.4	+33 28	Not given in the N.G.C., though fully as conspicuous as 7363 or 7369. Small, round; nucleus quite bright; perhaps spiral. 5' n.f. is another fairly bright somewhat elongated nebula 0'5 long; probably spiral.
7439	22 53.9	+28 43	Described as "Long patch of F neby"; non-existent? No trace found in an exposure of two hours.
7497	23 4.1	+17 38	6' long by 0'5 wide in 135°. Has very faint elongated or double nucleus; is an irregular spiral seen nearly edgewise. Six other small nebulae on this plate; all probably spirals.
7640	23 17.3	+40 18	9' by 1'; an S-shaped spiral seen nearly edgewise; short dark lane down middle of central mass; rather patchy.
7654	23 19.7	+61 3	A large, loose, open cluster 16' in approximate diameter; very little condensed toward center.
7748	23 40.3	+69 12	Described as "vL neby, surrounds star 7 mag." Does not exist; absolutely no trace in exposure of 130 min.
7752}	23 42.1	+28 55	Rather faint, symmetrical, open spiral 2'5 long; slightly oval; stellar nucleus, a few star-like knots. Remarkable small bright patch is 1' beyond end of longest whorl; this patch is 20" long, and is trinuclear; is N.G.C. 7752.
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